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STANDARD SEVEN

TERM - III

VOLUME - 3

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SOCIAL SCIENCE

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Department of School Education

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PREFACE

The Science textbook for standard Seven has been prepared following the guidelines given in the National Curriculum Framework 2005. The book enables the reader to read the text, comprehend and perform the learning experiences with the help of teacher. The Students explore the concepts through activities and by the teacher demonstration. Thus the book is learner centric with simple activities that can be performed by the students under the supervision of teachers.

HOW TO USE THE BOOK?

- The Third term VII Science book has Six units.
- Units planned as per the index given including computer science.
- Each unit comprises of simple activities and experiments that can be done by the teacher through demonstration if necessary student's can perform them.
- Colorful info-graphics and info-bits enhance the visual learning.
- Glossary has been introduced to learn scientific terms.
- The "Do you know?" box can be used to enrich the knowledge of general science around the world.
- ICT Corner and QR code has been introduced in each unit for the first time to enhance digital science skills.

Lets use the QR code in the text books ! How ?

- Download the QR code scanner from the Google play store/ Apple App Store into your Smart phone.
- Open the QR code scanner application
- Once the scanner button in the application is clicked, camera opens and then bring it closer to the QR code in the text book.
- Once the camera detects the QR code, a URL appears in the screen.
- Click the URL and go to the content page.

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2.	Universe and Space	24	February
3.	Polymer Chemistry	42	February
4.	Chemistry in Daily Life	65	March
5.	Animals in Daily Life	81	March
6.	Visual Communication	93	April

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Assessment

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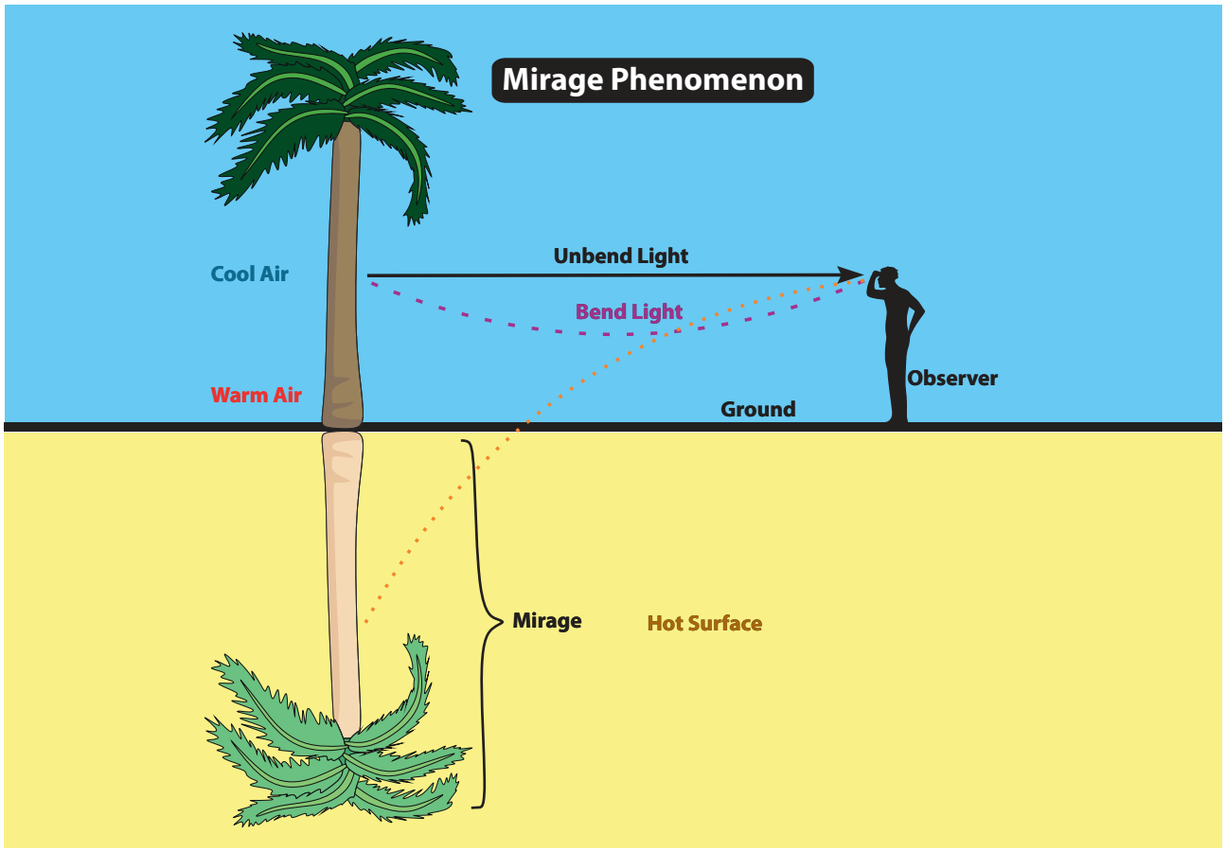
Unit 1

Light



Learning Objectives

The students will be able to

- understand that light is an energy
- differentiate natural and artificial light sources
- understand rectilinear propagation of light
- understand formation of shadows
- know reflection of light and its types
- know the laws of reflection
- understand the properties of the images formed in a plane mirror
- understand dispersion and spectrum
- understand synthesis of colours

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Introduction

When you enter into a dark room, nothing is visible. The moment you switch on the light, everything in the room becomes visible. How do we see things with our eyes? When you look at this book, the light falling on the book is reflected and enters your eyes. Light is a type of energy that helps us to see all the things around us. Light can be detected by the human eye. We all know that light is essential for vision. Let us see more about light in this chapter

DO YOU KNOW?

Light is the only source of energy for plants. So, they entirely depend on light. People and animals derive energy from carbohydrates, protein and fat through their food. Plants produce food using the energy from Sunlight, carbon-di-oxide and water by the process called as Photosynthesis. Sunlight acts a vital role in the process of photosynthesis.

Sources of Light.

Objects which are able to emit light are known as light sources. Light rays can come from different sources. There are two types of sources of light.

1. Natural sources of light
2. Artificial sources of light

JNQG8

Natural Sources of light

Sources which emit light naturally are known as natural sources of light. The Sun is the primary and the major source of natural light. Stars also produce light, in the same way as the Sun do. However, as they are much farther away than the Sun, the light from them are too weak. The moon provides light, particularly in the night. Some living organisms have the ability to produce light named by **bioluminescence**. It is the effect of certain chemical reactions occurring in the organism. Fireflies, jellyfish, glow worm, certain deep sea plants and some microorganisms can emit light naturally.

Artificial Sources of light

Apart from the natural sources, light can also be produced artificially. The different light sources that are able to produce light artificially can be put under the following categories.

DO YOU KNOW?

Is the moon a luminous object?

The moon provides light as well, but it cannot produce light by its own. The light emitted by the Moon is the light of the Sun reflected towards the Earth. When we see the Moon, we see only the Moon's lighted part. Thus, half of the moon is always facing the Sun and receiving light from it. Hence, we receive light from the moon.

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Artificial sources are man – made light sources such as flame of candle, incandescent lamp, neon lamp, Sodium lamp etc.

1. Incandescent Sources: When certain objects are heated to a high temperature, they begin to emit light. The glowing of hot iron rod is a kind of Incandescent light.

Example: Candle, incandescent lamp.

2. Gas Discharge Sources: Passing electricity through certain gases at a very low pressure (discharging) can produce light .

Example: Neon lamp, Sodium lamp

DO YOU KNOW?

We often use a kind of gas-discharge lamp that uses fluorescence to produce visible light. The electric current in the gas excites mercury vapour, which produces short-wave ultraviolet light that then causes a phosphor coating on the inside of the lamp to glow in visible light.

Properties of light

In this section, we shall examine some properties of light. Light has some fundamental properties as mentioned below

- Rectilinear propagation of light
- Reflection
- Speed
- Interaction of light with matter
  - Types of material according to permeability
  - Formation of shadows
  - Plane mirror and images
- Spectrum

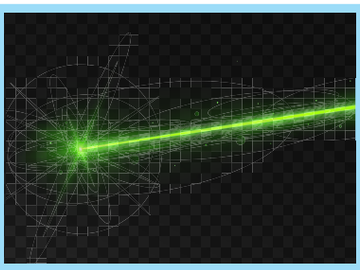
The path of light

How does light travel?

- Have you ever seen the scene of light penetrating through the branches of trees in denser forest?
- Have you ever seen the path of sun light entering through the hole of a cement grill building?
- Have you ever seen the path of a laser light?

Light penetration through trees

Light travels through the window grill



Laser beam

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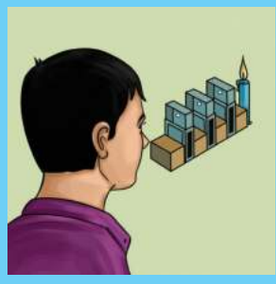
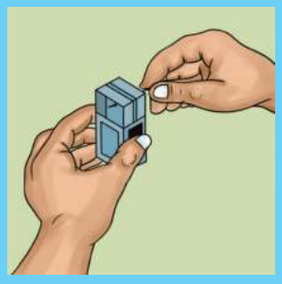
ACTIVITY 1

Requirement: Three empty match boxes, pin, candle and wooden blocks.





Procedure: Arrange empty match boxes and wooden blocks as shown in the figure. First, you make a hole in the inner tray of each match box such that all three holes are in the same spot. Arrange the match boxes as shown in figure. Now, adjust the three inner trays in such a way that the three holes are in a straight line. Place a lighted candle at one end of this arrangement and try to see the flame of candle from a hole at the other end. Is the flame visible?

Now, arrange the trays such a way that they are not at the same height. Try to see the flame. Is it visible? What does this activity tell you about the path of light?

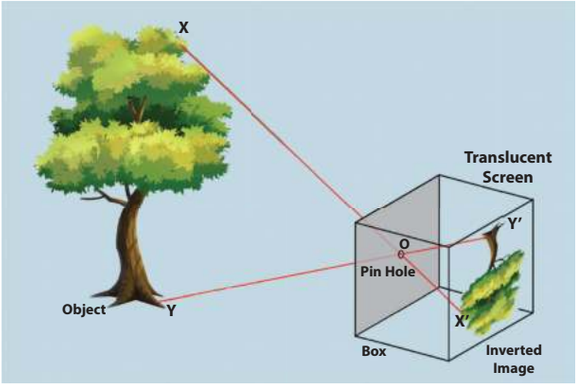
Light travels in straight line, it cannot bend the path itself. This is called as the *rectilinear propagation of light*. This is one of the most important property of light.

DO YOU KNOW?

Al-hasan-Haytham was a scientific thinker who made important contribution to the understanding of vision, optics and light. He observed that light coming through a tiny hole travelled in straight lines and projected an image onto the opposite wall. Based on such experimentation, he concluded that vision is accomplished by rays coming from external luminous sources and entering the eye, rather than through rays emitted from the eye as was then commonly believed. He is the first one to experiment with light and found important properties like the rectilinear propagation of light.

Pinhole Camera

Pin hole camera is a simple device which helps us to understand about the rectilinear propagation of light



The above picture shows a model of a pin – hole camera. O is small hole by a pin. XY is the object and Y'X' is the image of XY. As light travels in straight line, one light ray from X travels along the XO strikes the screen X'.

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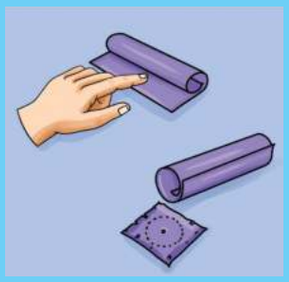
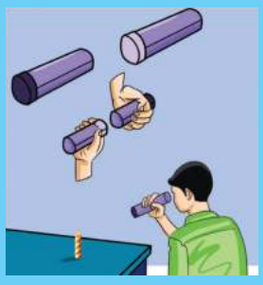
ACTIVITY 2

Make your pin-hole camera

Requirement : Two rectangular pieces of thick paper, carbon paper, a semi-transparent paper, adhesive





Procedure : Make two tubes using thick paper as shown in figure. One tube should be slightly smaller in diameter so that it can slide into the other tube without leaving much gap between the tubes. Fix a carbon paper to one side of the tube of greater diameter. Make a hole with a pin at the center of the carbon. Close one end of the second tube with the butter paper. Slide the smaller tube into the bigger one such a way that the butter paper is inside. Keep a lighted candle on a table and look through the hole with black side towards the candle. If you go closer to the candle, you will see a smaller, but brighter image. You can also change the image size by adjusting the tubes.

Use the pin-hole camera to see things in sun light outside the window and see how good an image you get. What are your observations about the image? Is it straight, inverted, bright and sharp?

In similar way, another light ray staring from Y and travels along YO strikes the screen Y'. Similarly, all the rays in between X and Y fall on the screen between Y' and X'. Thus Y'X' becomes the image of XY. The image produced is temporary, if a simple paper is used. The image can be made permanent if the paper is replaced by a photographic plate.

Reflection

A mirror reflects our face. A still water body like a pond reflects the scenery around it. When we see our face in the mirror, we see the light rays from our face bouncing off the surface of the mirror. How the rays of the light are reflected?

Take a plane mirror. Cover it with black paper. Cut a small slit as shown in the figure. If

DO YOU KNOW?

Before the advancement of camera, Pinhole camera was used to photograph movement of the sun over a long period of time. This type of photography is known as ***solography*** and also be used for observing and recording solar eclipses. And it was also used to take photograph of stationary objects.

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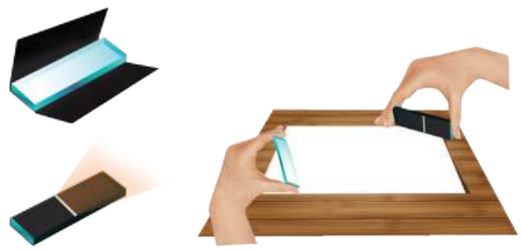
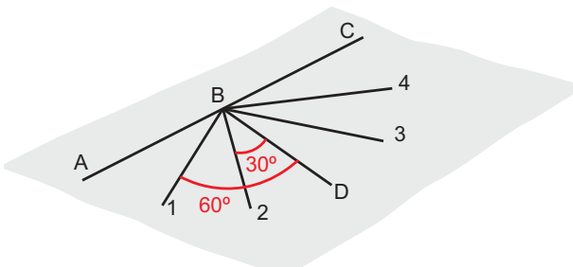
you shine light on the mirror from a torch light or sunlight, you will get a small ray of light. We can use this to study the properties of light.





Place a blank white sheet on a level ground out in the open. Choose a place where partly the sheet gets sunlight and partly it is in shadow. Hold the mirror with the slit facing the sun. You can see a straight ray of light reflected from the slit on the paper. Hold another mirror to reflect this ray. Observe well.

The light falling on the mirror is called as incident ray and the light reflected is called reflected ray.

Relationship between the incident ray and reflected ray

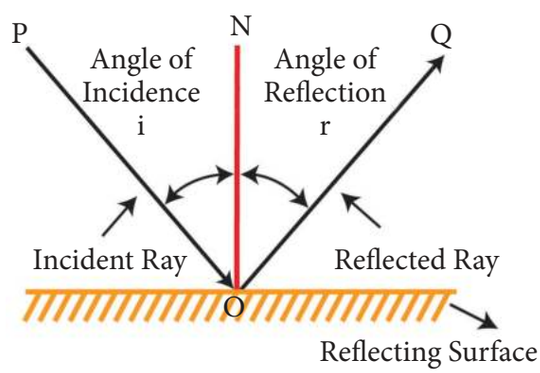
Draw a straight line ABC and angles as shown in the figure above. The line 1 is at 60° from BD, 2 at 30° from BD. Now, the line 4 at 60° from BD and line 3 at 30° from BD. The line BD is perpendicular, to ABC. Hold the mirror along the line ABC. Use the mirror with slit and make a ray go along the line 1 and reach the mirror at point B. Observe where the reflected ray is? Is the reflected ray go along 4?

Now, try keeping the mirror with slit and make the incident ray go along line 2. Now do we see that the reflected ray is along line 3?

Line BD, which is perpendicular the mirror surface is called as normal. The angle between the incident ray and the line BD is called angle of incident. Similarly, the angle between reflected ray and the normal is called as angle of reflection.

Can you make out relationship between the angle of incident ray and the angle of reflected ray? Yes. Is it not obvious that the angle of incident is same as the angle of reflection?

Terms used in reflection of light.



Incident ray: The ray of light that falls on the surface of the reflection materials. In the figure, PO is the incident ray.

Reflected ray: The ray of light that comes from the point when the incident ray falls on the reflection material. In the figure, OQ is the reflected ray.

Point of incidence: The point of which are incident ray strikes the reflecting surface is the point of incidence. In the figure 'O' point of incidence.

Normal: The perpendicular line drawn from the point of incidence to the plane of reflecting surface is called normal. In figure, ON is the normal.

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Angle of incidence: The angle formed between the incident ray PO and the normal 'ON' is angle of incidence. It is denoted by ∠i

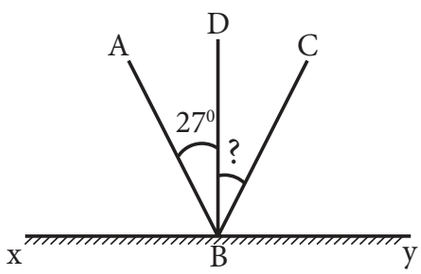
Angle of reflection: The angle formed between the reflected ray OQ and the normal ON is angle of reflection. It is denoted by ∠r

Laws of reflection:

1. The angle of incidence is always equal to the angle of reflection. ∠i = ∠r
2. The incident ray, the reflected ray and the normal at the point of incidence lie on the same plane.

Example 1

In the figure, the incident ray makes 27° with the normal, then find the angle of reflection.



Solution:

Angle of incidence = 27°

According to the laws of reflection, the angle of reflection = Angle of incidence = 27°

Example 2:

A light ray strikes a reflective plane surface at an angle of 43° with the plane surface.

i. Find the angle of incidence.

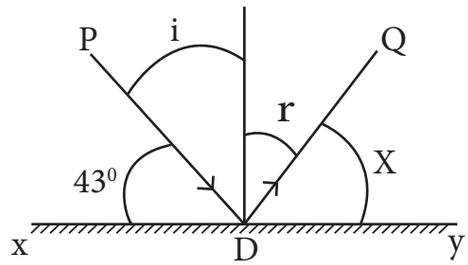
ii. Find the angle of reflection.

iii. Find the angle between the incident and the reflected ray

iv. Find the angle between the reflected ray and the plane surface.

Solution:

We use the diagram shown below to answer the questions.



a) Angle of incidence ∠i = 90 - 43 = 47 °

b) angle of reflection ∠r = ∠i = 47°

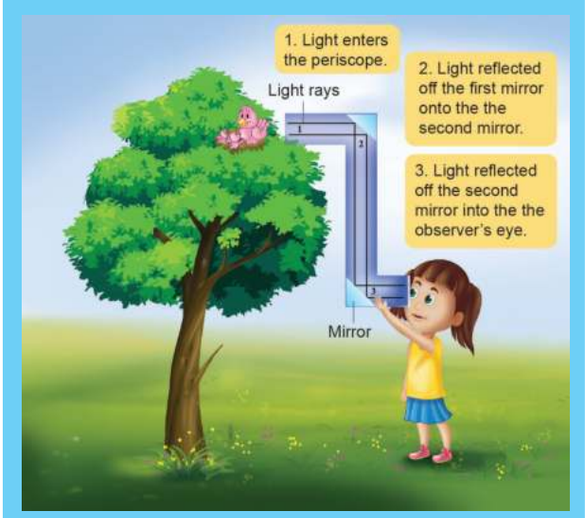
c) ∠i + ∠r = 47 + 47 = 94 °

d) ∠x = 90 - ∠r = 90 - 47 = 43 °

ACTIVITY 3

Make your own Periscope : You can use an empty agarbathi box and two plane mirrors to make a periscope.

As shown in the figure below, two plane mirrors are kept 45 degree to horizontal.



As shown the figure above, the light rays from the distant object enter through the tube at 1, and hit the mirror at 2. As the angle of incident must be equal to angle of reflection, the reflected rays flow through the tube downwards. As the light rays hit the mirror at 3 once again they are reflected. This reflected rays then travel out of the box to our eye. As you can see, periscope uses the laws of reflection.

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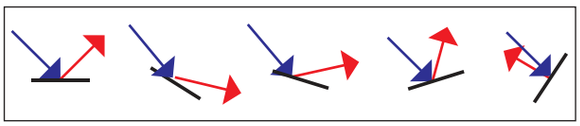
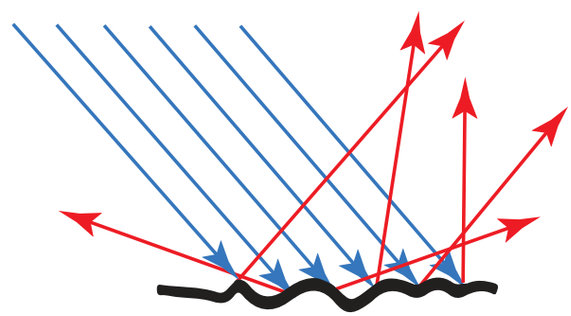
Types of reflection

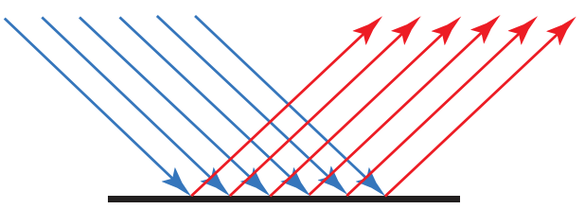
On a mirror we can see our image, but not on the wall. Why? Both the surface reflects light. Only because the reflected light comes to our eyes, we are able to see it. If the wall was not reflecting light, then we cannot see it.



We saw earlier that the light reflects off surfaces in a very predictable manner, in accordance with the law of reflection. The laws of reflection holds good for all surfaces irrespective of the shape. Vertical surfaces, angled surfaces, and even over the curved surfaces, the laws of reflection holds good. As long as we can draw the normal, perpendicular to the surface at the point can be drawn, the angle of incidence at that point will be equal to angle of reflection.



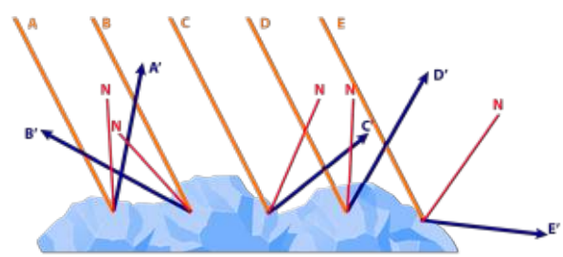
Diffuse Reflection
(Rough surface)



Specular Reflection
(Smooth surface)

The law of reflection is always observed regardless of the orientation of the surface. If the surface is smooth, and flat, all points on it have the normal in the same direction. Therefore a set of parallel rays striking the surface will be reflected at an angle, but the rays themselves will still remain parallel to each other.

However ,consider a surface which is not smooth. Such as the surface of a wall. What happen when the light ray hits the rough surface? Roughness of the wall means that each individual ray meets a surface which has a different orientation. The diagram below depicts the case. Five incident rays labelled as A, B, C, D and E approach a surface. The normal line at each point of incidence is shown in black and labelled with an N. In each case, the law of reflection is followed, resulting in five reflected rays labelled A', B', C', D', and E'. While the incident rays were parallel to each other, the reflected rays are going in different directions. The result is that the rays of light are incident upon the surface in a concentrated bundle and are diffused upon reflection.



Broadly, we can say that there are two types of reflection. If the surface is smooth then we have specular reflection. The parallel light rays striking the surface gets reflected, yet individual reflected rays remain parallel.

If the surface is rough, then we have diffused reflection. Light rays, after reflection go in many directions.

In fact during the day, our class room is illuminated by sunlight . Walls and floors are exposed to diffused reflection. Suppose walls

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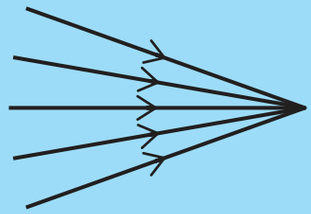
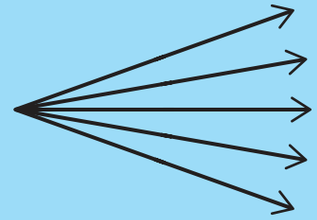
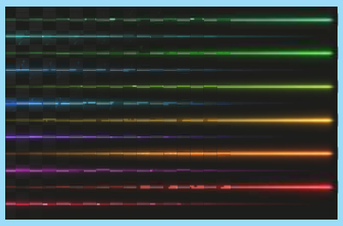
Parallel rays	Convergent rays	Divergent rays
		
		

were smooth mirror like. Then sunlight entering through the window will get bounced by the floor at an angle above towards the roof. And it will never get reflected to left or right. That is left and right walls will remain dark. However walls and floors are not smooth surfaces. Therefore, incident light from the window get bounced in all directions that the whole room is illuminated with diffused light.

Types of beam of light

Generally light is not a single ray, but a bundle of rays which are called as a beam of light.

A light beam can be a bundle of parallel rays, convergent rays or divergent rays. Let us look at the light coming from the Sun. The rays of sunlight are parallel. Often the headlight of car gives parallel rays. However look at the rays of light coming out of a candle. Light rays go in all directions, from the candle fire. These rays are divergent. Light rays from a flash light is also divergent. Using lens we can converge light rays. Using a lens, you can focus sunlight at a point. That is what we are making the light rays to converge.

Speed of light:

When lighting a bulb in a dark room, light spreads the whole room quickly. This is because the light travels very fast. Light travels three lakh kilometers per second in air or vacuum. In theory , nothing can travel faster than light

Interaction of light with matter

Take a piece of clear glass, a paper and a metal sheet. Shine a light from one side of each object and see if the light penetrate on the other side. Readily, we can see light enters and comes out of the other end of clear glass, whereas the light is bit dim through a paper. Light does not pass through metal sheet. Depending upon permeability, materials can be classified into three categories.

Transparent Material:

Materials that allow light to pass through completely are known as transparent material.

Examples: Eye glasses, clear drinking glass, clear water, face glasses used in buses.

Translucent Material:

Objects that allow light to pass through partially are called translucent material. For

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example, we cannot see the image of someone who stands behind a rough window glass, because it allows only a part of light from the person.

Opaque Material:

Materials that are not able to allow light to pass through, are called opaque material. **Examples**: Wall, thick card board, stone, etc.

ACTIVITY 4

Let's categorize transparent material, translucent material and opaque material among the given materials

(Clear plastic ruler, cellophane paper , some water in a glass jar, tissue paper, drinking glass, beaker, tap water, kerosene, coconut oil, note paper, card board, milk, diluted milk, aluminum foil, thick coloured plastic lid, rough glass piece, measuring glass with water, wooden piece)

Place all the materials given above in the dark room. Focus a torch light on one side of each material. Inspect the light coming out at the other side of each material and then classify the materials in the table.

S. No	Transparent Material	Translucent Material	Opaque Material

Shadows

How are shadows formed?

As we saw earlier, light is obstructed by certain materials. Light travels in a straight line. Hence it cannot go around such objects. That is why we see shadow. Shadow is always against, opposite side of light source. It is caused by opaque objects that stop light from propagating.

Parts of shadow

When an opaque object is placed in the path of light from a point source, a uniform dark shadow will appear on the screen. This is shadow is called as **umbra**. When an opaque object is placed in the path of light coming from a broad source of light, a small umbra will appear on the screen and an illuminated shadow area appears around umbra. This illuminated shadow area is called as **penumbra**. The penumbra always surrounds the umbra. The umbra is the darkest part of a shadow. In this part, light rays are completely prevented by the opaque object. The lighter shade of shadow is the penumbra.

Properties of shadow

1. All objects do not form shadows. Only opaque objects form shadows.
2. Shadows will be formed in the opposite side of light source.

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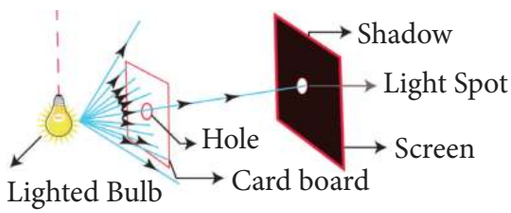
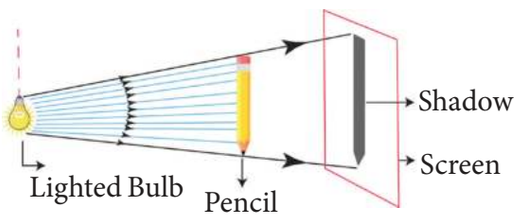
3. It cannot be determined the characteristics of an object by its shadow.
4. The shadow will be always darker, whatever may be the colour of light rays.
5. Light source, opaque object are shadow all are in a straight line.
6. The size of shadow depends upon the distance between light source and object and the distance between object and the screen.

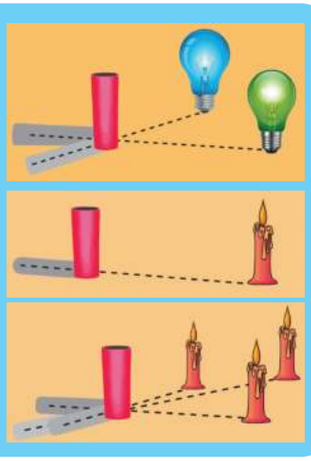
ACTIVITY 5

Arrangement	Activity	Observation	You Learn
	Place a lighted bulb in front of a rectangular card board with a hole at the center	A shadow with a spot light appears in the screen.	Light rays are passing only through the hole and are not allowed by the remaining part of card board
	Place a pencil in the path of light ray coming from a bulb	A shadow of pencil appears in the screen	The size of the shadow is proportional to the size of the opaque objects.

ACTIVITY 6

Requirement : A white screen, a cylindrical opaque object and three bulbs in different sizes.

Use the three different size lamps and examine the umbra and penumbra formed. Keep the distance between the lamp and the cylinder, cylinder and the screen same. As the size of the lamps grow smaller, the umbra region begins to enlarge. If the size of the lamp is a point, then there will be no penumbra. There would be only umbra shadow. Can you tell what the reason is for that?



Eclipses

An eclipse is an incident, when any astronomical object is partially or fully obscured due to the placement of another astronomical object in the presence of light. Thus, solar and lunar eclipses are occurring that are due to the property of light known as the rectilinear propagation of light.

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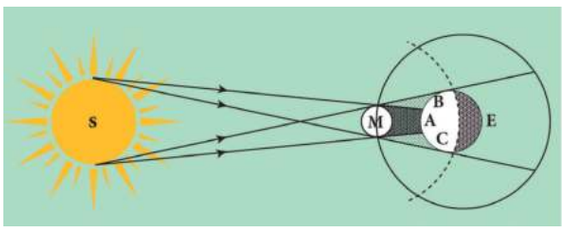
Solar eclipse

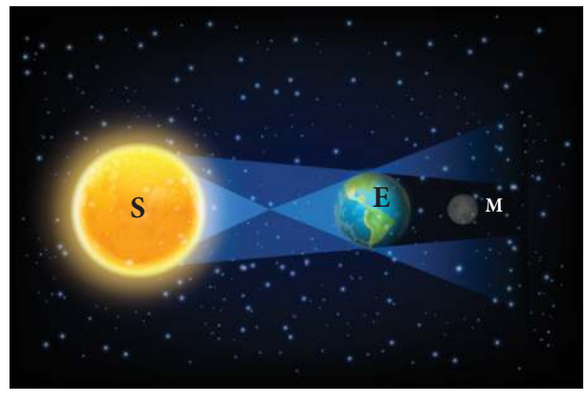
Solar eclipse occurs, when the moon arrives between the sun (S) and the earth (E). The shadow of the moon appears on the earth at A as shown in picture. Hence, those who are at the region A are unable to see the Sun instantly. This is solar eclipse. But, those who are at the region B and C are able to see the sun partially.

Solar eclipse



Lunar eclipse

Lunar eclipse occurs, when the earth (E) comes between the sun (S) and the moon (M). The earth prevents light coming from the sun and makes shadow on the moon. This is lunar eclipse.



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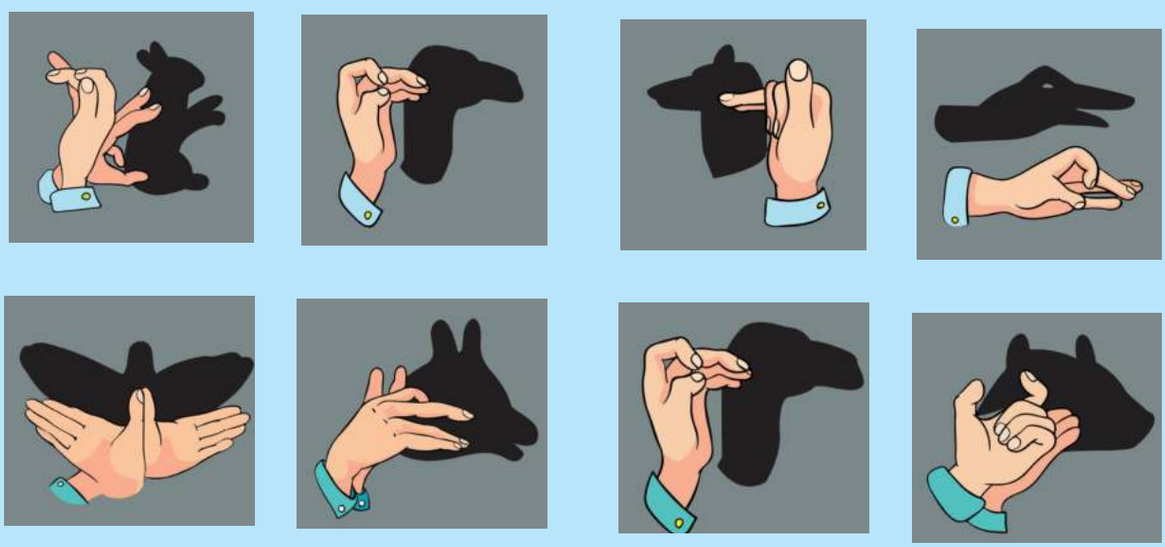

ACTIVITY 7

Surfaces	Property of Image (Clearer / blurred)
Glass	
Metal Sheet	
Aluminum foil	
White paper	

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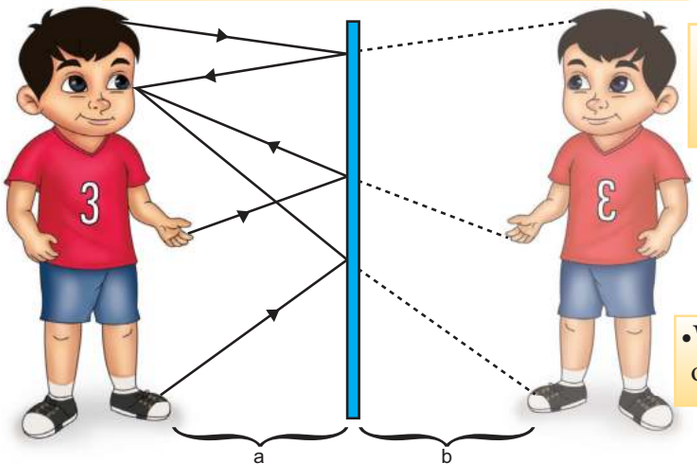
Plane Mirror and Reflection

A polished (or) smooth surface (like glass) which forms image by reflection is known as mirror. A plane mirror is a mirror with a flat reflective surface. A plane mirror makes an Image of objects in front of it.

- The image is upright.
- The image and the object are the same size.
- The image is virtual.



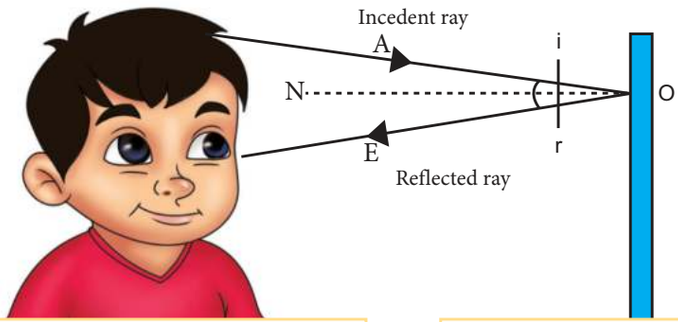
- The image is laterally inverted. The boy's left hand is his image's right hand.

- We can determine the position of an object's image by drawing light rays.

- The distance of the object from the mirror is equal to the distance of the image from the mirror (a=b).

The ray of light AO from the boy head strikes the mirror at point O. AO is called the incident ray.

The incident ray makes an angle of incidence. i. with the perpendicular line ON.

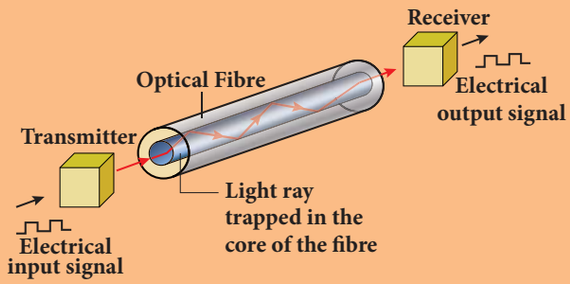


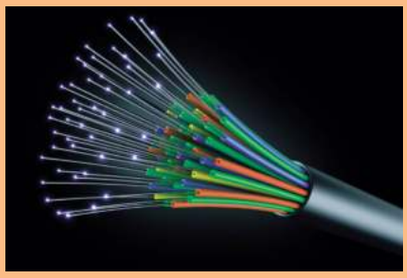
The light ray OA strikes the surface and is reflected as OE. OE is called the reflected ray. This ray makes an angle of reflection r with normal.

The line, ON, perpendicular to the surface is known as the normal.

DO YOU KNOW?

Optical fibre is a device that works on the principle of ***total internal reflection*** by which light signals (huge data) can be transmitted from one place to another place with a negligible loss of energy in a very short time. It consists of a cable having one or more thin flexible fibers with a glass core through which light signals can be sent. Optical fiber can be twisted and bent easily. When a light a ray of light is incident at one end of the core of optical fiber, it suffers total internal reflection at the many places inside the fiber and emerges at the other end with negligible loss of energy. The data or information in the form of pulses of light, can be sent through bundles of optical fibers. Optical fibers have become very important in high-speed communications, such as cable TV and high-speed broadband services. Fiber optic cables are able to carry more signals than traditional **copper** cable telephone lines.





Real and virtual images

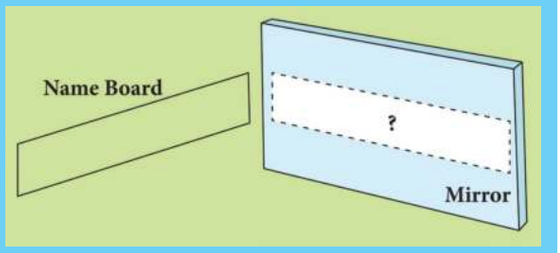
We have seen images being formed in a pinhole camera and a mirror. Can we see what is different in both of these images? Firstly, the image of the pinhole camera was formed on a screen. While the image made by the mirror is not obtained on a screen. The images that are obtained on a screen are called 'real image' and that which cannot be obtained on a screen 'virtual image'. Also notice that the image on pinhole camera was upside down. While the mirror image was upright.

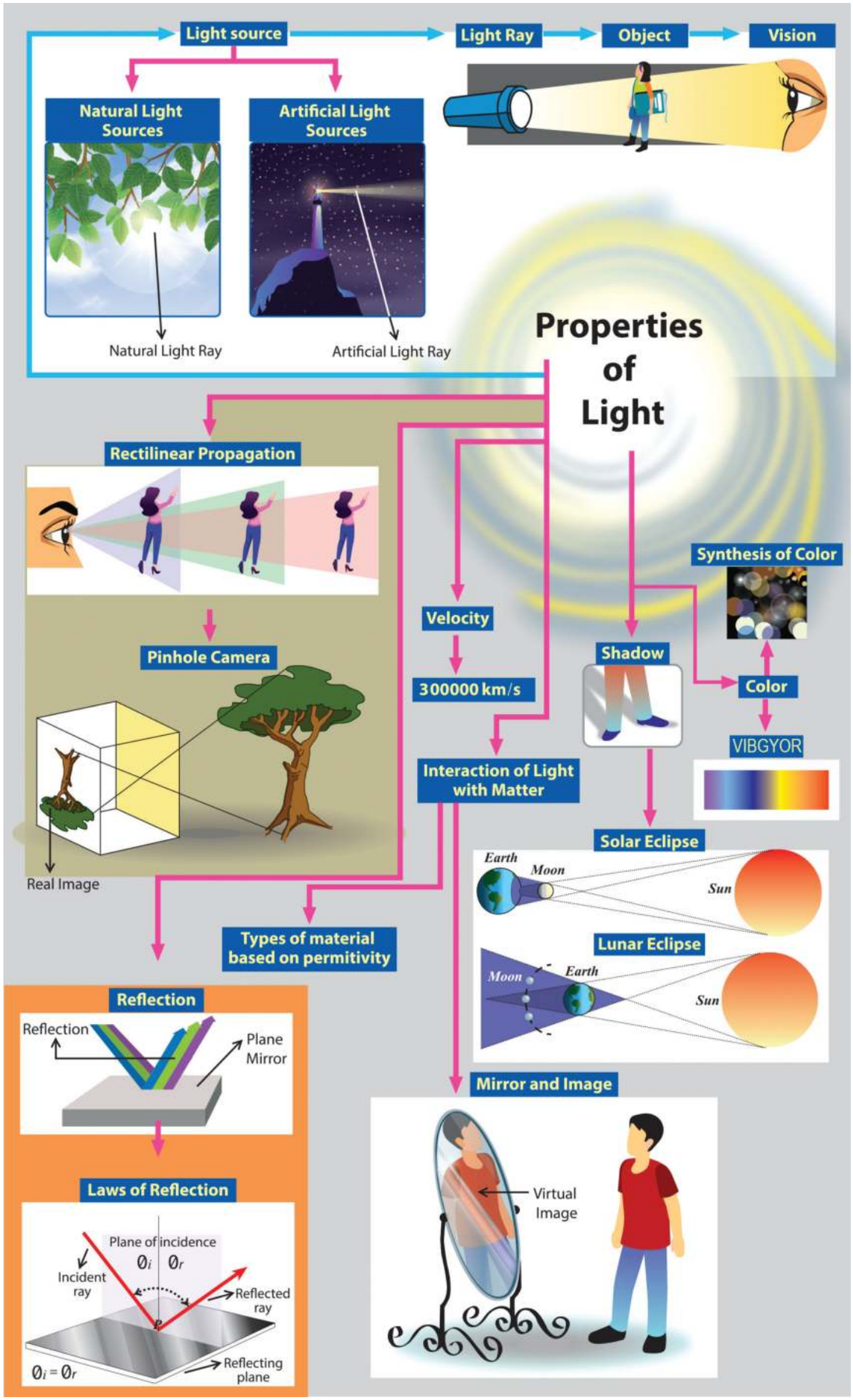
Properties of Image formed in a plane mirror
♦ Image formed in a plane mirror is upright
♦ Image formed in a plane mirror is virtual
♦ The image is of the same size as the object
♦ The distance of the image from the plane mirror is equal to the distance of the object from the mirror
♦ Image is laterally inverted.

ACTIVITY 8

There are eight letters in the word. **EINSTEIN**

1. Write the word in front of a plane mirror shown in diagram.
2. Write down how these letters appear in the mirror.
3. How many of these letters appear to be different, when the word is reflected?
4. Write down the letters that appear to be the same.




Light source
Light Ray
Object
Vision
Natural Light Sources
Artificial Light Sources
Natural Light Ray
Artificial Light Ray
Properties of Light
Rectilinear Propagation
Pinhole Camera
Real Image
Velocity
300000 km/s
Shadow
Synthesis of Color
Color
VIBGYOR
Interaction of Light with Matter
Solar Eclipse
Earth
Moon
Sun
Lunar Eclipse
Moon
Earth
Sun
Types of material based on permitivity
Reflection
Reflection
Plane Mirror
Laws of Reflection
Plane of incidence
Incident ray
Reflected ray
Reflecting plane
Mirror and Image
Virtual Image

Colour

Colour of sunlight : Light is a form of energy in the form of a wave that simulates that retina of our eyes. Visible light is a spectrum of a number of waves with different wavelength range from 400nm to 700nm (1nm = 10^{-9} metre) each wave has a definite wavelength represents a particular colour. The band of visible light is **VIBGYOR**.

V	-	**Violet**
I	-	**Indigo**
B	-	**Blue**
G	-	**Green**
Y	-	**Yellow**
O	-	**Orange**
R	-	**Red**

Violet colour has shorter wavelength and red colour has longer wavelength.

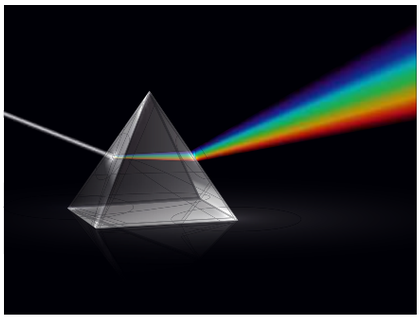
When light ray of particular wavelength (Colour) strikes the retina of our eye, our brain perceives that specific colour. When all colours of visible light strikes the retina of our eye at the same time, our brain perceives white. This shows, white is not a colour at all. But, it is the combination of all the colours of the visible light spectrum. If all the wavelength (colours) of visible light spectrum give appearance of white similarly, the observe of all there wavelength of visible light, will lead appearance of black

DO YOU KNOW?

Why is the word "**AMBULANCE**" written backwards in ambulance vehicle? This is due to lateral inversion .The phenomenon due to which the left side of an object appears to be right side of the object in its image in a reflecting medium (mirror). so that drivers see the word the right way around in their rear-view mirror

What is prism?

A prism is an object made up of a transparent material, like glass or plastic that has at least two flat surfaces that from an acute angle (less than 90° degree).



ACTIVITY 9

We have seen that white light is made of different colours and we can split white light. Is it possible to do the reverse? That is, can you get white colour by mixing colours? Try this activity.

You need oil pastel and white paper. Take different oil pastel colours. Choose colours which are exactly seen on the rainbow. Apply colours over each other on a white paper. Did you get white colour?

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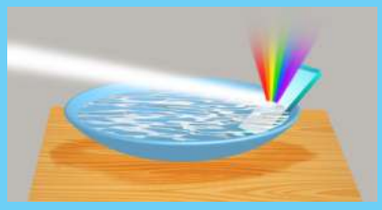
Difference between the images formed in Pinhole camera and Plane mirror	
Images formed by Pin hole camera	**Images formed in Plane mirror**
The image is real	The image is virtual
The image may not be equal to the size of the object	The image is equal to the size of the object
The image is inverted	The image is erect

ACTIVITY 10

Let's make a rainbow

You must surely have seen a rainbow in the sky. Why don't you try making one at your class room?



Place a flat but deep pan. Place this pan where there is direct sunlight. Place a plain mirror in the pan as shown in the diagram, so that you see sunlight reflected on you ceiling or on a white wall. Next slowly pour water in to the pan. At particular level of water, you will get a beautiful rainbow colours on the wall. If the colours are not clear adjust the position of the mirror to bring it into focus. This arrangement of colours in sunlight is called spectrum.

DO YOU KNOW?

Why danger lights in vehicles are red in colour?

1. Red colour is scattered the least by air molecules.
2. Red colour has the highest wavelength of all the other colours. So red colour is able to travel the longest distance through air, fog.

When white light is passed through a prism as shown in the figure, the colours of the rainbow emerge from the prism. This phenomenon is called **dispersion of light**, and the band of colour is called as **spectrum**.

Newton Disc:

Newton suggested a process of mixing different colours to make white colour by setting an arrangement as shown figure below. Newton Disc is a card board disc with seven equal sectors coloured red, yellow, orange, green, blue, indigo and violet. When the disc turned quickly, the retina receives the sensation of the spectrum simultaneously and disc appears white. Using this disc, one can explain that white is a combination of VIBGYOR.

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ACTIVITY 11

You need Gelatin papers of Red, Blue and Yellow. Fold each gelatin paper three times and look different colour objects listed below through each folded paper. Observe what colour each object has. Write your observations in the table.

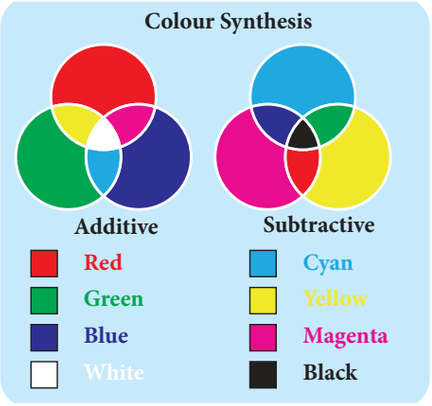
Object	Original colour of object	Colour through Red gelatin paper	Colour through Blue gelatin paper	Colour through Yellow gelatin paper
Blue sky				
Orange flower				
Yellow banana				
leaves				
Brown trouser				
White shirt				
Black board				

We know that white shirt will reflect white light and we have seen that white light consists of different colours. When we look at the white shirt through the yellow gelatin paper, we see it as yellow in colour. From this, we can say that the yellow gelatin paper did not allow any other colour except yellow to pass through. Similarly, we conclude that red gelatin paper allows only red light and blue gelatin paper allows only the blue light.

Synthesis of colour

Synthesis of colour is the method of creating colour by mixing various proportion of two (or) three distinct colours of light. These distinct colours are Red, Green and Blue called as **primary colours.**

- Equal proportions of two primary colour create a secondary colour.
- Magenta, Cyan and yellow are called **secondary colours**.



1 Red	+	1 Blue	=	Magenta
1 Blue	+	1 Green	=	Cyan
1 Green	+	1 Red	=	Yellow

- Equal proportions of all three primary colour create white.

1 Red	+	1 Blue	+	1 Green	=	White

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EVALUATION

I. Choose the correct option

1. Light travels only in a _____. It is because of this property that _____ are formed.
   a. curved line, shadows
   b. straight line, shadows
   c. straight line, reflection
   d. curved line and then straight line, shadows

2. Light that hits a mirror gets _____.
   a. Transmitted
   b. Reflected
   c. Absorbed
   d. Refracted

3. _____ Surface reflects the light well.
   a. water
   b. compact disc
   c. mirror
   d. stone

4. Light is a form of _____.
   a. matter
   b. energy
   c. medium
   d. particle

5. You can see your image in polished floors, but not in wooden table because _____.
   a. regular reflection takes place in wooden table and irregular reflection in polished floor
   b. regular reflection takes place in polished floor and irregular reflection in wooden table
   c. regular reflection takes place in both polished floor and wooden table
   d. irregular reflection takes place in both polished floor and wooden table

6. Choose the translucent substance from the following
   a. glass b. wood
   c. water d. Clouds

7. Reflection occurs, when the light
   a. about to reach a surface
   b. approaches a surface
   c. passes through a surface
   d. None of these

8. The image formed by a pinhole camera is inverted because,
   a. light travels in straight lines
   b. light rays become laterally inverted as they pass through a pinhole camera
   c. light rays pass through the pinhole
   d. light rays get reflected

9. Which of the following facts explain how shadows are formed?
   a. Light travels in straight lines
   b. Opaque bodies do not allow light to pass through them
   c. Reflection occurs at a smooth surfaces like mirrors
   d. Lateral inversion happens
      (i). both A and B
      (ii). both A and D
      (iii). both B and C
      (iv). only A

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II. Fill in the blanks

1. A plane mirror produces a _____ image.
2. A _____ reflection helps us to see the objects.
3. The light ray gets _____ when it falls on any polished surface.
4. Sunlight is a blend of _____ colours.
5. The splitting of white light in to seven colours is called _____.
6. The moon _____ sun light
7. The sunlight can be split into its constituent colours using _____.
8. Reflection of light from rough surface is called _____ reflection.

III. True or False – If False give the correct answer

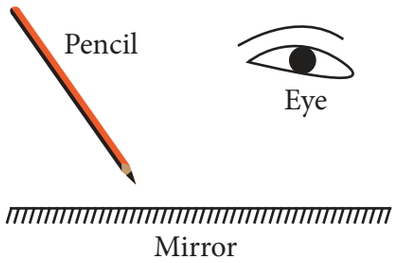
1. Rainbow is formed by dispersion of which light by water drops.
2. The image formed by the plane mirror is laterally inverted, hence the image seen through the periscope is also laterally inverted.
3. We see planets because they reflect light from the sun.
4. We see a book because it reflects the light that falls on its surface.
5. The image formed in a pinhole camera is always inverted.
6. The image formed in a pinhole camera is always the same size as the object.
7. The image formed in a plane mirror is upside down.
8. A plane mirror is opaque.
9. A shadow is formed on the same side of the object as the source of light.
10. we are able to see things around us with the help of regular reflection.
11. After passing through a prism, white light splits into a band of seven colours.

IV. Match the following

1. Rectilinear propagation	-	Primary source of light
2. Plane Mirror	-	Non-luminous object
3. Fire fly	-	Periscope
4. The Moon	-	Pinhole camera
5. Wide light source	-	Spectrum of light
6. Regular reflection	-	luminous object
7. The sun	-	Penumbra
8. Band of seven colours	-	Glossy surface

V. Answer the following questions in short

1. With the help of a diagram, state the laws of reflection.
2. Figure shows a pencil placed above a mirror.



a. Draw its image formed by the mirror.

b. Show how light rays from the object are reflected at the mirror to form the image for the eye.

3. A person is looking at the image of a tree in a mirror placed 3.5 m in front of him. Given that the tree is at 0.5 m behind his eyes. Find the distance between the image of the tree and his eyes. What are needed to see an object?

4. What are luminous objects?

5. Is the moon a luminous object?

6. What are the three types of materials based on the absorption of light?

7. What are the parts of shadow?

8. What are the properties of shadow?

9. What is plane mirror?

10. What is prism?

11. What do you mean by visible light?

12. Write the items given here in the correct column **(Stars, brick walls, plants, mirror, planets, electric light bulb,candle)**

Sources of Light	Objects that reflect light

13. A boy of height 1m 45 cm is standing in front of a long mirror at a distance of 2 m. From this information, fill up the following sentences:

a. The distance between the boy and his image is _____.

b. The height of the image is _____.

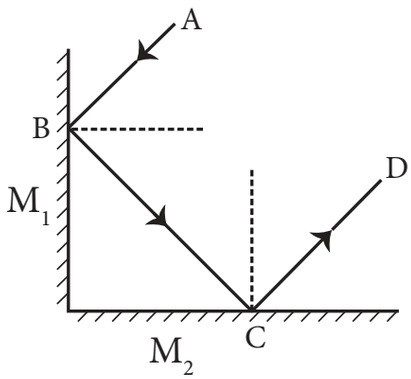
c. When the boy moves 1m forward, the distance between him and his image is _____.

14. Draw a diagram of a pin hole camera showing the rays of light passing between the object and its image.

15. Why is the writing on the front of an ambulance back to front as shown in the picture?

16. Explain with examples, why some capital letters look the same in a mirror but others are reversed.

17. Two plane mirrors M1 and M2 are placed perpendicular with each other, as shown in figure. The ray AB makes an angle 39 ° with the plane mirror M1, then



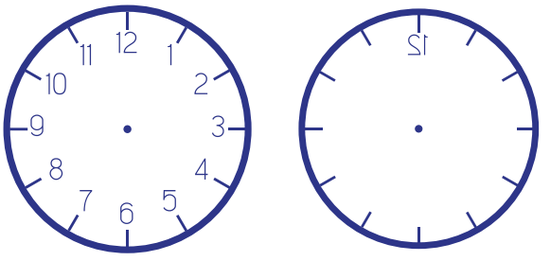
1. The reflected rays are _____, _____.

2. The incident rays are _____, _____.

3. What is the angle of incident corresponding to the ray BC?

4. What is the angle of reflection corresponding to the ray CD?

18. Rajan was playing with the mirror images of a clock. He looked at the clock in his room. It was showing 1:40. Draw the position of the hands on the real clock and on its mirror reflection. Write below the picture what time each picture is showing.



19. What is reflection of light?

20. If a ray of light is falling on a plane mirror at an angle of 50° is formed, what will be the angle of reflection?

21. What do you mean by lateral inversion?

22. How do you obtain a spectrum of light?

23. Why do we see white colour in Newton's disc, when we rotate it very fast?

24. What is a shadow? What things are necessary for the formation of a shadow?

VI. Answer the following questions in detail

1. What are regular and irregular reflection? Explain with the help of diagrams.

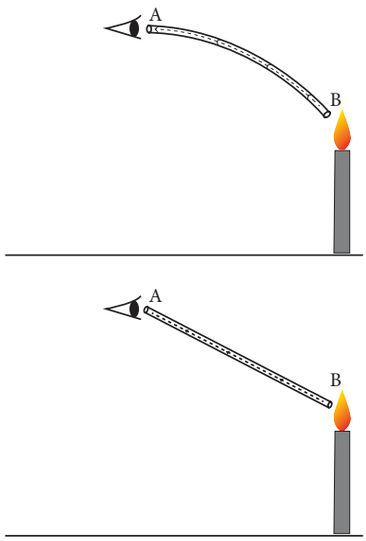
2. What are the difference between luminous and non-luminous objects? Give two examples of each.

3. Write about two everyday situations that tell you that light travels in a straight line.

4. Differentiate between a reflection and a shadow.

5. What are the characteristics of an image formed in a plane mirror?

6. Describe the pictures.



7. Define the following terms
   a. Incident ray
   b. Reflected ray
   c. Normal
   d. Angle of incidence

8. Compare the images formed by plane mirror with that by pinhole camera.

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ICT CORNER

LIGHT

Explore the activity to know about law of reflection.

PROCEDURE :

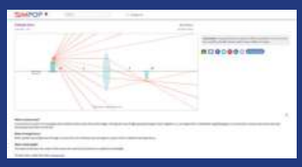
Step 1: Type the following URL in the browser or scan the QR code from your mobile to open the activity page.

Step 2: Click the torch to see how the light ray reflects off the mirror and drag the torch to different angles. You can learn the angle of incidence at that point will be equal to angle of reflection.

Step 3: Next Scroll down and select the prism. Click the torch how the prism changes the path of the light ray.

Step 1

Step 2



Step 3

Step 4

Light URL:

https://simpop.org/reflection/reflection.htm

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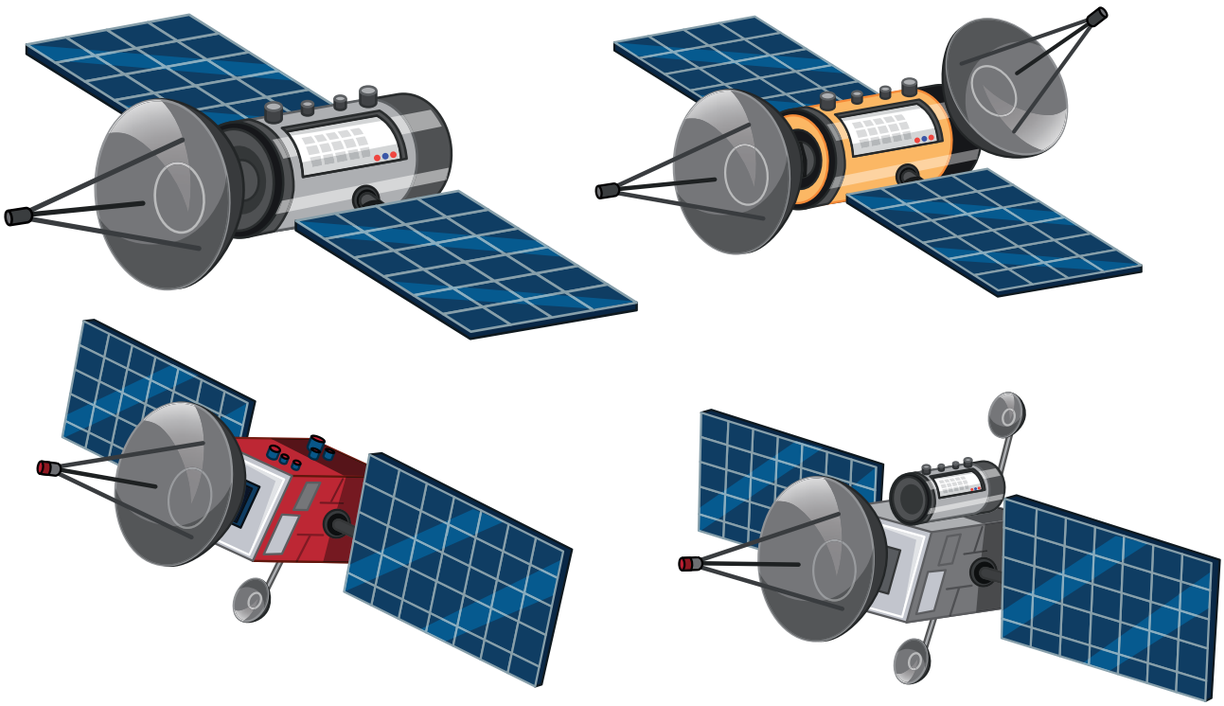
Unit 2

Universe and Space



Learning Objectives

The students are able to

- Explain the beginning of universe
- Know about galaxies and its types
- Recognise different constellations in the night sky
- Get information about the stars
- Distinguish between natural and artificial satellites.
- Understand the functions of ISRO

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Introduction

"My goal is simple. It is a complete understanding of the universe, why it is as it is and why it exists at all."

—Stephen Hawking

Starry night sky is a wonder which has fascinated humans from time immemorial. Our ancestors have observed and documented the objects seen in the night sky. The field of study of the universe is called astronomy. We know that there are billions and billions of stars in the universe, although only about 6000 or so are visible to naked eye. Have you ever think of the size of our universe? The universe is unimaginably and infinitely big. Universe is commonly defined as the totality of everything that exists or is known to exist. Even though the spatial size of the entire universe is still unknown, it is possible to measure the observable universe.

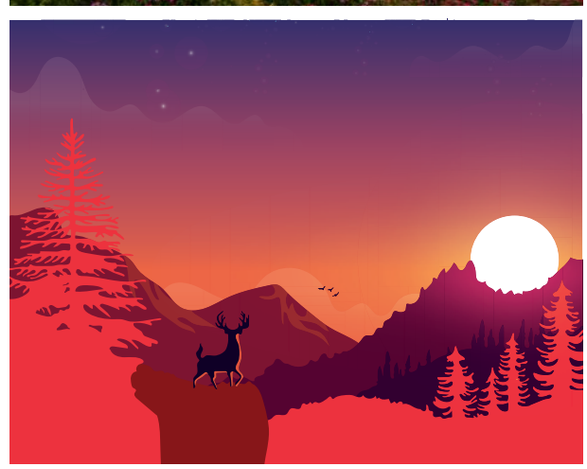
The universe consists of galaxies, planets, stars, meteorites, satellites and all other forms of matter and energy. And It is a world of wonder. Let us move into this world of wonder to know more interesting facts about the place of residence of our solar system.

GEO Centric Theory

Sky is a wonder. Sun, Moon, stars all appear to rise in the East and move towards the West, giving us an impression that all these objects are going around the Earth. Just as in a moving bus the distant mountains and trees appear to move backwards. Perhaps really Earth is spinning and that is why Sun, Moon and stars appear to go around the Earth. Does the Earth revolve around the Sun, or the Sun revolves around the Earth? How do you know about it?

When you look at the night sky you can see lot of twinkling objects. But a few of them differ from the others. They don't twinkle and while the other stars hold a fixed pattern from night to night, these drift. They wander across the sky, moving against the backdrop of stars. These are called planets. Our ancestors observed this and they imagined a universe with the Earth at the center, the stars in the distant background, and Sun, Moon and the planets orbiting around us.

Two observations supported the idea that Earth was the center of the Universe. First, from anywhere on the Earth, the Sun appears to revolve around the Earth once in a day. While the Moon and the planets have their own motions, they also appear to revolve around the Earth about once per day. Even the celestial sphere studded with stars appears to rise and set in the evening, and make one complete rotation in a year. Second, the Earth seems to be unmoving from the perspective of an Earthbound observer; it feels stationary.



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As civilization progressed the early astronomers found two types of motion of celestial objects. Let us take the case of Moon. On a daily basis Moon appears to rise in the east and set in the west. Thus, one can say that Moon is going around the Earth with a period of one day. But for a careful observer, it was clear that the Moon was also exhibiting another motion. Suppose, the Moon is appearing in the sky today near the star Asvini, tomorrow we will observe that the Moon is near the star Bharani, a star east of Asvini. And the next day it will be near the star Kartikai, east of Bharani. After 27 days, moving little by little eastwards, the Moon again stations itself near asvini. Thus, everyday Moon appears to move from east to west in one day where as it appears to go in a circle from west to east in the background of stars in about 27 days.

These two motions were puzzling. Very soon astronomers like Aryabhata said that Earth is spinning in its axis, that is the cause of apparent daily motion from East to West. Whereas the eastward motion of Moon in the celestial sphere with a period of about 27 days, was seen as the 'actual' motion of the celestial objects.

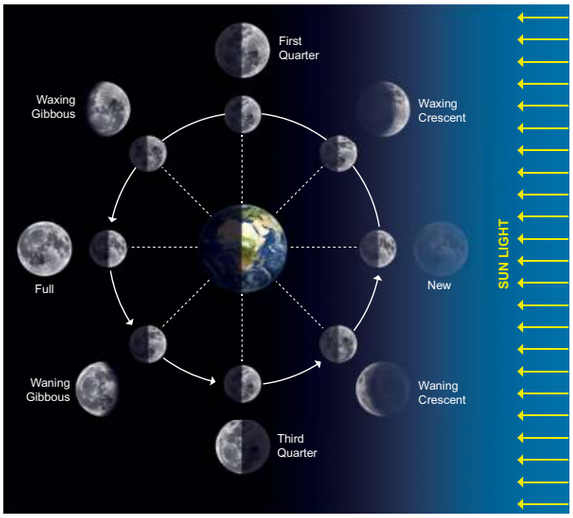
Thus, the geocentric model (also known as geocentrism), that is a description of the Universe with spherical and spinning Earth at the center and the Sun, Moon, stars, and planets all orbits the Earth emerged in various cultures. In Greece, this model was put forth by the Greek philosopher Plato and his disciple Aristotle in 6th century B.C. It was standardized by a Greeco Roman mathematician Ptolemy in the 2nd Century A.D. A similar model is seen in the Siddhanthic astronomy in India like Aryabhateeyam of Aryabhata.

How Moon exhibit phases?

Astronomers in ancient times also observed certain facts. The Purananuru (65) of Sangam literature, the Poet Kalathalaiyar singing in appreciation of Cheraman Peruncheralathan says,

"On the day when the full Moon appears, the Sun and Moon look at each other with their bright light. In the evening time, one sphere hides behind the mountains."

On the full Moon day, when the Sun is setting in the west, precisely at the same time, Moon rises at the East. That is both Sun and Moon are in the opposite side. Likewise when it is waning half Moon, the Moon rises when it is midnight and the waxing half Moon rises during noon. From such observations and modelling ancient astronomers could explain why we have waxing and waning of Moon.



It is probably easier to understand the waxing and waning of Moon in the order of new Moon & full Moon and then how the first and third quarter Moon (half Moon) appear and then the phases in between.

Sun is the source of light. Sun light falls on the spherical Earth, but only on the side facing

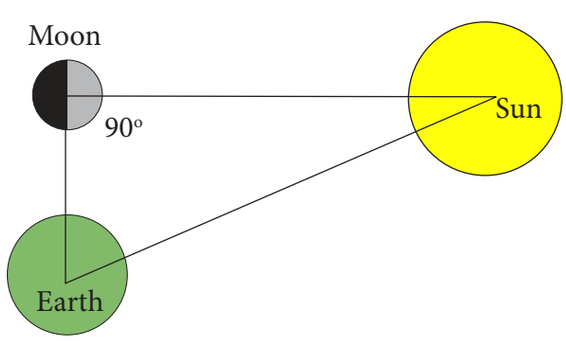
Sun. The opposite side of Earth is without sunlight. As the Earth spins day and night follows as different parts of Earth appear before the Sun. That is at all times one half of Earth is illuminated by Sun and one half is in darkness.

Likewise at all times one half of Moon is illuminated by Sun and the opposite side is shroud in darkness.

As shown in the diagram, when the Moon is positioned between the Earth and Sun, notice all the illuminated part of Moon is away from Earth. Hence we cannot see any part of the illuminated side of the Moon. Only the dark side of Moon is towards Earth. When the Moon is in this position, we have new Moon.

Now look at the Moon when it is behind the Earth. Now the portion of the Moon illuminated by Sun is totally towards Earth. The dark side is away from the Earth. This means the Moon will appear to be round in the sky. This is full Moon.

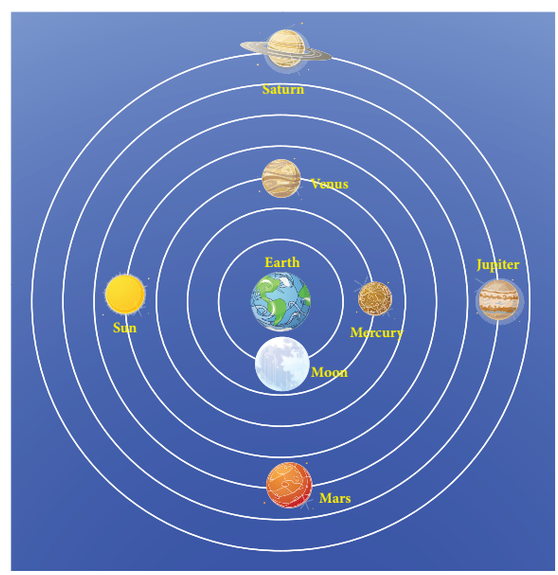
When the Sun, Earth and Moon are in 90 degree angle how will the Moon appear to a person on the surface of the Earth? Now if you look at the portion of Moon facing Earth, we will see half if it illuminated and half is dark side. Thus, the Moon will appear as half Moon. The half Moon during the waxing period is called as first quarter and the half Moon during the waning period is called as third quarter. (Figure: Sun, Moon and Earth are at right angles)



Once we understand those four key Moon phases, the phases between them should be fairly easy to visualize.

The word **crescent** refers to the phases where the Moon is less than half illuminated. The word **gibbous** refers to phases where the Moon is more than half illuminated. Waxing essentially means "growing" or expanding in illumination, and waning means "shrinking" or decreasing in illumination. Note all so that these discoveries could be made with naked eye. You do not need telescope or any modern equipment.

Geocentric model



Moon going around Earth with 27 days period nicely explained its motion. However astronomers in ancient times faced problem in explaining the motion of the then known five planets - Mercury, Venus, Mars, Jupiter and Saturn.

Moon in the background of stars moved everyday eastwards nicely. However for example, if we were observing the motion of Mars from January, it would appear to move

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eastward in the background stars. That is the position of Mars today will be near a star which is east of the star near which it was yesterday. However on June 28 , we will see a change. From that date the Mars would appear to move west rather than its normal eastward motion. This reversal of direction of planets is called as 'retrograde motion'. If we continue to observe, on August 28 once again the Mars would appear to reverse the direction and again on its usual eastward motion in the celestial sphere. Usually Jupiter is brighter than Mars, however, around the period of retrograde motion the Mars was much brighter than other times; even brighter than Jupiter.

Other planets also exhibited number of puzzling behaviours. Venus and Mercury always appeared very close to Sun, and hence never appeared in the midnight sky. The brightness of Jupiter also varied again when it exhibited retrograde motion. For example in 2018, Jupiter reversed its direction of motion on March 9, 2018 and again resumed its normal eastward motion on July 11, 2018.

The simple geocentric model, where planets go around the Earth could not explain why the brightness of the planets changed, and why they reversed their directions. Change in brightness and retrograde motion would be impossible if we assumed that the planets were at the same distance at all times from Earth.

To explain the puzzling phenomena astronomers in early times proposed a change in the simple geocentric model. This is called as epicycle model.

Ptolemy (2nd cent) in Greece, Aryabhatta in India and others used the epicycle model to explain the motion of the celestial objects. Their models were improved by generation of astronomers like Tycho Brahe and Neelakanta Somayaji.

Although, the model explained many phenomena there were number of mismatches. The model was becoming messy.

Arrival of Telescope

Telescope was invented by **Hans Lippershey** but Galileo used it for studying the sky for the first time. The telescope showed more universe was than visible to naked eye. With his simple telescope matching toy telescopes of today, Galileo was able to see mountains on the Moon, small dim stars invisible to naked eye, Sunspots on the face of Sun. He was able to demonstrate that the milky way, an hazy bright patch in the sky is nothing but thousands of stars huddled together, Jupiter had moons going around it and Saturn had mysterious appendage which we now know as rings.

One of the most startling observations he made was related to telescopic observation of Venus. This convinced him to accept the theory of the Polish Astronomer Nicolus Copernicus, that it is not Sun, planets and Stars that go around Earth, but it is Earth and other planets that go around the Sun- heliocentric theory.

Heliocentric model

Dissatisfied with the messy epicycle model Nicolus Copernicus, radically proposed that the model will become simple if we assume Sun is at the center and all planets, including Earth, go around it.

Suppose, Earth and Mars are on the two sides of the Sun, then Mars would be far and appear dim, compared to when they are on the same side. Earth orbit around Sun in 365 days, whereas Mars takes 687 days. This implies at

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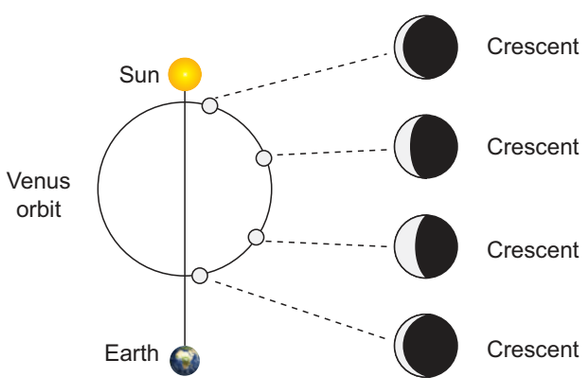
times Earth will overtake Mars. When the Earth is approaching and overtaking Mars, the Mars would appear to exhibit retrograde motion. In short all the observed phenomena could be explained in a simple way.

However how do we know that actually Sun is at the center or not?

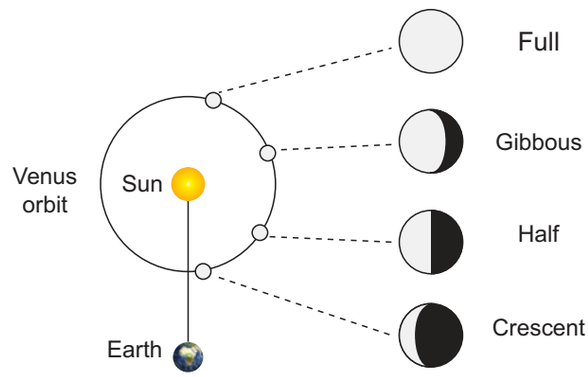
Galileo found that his observation of Venus gave the observational evidence to support the heliocentric theory. Galileo observed Venus in 1610-1611 with a telescope. To naked eye, Venus is just a gleaming bright spot. However, through a telescope, the shape of the planet can be seen. Galileo was startled to find like Moon Venus too exhibited phases. The shape varied from crescent to gibbous. Also, the size of the planet varied. When the planet was in gibbous phase the size was small, and when it was thin crescent the size was many folds higher.



Phases of Venus in Geocentric Model

As the Venus went around the epicycle, as shown in the diagram Venus would exhibit phases. Also at times the planet would be nearer, making the apparent size grow bigger and at times far making the apparent size smaller. Thus, the variation in the brightness can also be explained.

It became clear to Galileo that the geo-centric epicycle model will not help in accounting for the observed phases of the Venus.



Phases of Venus in Heliocentric Model

Look at the above diagram. If the Venus was going around the Sun, and its orbit is inside that of Earth, Venus would appear always near the Sun in the sky. It can never be seen in the midnight sky. Secondly when it is near the Earth, it would be brighter and bigger compared to when it is on the other side of the Sun. Thirdly only if the Venus is revolving around the Sun, it can exhibit gibbous phase, and the size of the gibbous phase smaller than the crescent phase. If the Venus was revolving around the Earth, we can never see the gibbous phase of the Venus and it would be seen only if it is orbiting the he Sun. This clinching observational evidence proved that at the least Venus orbited around the Sun. Further evidences collected by astronomers using telescope and other advanced modern instruments gave enough evidence that all planets revolve around the Sun.

If Galileo were around today, he would surely be amazed at exploration of our solar system and beyond by ISRO, NASA, Russian space agency and others.

Now we can observe planets orbiting around other stars (called exoplanets), proving that not only planets orbit around the Sun in

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solar system, but all around the universe such planetary systems exist. Who knows, in some of them could be life and in rare cases intelligent life, like humans wondering and exploring universe. Imagine a future time when such life meet us; how exciting and momentous it would be!

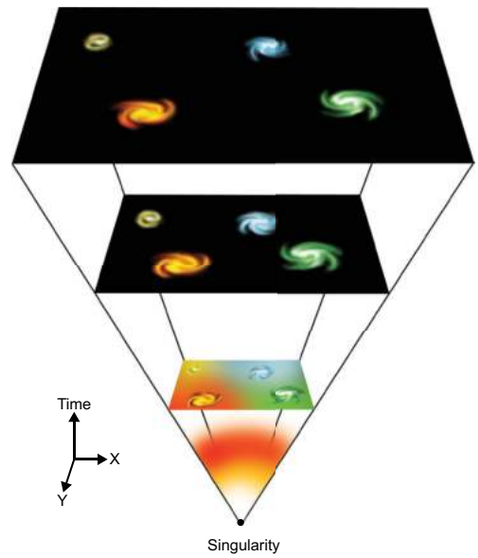
Origin of the Universe

You are a student who belong to a particular class studying in VII std. In your school, there might me many section for VII std. Likewise, there are VI std class, VIII std class and so on. All of them together make the school. Likewise, our Sun is a star with a planetary system. Billions of such stars consitute a system called as Galaxy. The name of our galaxy is, Milky Way. Like Milky Way, there are at least hundreds of billions of galaxies in the Universe.

How did all these come about? Where they in existence always or was there a beginning?

When we observed other galaxies we found a strange behavior. All the galaxies were appearing to move away from us. Further, farther they are faster they appear to move. Cosmologists, scientists who study the structure and evolution of universe that is cosmos, reason that this imply at one point of time in the past all matter was confined in a single point and since then it has started to expand.

The event when the matter confined in a single point and began to expand is called '**Big bang**'. This is considered as the origin of our universe as we know it.



The Big Bang Theory is the prevailing model of the evolution of the Universe. Under this theory, space and time emerged together about 14 billions of years ago. At that time, the entire Universe was inside a bubble that was thousands of times smaller than a pinhead. It was hotter and denser than anything we can imagine. Then it suddenly expanded. The present Universe emerged. Time, space and matter all began with the Big Bang.

In a fraction of a second, the Universe grew from smaller than a single atom to bigger than a galaxy. And it kept on growing at a fantastic rate. It is still expanding today. Over the next three minutes, the temperature dropped below 1 billion degrees Celsius. After 300,000 years, the Universe had cooled to about 3000 degrees. Atomic nuclei could finally capture electrons to form atoms. At that stage of the evolution of the Universe, it was filled with clouds of hydrogen and helium gas. Giant clouds of hydrogen and

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helium were gradually drawn to the places where dark matter was the most dense, forming the first galaxies, stars, and everything else seen today.

We cannot see anything that happened during the first 300,000 years of the Universe. Scientists try to work it out from their knowledge of atomic particles and from computer models. The only direct evidence of the Big Bang itself is a faint glow in space, called cosmic microwave background.

As millions of years passed, the dense areas pulled in material because they had more gravity. Finally, about 100 million years after the Big Bang, the gas became hot and dense enough for the first stars to form. New stars were being born at a rate 10 times higher than in the present-day Universe. Large clusters of stars soon became the first galaxies.

The Hubble Space Telescope and powerful ground-based telescopes are now beginning to find galaxies that were created within a billion years after the Big Bang. These small galaxies were much closer together than galaxies are today. Collisions were common. Like two flames moving towards each other, they merged into bigger galaxies. Our Milky Way galaxy came together in this way.

Building Blocks Of Universe.

As stated above universe is constituted of galaxies, just as lot of houses in our locality constitute a village or a city. We have lot of things such as rooms, furniture etc. in our homes. Likewise lot of stellar objects such as stars, planets, asteroids and meteors are the building blocks of our universe.

More to know

Astronomical unit : The average distance between the Earth and the Sun is called an astronomical unit. It is denoted by 'au'.

$$1 \text{ au} = 1.496 \times 10^{8} \text{ km}$$

Light year : The distance travelled by light in one year is called a light year. It is denoted by 'ly'.

$$1 \text{ ly} = 9.4607 \times 10^{12} \text{ km}$$

Parsec: A parsec is defined as the distance at which one astronomical unit subtends an angle of one arc second. It is denoted by 'pc'

$$1 \text{ pc} = 3.2615 \text{ ly} = 3.09 \times 10^{13} \text{ km}$$

Galaxies

A galaxy is a large collection of stars or cluster of stars and celestial bodies held together by gravitational attraction. There are about billions of galaxies in the universe. Most galaxies range from thousand to ten thousand parsec in diameter. As we have different types of houses in a locality, the galaxies are also of different types.

Types of Galaxies

There are various types of galaxies such as spiral, elliptical, barred spiral and irregular

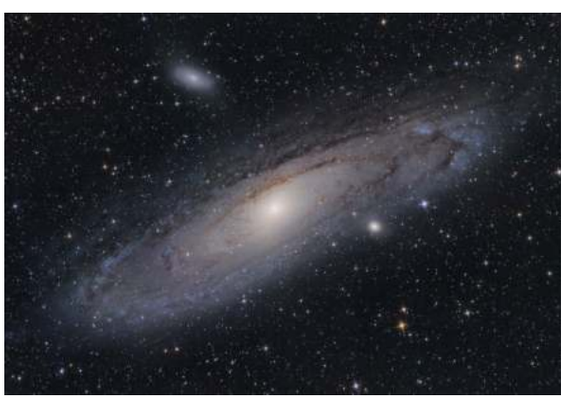
Spiral Galaxy

Spiral galaxies consist of a flat, rotating disk containing stars, gas and dust, and a central

concentration of stars known as the bulge. These are often surrounded by a much fainter halo of stars. Spiral galaxies are named by their spiral structures that extend from the centre into the galactic disc. The spiral arms are sites of ongoing star formation and are brighter than the surrounding disc because of the young, hot stars that inhabit them.

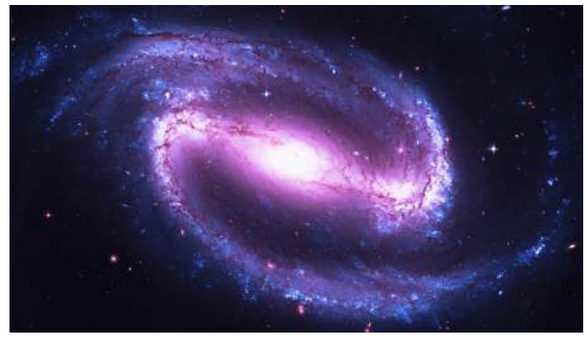
Elliptical Galaxy

An elliptical galaxy is a type of galaxy having an approximately ellipsoidal shape and a smooth image. Unlike flat spiral galaxies with organization and structure, elliptical galaxies are three-dimensional, without much structure, and their stars are in somewhat random orbits around the center. Interestingly Stars found inside of elliptical galaxies are on an average much older than stars found in spiral galaxies. Elliptical galaxies tend to be surrounded by large numbers of globular clusters.



Barred Spiral

A barred spiral galaxy is a spiral galaxy with a central bar-shaped structure composed of Stars. Bars are found in approximately in two-thirds to one third of all spiral galaxies.The Milky Way Galaxy, where our own Solar System is located, is classified as a barred spiral galaxy.



Irregular Galaxy

An irregular galaxy is a galaxy that does not have a distinct regular shape, unlike a spiral or an elliptical galaxy, they are often chaotic in appearance, with neither a nuclear bulge nor any trace of spiral arm structure. About one forth of the galaxies found so far are of this type.

Cosmologists say that some irregular galaxies were once spiral or elliptical galaxies but were deformed by an uneven external gravitational force. Irregular galaxies may contain abundant amounts of gas and dust.

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Milky Way

The Milky Way is the galaxy in which our solar system is located. The diameter of Milky Way is over 100,000 light years. The Milky Way includes stars smaller than our Sun as well as many other stars that are thousands of times bigger than the Sun. It includes many other celestial bodies of gases, clouds of dust, dead stars, newly born stars, etc. It is also thought to contain at least 100 billion stars. The galaxy that is closest to our Milky Way is Andromeda. The descriptive "milky" is derived from the appearance from Earth of the galaxy – a band of light seen in the night sky formed from stars that cannot be individually distinguished by the naked eye. In Indian mythology, this patch called as Akasha Ganga. From the Earth, the Milky Way appears as a band because its disk-shaped structure is viewed from within. Galileo Galilei first resolved the band of light into individual stars with his telescope in 1610. Until the early 1920s, most astronomers thought that the Milky Way contained all the stars in the Universe. Observations by Edwin Hubble showed that the Milky Way is just one of many galaxies.

The Milky Way does not sit still, but is constantly rotating. Our solar system is located within the disk of the galaxy, about 27,000 light years away from the centre of the galaxy. The solar system travels at an average speed of 828,000 km/h. Even at this rapid speed, the solar system would take about 230 million years to travel all the way around the Milky Way. When the solar system was in the same spot as it is now, there were no humans, no Himalayan mountain on Earth and the dinosaurs were roaming around the Earth.

Tucked inside the very center of the galaxy is a monstrous black hole, billions of times as massive as the Sun. Although, black holes cannot be directly viewed, scientists can see their gravitational effects as they change and distort the paths of the material around it, most galaxies, like our milkyway, are thought to have a black hole in their heart.

Constellation

A constellation is a recognizable pattern of stars in the night sky when viewed from the Earth. International Astronomical Union has classified 88 constellations to cover the entire celestial sphere. Many of the old constellations have Greek or Latin names and are often named after mythological characters.

Ursa Major (Saptha Rishi Mandalam) is a large constellation and it covers a large part of the sky. The most striking feature of this constellation is a group of seven bright stars known as big dipper (seven Sages in Indian astronomy).

Ursa Minor in Lattin means 'the little bear' it lies in the northern sky. The Pole star – Polaris (Dhrua) lies within this constellation. The main group, 'little dipper', consists of seven stars and is quite similar to that found in Ursa Major.

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Orion was a hunter in Greek mythology. The constellation comprises around 81 stars out of which all but 10 are too faint to be seen with naked eye.

Different constellations become visible in the sky at different times in the year. This happens due to the revolution of the Earth around the Sun.

Unlike galaxy, constellations are mere optical appearance and not real objects. In galaxy stars are bound by gravity and constitute a system. In a constellation, one star may be near and another very very far, but because they are in the same direction appear to be near to each other in the sky.

Name of Constellations	
Indian Name	**English Name**
Mesham	Aeries
Rishabham	Taurus
Midhunam	Gemini
Kadakam	Cancer
Simmam	Leo
Kanni	Virgo
Thulam	Libra
Vrischikam	Scorpio
Dhanusu	Sagittarius
Makaram	Capricorn
Kumbam	Aquarius
Meenam	Pisces

Stars

A Star is a luminous heavenly body that radiate energy. With naked eyes, we can see nearly 3000 stars in the night sky and many more with the help of a telescope. The stars are remotely located and appear as tiny dots of light. Their light travels long distances to reach us. The atmosphere disturbances do not allow light to reach us in a straight line path. Because of this the stars appear to twinkle. The Sun is the nearest star to the Earth. The next nearest star is Alpha Centauri.

Satellites

An object that revolves around a planet in a stable and consistent orbit is called a satellite. Satellites can be classified into two categories – natural and artificial.

Natural Satellites

All natural objects revolving around a planet are natural satellites. They are also called moons. Most moons are spherical, the ones that are not usually asteroids or meteors that were captured by the strong gravity of a planet. All planets except mercury and Venus in our solar system have moons. Earth has only one moon- whereas planets like Jupiter and Saturn have more than 60 moons.

Artificial Satellites

Artificial satellites are man-made objects placed in an obit to rotate around a planet – usually the Earth. The world's first artificial

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Spiral galaxies

Flat rotating disc containing Stars.

Elliptical galaxies

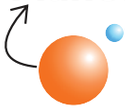
Ellipsoid in shape

Irregular galaxies

Irregular in shape

Satellites
Objects revolving around the planets

Planets



Objects revolving around the stars

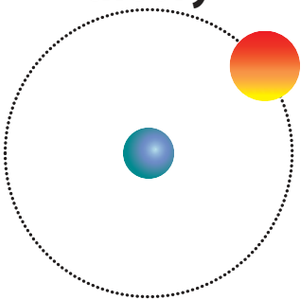
Stars

Luminous heavenly bodies radiating light

Milky way

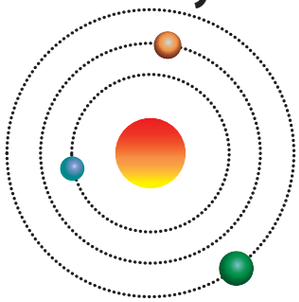
The galaxy in which our solar system is located.

Geocentric theory



Earth is supposed to be at the centre

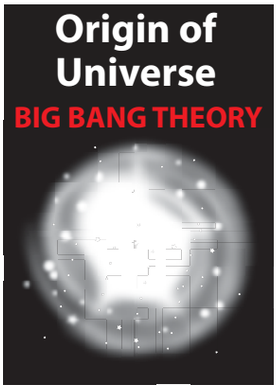
Heliocentric theory



Sun is supposed to be at the centre

Origin of Universe

BIG BANG THEORY



Space and time emerge together about billions of years ago

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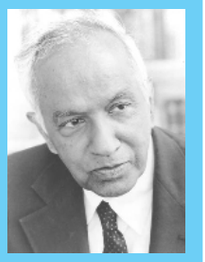
satellite launched was Sputnik-1 by Russia, Aryabhatta was the first satellite launched by India. These satellites are used in television and radio transmission, studying agriculture yield, locating mineral resources, weather forecasting, locate different places on earth.

ISRO

The Indian Space Research Organisation (ISRO) is the space agency of the Government of India headquartered in the city of Bangalore. Its vision is to "harness, sustain and augment space technology for national development while pursuing space science research and planetary exploration."

Know your Scientist

Subrahmanyan Chandrasekhar (19 October 1910 – 21 August 1995) was an Indian Americanastrophysicist who spent his professional life in the United States. He was awarded the 1983 Nobel Prize for Physics with William A Fowler. His mathematical treatment of stellar evolution yielded many of the best current theoretical models of the later evolutionary stages of massive stars and black holes. The Chandrasekhar limit is named after him. Chandrasekhar worked on a wide variety of physical problems in his lifetime.



Formed in 1969, ISRO superseded the erstwhile Indian National Committee for Space Research (INCOSPAR) established in 1962 by the Scientist Vikram Sarabhai. The establishment of ISRO thus institutionalized space activities in India. It is managed by the Department of Space, which reports to the Prime Minister of India.

ISRO built India's first satellite, Aryabhatta, which was launched by the Soviet Union on 19 April 1975. It was named after the Indian astronomer Aryabhata. In 1980, Rohini became the first satellite to be placed in orbit by an Indian-made launch vehicle, SLV-3. ISRO subsequently developed two other rockets: the Polar Satellite Launch Vehicle (PSLV) for launching satellites into polar orbits and the Geosynchronous Satellite Launch Vehicle (GSLV) for placing satellites into geostationary orbits. These rockets have launched numerous communication satellites and Earth observation satellites. Satellite navigation systems like GAGAN and IRNSS have been deployed. In January 2014, ISRO used an indigenous cryogenic engine in a GSLV-D5 launch of the GSAT-14.

ISRO sent a lunar orbiter, Chandrayan -1, on 22 October 2008 and a Mars orbiter, Mangalyan, on 5 November 2013, which entered Mars orbit

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on 24 September 2014, making India the first nation to succeed on its first attempt to Mars, and ISRO the fourth space agency in the world as well as the first space agency in Asia to reach Mars orbit. Mangalyan was launched by PSLV-XL C25. On 18 June 2016 ISRO set a record with a launch of 20 satellites in a single payload. On 15 February 2017, ISRO launched 104 satellites in a single rocket (PSLV-C37) and created a world record. ISRO launched its heaviest rocket, Geosynchronous Satellite Launch Vehicle-Mark III (GSLV-Mk III), on 5 June 2017 and placed a communications satellite GSAT-19 in orbit. With this launch, ISRO became capable of launching 4 ton heavy satellites.

ISRO launched Chandran 2 on July 22, 2019, Geosynchronous Satellite Launch Vehicle (GSLV-Mk III M1). It entered the Moon's orbit on August 20, 2019.

DO YOU KNOW?

In 1989, Galileo Galilei was memorialized with the launch of a Jupiter-bound space probe bearing his name. During its 14-year voyage, the Galileo space probe and its detachable mini-probe, visited Venus, the asteroid Gaspra, observed the impact of Comet Shoemaker-Levy 9 on Jupiter, Europa, Callisto, IO, and Amalthea.

In order to avoid the possible contamination of one of Jupiter's moons, the Galileo space probe was purposely crashed into Jupiter at the end of its mission in September 2003.

Points to Remember

- The field of study of the universe is called astronomy.
- The universe consists of galaxies, planets, stars, meteorites, satellites and all other forms of matter and energy.
- The half Moon during the waxing period is called as first quarter and the half Moon during the waning period is called as third quarter.
- The word crescent refers to the phases where the Moon is less than half illuminated. The word gibbous refers to phases where the Moon is more than half illuminated.
- The reversal of direction of planets is called as 'retrograde motion'.
- The geocentric theory followed by the ancient people proposed that the Earth is at the centre and the Sun and other planets revolve around it.
- The helio-centric theory states that the Sun is at the centre and the planets revolve around it
- Galileo gave the observational evidence to support the heliocentric theory
- A galaxy is a large collection of stars or cluster of stars and celestial bodies held together by gravitational attraction.
- A constellation is a recognizable pattern of stars in the night sky when viewed from the Earth.
- An object that revolves around a planet in a stable and consistent orbit is called a satellite.
- The Indian Space Research Organization (ISRO) is the space agency of the Government of India headquartered in the city of Bangalore.

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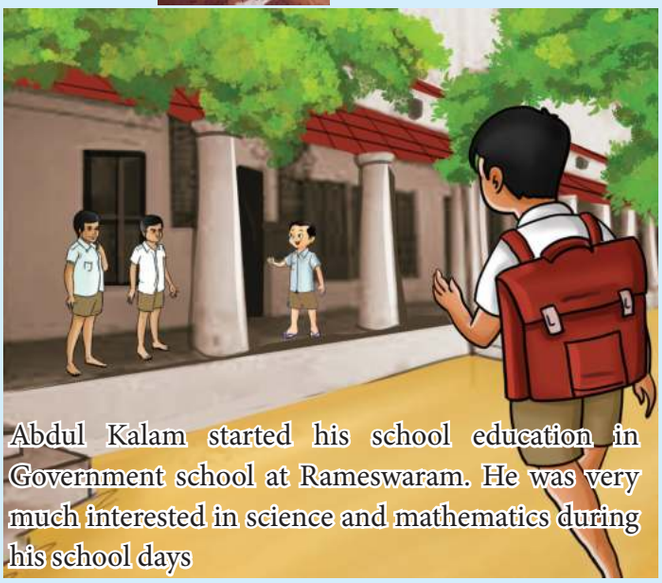
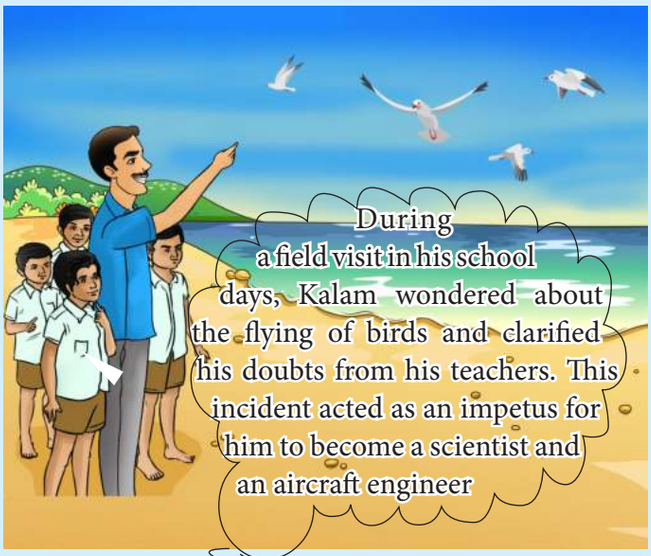
The Missile Man Of India

A.P.J. Abdul Kalam (1931-2015)

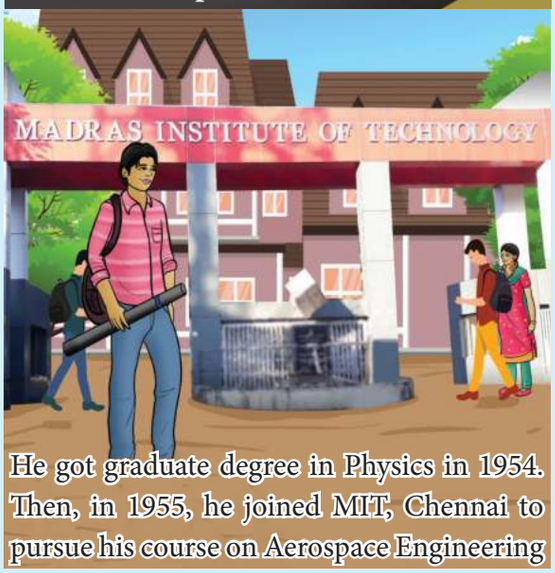


Abdul Kalam started his school education in Government school at Rameswaram. He was very much interested in science and mathematics during his school days

He assisted his relative, a news paper agent during his childhood to meet his educational expenditure



During a field visit in his school days, Kalam wondered about the flying of birds and clarified his doubts from his teachers. This incident acted as an impetus for him to become a scientist and an aircraft engineer



He got graduate degree in Physics in 1954. Then, in 1955, he joined MIT, Chennai to pursue his course on Aerospace Engineering

After completing his studies at MIT, he designed an aircraft named 'Nandhi' using indigenous materials with the help of indigenous technologists, He operated that flight himself

He took charge as the Director of Indian Defence Research Development Organisation and the scientific advisor to the Defence Ministry of India in 1983

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Kalam successfully launched the 'Rohini-1' satellite using the India's first satellite launch vehicle SLV-3 in 1980. He acted as the Project Director when the missiles Thrishul, Agni,Prithvi, Nag and Akash were designed in the Indian Defence

India for the first time experimented nuclear explosion test named 'Smiling Buddha' in 1974. Kalam was one among the sixty Aeronautical Engineers in this project

Abdul Kalam played a vital role in the nuclear explosion test project in Pokran named "Operation Sakthi" in 1998. The credit that the India has become a nuclear power goes to him

Kalam worked in five missile projects of India. He was the most important behind the designing defence rocket of India

The Government of India awarded him the Bharatha Ratna. He was the President of India during the period from 2002-2007

The missile man who quoted "Man needs difficulties because to enjoy the success they are needed to and you have to dream before your dreams can come true" lives among us even after his death. Let's also sacrifice for the country like him

EVALUATION

K4Q6Z

I. Choose the correct answers

1. The Moon takes _____ days to complete one revolution around the Earth.

   a. 25 b. 26 c. 27 d. 28

2. If the Moon is appeaing in the sky today near the star Karthikai, the position of the Mon after 27 days is near the star

   a. Bharani b. Karthikai
   c. Rohini d. Asvini

3. Telescope was invented by

   a. Han Lippershey b. Galileo
   c. Nicolus Coppernicus d. Ptolomy

4. The galaxy containing young and hot stars is

   a. elliptical galaxy b. irregular galaxy
   c. cluster d. spiral galaxy

5. With the launch of this satellite, ISRO became capable of launching 4 ton heavy satellites.

   a. GSAT- 13 b. GSAT- 14
   c. GSAT- 17 c. GSAT- 19

II. Fill in the blanks

1. Waxing of Moon means _____.
2. Heliocentric model is proposed by _____.
3. _____ is the prevailing model of Evolution of the Universe.
4. _____ is a large constellation which covers a large part of the sky.
5. _____ is the first satellite launched by India.

III. True or False – If False give the correct answer

1. On a full Moon day, when the Sun is setting in the west, Moon rises in the West.
2. The word crescent refers to the phases where the Moon is less than half illuminated.
3. Galileo accepted the Geo-centric model.
4. Our Milky Way galaxy is identified as an elliptical galaxy.
5. The planet Venus in our solar system doesn't have a moon.

IV. Match the following

1.	Rohini	-	GSLV-Mark III
2.	GSAT-14	-	GSLV Mark III M1
3.	GSAT-19	-	SLV-3
4.	Chandrayaan-2	-	PSLV-XL C25
5.	Mangalyaan	-	GSLV-D5

V. Analogy

1. Older stars : elliptical galaxies :: younger stars :_____.
2. Nearest galaxy : Andromeda :: Nearest star :_____.

VI. Very short answer

1. The word _____ refers to the phases where the Moon is less than half illuminated. (cresent / gibbous)
2. _____ and _____ planets never appear in the mid-night sky.
3. Number of days taken by the Mars to orbit around the Sun.
4. In which phase does the size of the planet Venus is small?
5. The only evidence of the big bang theory is _____.
6. The galaxy which contains abundant amount of gas and dust is _____.

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7. Which country launched the world's first satellite?

VII. Short Answer Questions

1. What is epicyclic model?
2. Name the four different types of galaxies.
3. What is constellation?
4. Give the expansions of PSLV and GSLV.

VIII. Answer in Detail

1. Explain the waxing and waning phases in Venus.
2. Write short notes on constellations.

IX. HOT Question

Neelan and Mala are having a conversation about our Universe. Neelan is telling our Earth will be the only planet in the entire Universe to have a life with. But, Mala is opposing his view by citing certain points. What would be the argument of Mala. Do you support Mala? Justify your stand.

ICT CORNER

UNIVERSE AND SPACE

Let us know about Universe and space

PROCEDURE :

Step 1: Use the URL or scan the QR code to open the activity page.

Step 2: Click the start button and then Click anywhere to open side bar.

Step 3: Click the top most icon in the side bar then Click the RUN INTRO button to see the various views of the solar system and universe

Step 4: Click the bottom most search icon in the side bar to search a particular planet, constellation, stars and Spacecraft.

Step 5: By dragging the mouse left ,right, up and down you can see the various views and scroll the Mouse to zoom in and zoom out .

Step 6: Click the play button to see the solar system in year wise.

Step 1

Step 2

Step 3

Step 4

Universe and Space URL:

https://www.solarsystemscope.com/

https://play.google.com/store/apps/details?id=air.com.eu.inove.sss2

*Pictures are indicative only

*If browser requires, allow Flash Player or Java Script to load the page.

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Unit 3

Polymer Chemistry

Learning Objectives

- Recognize various types of fibres
- Conduct activities to learn the characteristics of synthetic fibres
- List the advantages and disadvantages of synthetic fibres
- Differentiate between thermoplastics and thermo-setting plastics
- Identify various types of plastics based on the resin codes
- Realize the impacts of plastics on humans, animals and the environment.
- Recall the different methods and hierarchy of disposing waste based on the 5R principle
- Explore the complexities of bio-plastics
- Gather information about plastic eating bacteria
- Learn about glass and its types and uses

SQOP7

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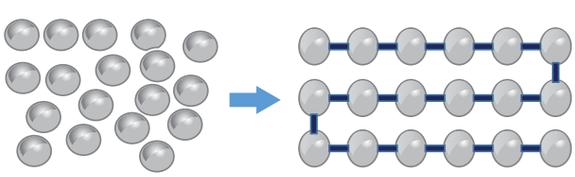
Introduction

Polymer chemistry has a positive impact on your everyday life. Many of the materials you use are linked to polymer chemistry. When you get ready for school, you wear clothes, shoes, brush your teeth and take a school bag. Did you ever ask yourself what these items are made of? They are created from fibres. Fibres are made up of long chains of natural or synthetic polymers.

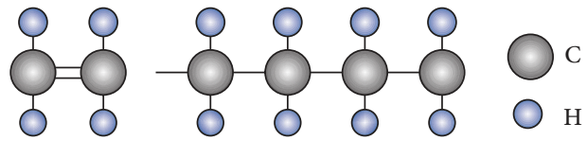
As a society, we are consuming more and more. The more things we buy the more things we throw away. 30 years ago, most of the waste in Tamil Nadu was biodegradable or easily recyclable. Today it is more complex. Many of the materials we use are non-biodegradable and difficult to recycle. For example, in the past people used many natural materials such as cotton, silk and jute fibres. Today we use a lot of synthetic materials such as plastics. In this lesson you will learn about polymers, different types of fibres, plastics and the waste we produce and how we should manage it.

3.2 What Are Polymers?

The word 'Polymer' is of Greek origin. 'Poly' means many and 'mer' means basic smaller unit. Polymers are very long chains made of repeating smaller molecules called 'monomers' that are joined together by covalent bonds and the process is called polymerization. The diagram below shows how repeating monomers join to form a polymer:

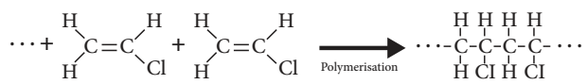


Monomers Polymer



Monomer Polymer

Polyvinyl Chloride (PVC) is a common plastic used for water pipes. The monomer and polymers of PVC is shown below.



monomer monomer polymer

ACTIVITY 1

Compare the following things. Ice cubes and a polythene bag. In both the materials, there are large number of molecules combined together. Are both polymers?

3.2.1 Polymer

Polymers can be classified into natural and synthetic polymers. Can you imagine that your body produces and you are made up of natural polymers? The most familiar polymers that we use in our daily life are man-made and synthetic.

3.2.2 Natural Polymers

Natural polymers are found in living systems that include proteins and carbohydrates

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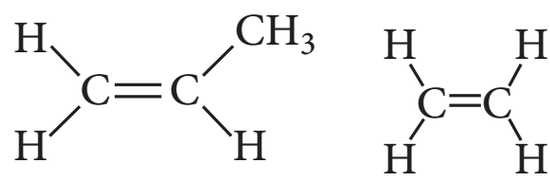
in our bodies and cellulose in wood and paper. They play a very important role in living things to provide structural materials and molecules needed for life processes.

Protein polymers are made from amino acid monomers (20 different kinds of amino acids). Different combinations of the amino acid monomers create many different protein polymers. Examples of protein polymers include DNA, enzymes, silk, skin, hair, fingernails, feathers and fur.

Examples of carbohydrate polymers include cellulose, chitin and lignin found in plants. Cellulose is made of sugar molecules and is the main component of cotton used in clothing. Chitin is found in the cell walls of fungi such as mushrooms and exoskeletons of insects such as crabs and spiders. Lignin consists of a network of polymers and is important in giving structure to plants.

3.2.3 Synthetic Polymers

Synthetic polymers are man-made polymers produced by using raw materials from petroleum oil and gas. Plastics are synthetic polymers. When oils and gases are processed to make petrol, ethylene and propylene monomers are removed as by-products. We have already seen that polymer such as the Poly Vinyl Chloride (PVC) is made up of many monomers joined together. Ethylene and propylene are the building block monomers that make up many different types of plastics.



Propylene and Ethylene

Based on the nature of the monomers, the way they are arranged in the polymer and the characteristics of final polymer. There are grouped into different categories such as fibres, plastics, proteins. Let us study about few of them in the following sections.

3.3 Fibres

We wear clothes, use bags, rope, blankets, etc. in our daily life. They are made of fibres. Once upon a time, people used natural fibres such as cotton and wool. Nowadays, we use a lot of synthetic fibres. All natural and synthetic fibres are polymers.

Observe the difference between the natural and synthetic fibres:

Natural Coconut Rope vs. Nylon Fishing rope

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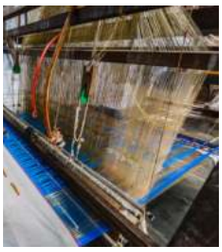
3.3.1 Natural and Synthetic Fibres

Fibres are long strands of polymers interwoven to form linear, string-like structures. Fibres that are obtained from plant or animal sources are called natural fibres. Examples include cotton, coconut fibre, hair, wool and silk. Fibres that are made using raw materials from petroleum are synthetic fibres. Examples include polyester, acrylic and nylon. Historically, humans used natural plant fibres and animal fur for shelter, clothing and protection from the weather. Today, a large variety of natural fibres are still grown and processed such as cotton, silk, and wool. Natural fibres can be spun into filament, thread or rope. Then they can be woven, knitted, matted or bonded and are used to make clothing, containers, insulation material and many other products we use in our daily life. Three main sources of natural fibres are: (i) Animals Eg. Silk moth (ii) Plants Eg. Cotton (iii) Minerals Eg glass fibre.

Natural wool



Silk

Plants

Cotton

Jute

Flax

Minerals

Glass fibre

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The discovery of making synthetic fibres out of petrochemicals has replaced the use of many natural fibres. Synthetic fibres such as nylon, polyester and acrylic are used to make many different plastic items you use in your daily life such as clothing, blankets, tooth brushes and stuffing in cushions.

3.3.2 Types and Uses

Silk: Natural Fibre

Natural silk fibres are obtained from boiling the cocoons of silk worms from specific species of moths. There are four types of natural silk: Mulberry silk, Tasar silk, Muga silk and Eri silk. Most of the mulberry silk worldwide is produced in India. Silk is one of the strongest natural fibres and has many uses such as clothing, carpets and parachutes.

Rayon: A Semi-synthetic Fibre

In the 19th century scientists were successful in producing the first artificial silk known as rayon. The first rayon factory in India was established in Kerala in 1946. Rayon is a man-made fibre, but it is not considered fully synthetic as it is made out of natural cellulose collected from wood pulp. The cellulose that is collected from wood or bamboo pulp is treated with several chemicals. First sodium hydroxide is added followed by carbon disulphide. The cellulose dissolves in the chemicals added to it and produces syrup called Viscose. Viscose is forced through a spinneret (a device made of metal plates with very tiny holes) into a solution of dilute sulphuric acid. This produces silk-like threads that are cleaned with soap and dried. This new fibre is called rayon.

Some types of rayon are made from the short cotton fibres left on cottonseeds after ginning. Rayon is cheaper than silk, can be woven like natural silk fibre and can be dyed in a wide variety of colours. It can be mixed with cotton to make bed sheets or with wool in the production of carpets and home furnishing products. Rayon is also found in sanitary products, diapers, bandages and gauze for dressing wounds.

Nylon: Synthetic Fibre

Nylon is the first fully processed synthetic fibre. It was popular during the Second World War for the use of parachutes and rope materials for climbing. Nowadays, nylon has replaced natural silk in many textiles, and has become one of the most commonly used synthetic fibres.

Nylon fibre is strong, elastic and light. It is lustrous and easy to wash, which has made it popular for the clothing industry.We use many products made from nylon such as socks, ropes, tents, toothbrushes, car seatbelts, sleeping bags, curtains, etc. Nylon thread is actually stronger than a steel wire.

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DO YOU KNOW?

Nylon is very strong and can be used for rock climbing!

Nylon is a plastic polymer made of chemical units called polyamides. Polyamides are made with monomers – hexamethylenediamine and adipic acid. Solid chips of these polyamides are melted and forced through a heated spinneret which has very, very tiny holes.

Parachute

mountaineer

ACTIVITY 2

How Strong is Nylon?

Take an iron stand with a clamp. Take samples of cotton, wool, nylon and silk threads of about 50cm in length.

First tie cotton thread to the stand so that it hangs freely from it. At the free end, attach a CD as plate so that weights can be placed on it. Add weights starting from 10 grams one by one, untilthe thread breaks. Note down the total weight required to break the cotton thread. Repeat the same activity with the wool, silk and nylon threads.

NOTE: All the varieties of threads should be of same thickness.

Arrange the threads in the order of increasing strength.

.....

.....

.....

What do you infer from the above activity?

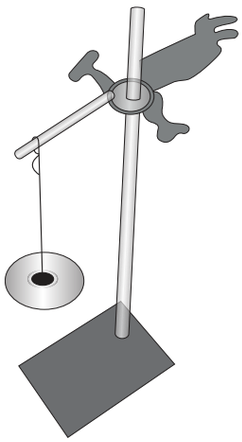
.....

Which type of fibre is the strongest?

.....

Which type of fibre is the weakest?

.....



Iron clamp with a hold weights

Polyester and Acrylic: Synthetic Fibres

Polyester is another synthetic fibre. It can be drawn into very fine fibres that can be woven like any other yarn. Polyester is sold in the name of polycot, polywool, terrycot, etc. Polycot is a mixture of polyester and cotton; Polywool is a mixture of polyester and wool. PET (Polyethylene Terephthalate) is a very familiar form of polyester. It is used for making water and soda bottles, utensils, films and wires amongst many other useful products. Many of the clothes we wear are made out of polyester fibres. Fabrics made from this fibre do not get wrinkled easily and are easy to wash making polyester fabrics suitable for dress materials.

Fill the data in the following table

S.No	Type of thread/fibre	Total weight required to break the thread (in g)
1	Cotton	
2	Wool	
3	Silk	
4	Nylon	

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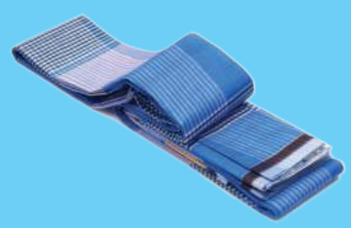
We wear sweaters and use shawls and blankets in the winter. Many of these are not made from natural wool although they appear to resemble wool. These are prepared from another type of synthetic fibre called acrylic. The wool obtained from natural sources is quite expensive, where as clothes made from acrylic are relatively cheap because they are a byproduct of the production of plastics. They are available in a variety of colours. Synthetic fibres are more durable and affordable which has contributed to their widespread use.

ACTIVITY 3

Identify The Fibre : Let us do an activity. Look at the images below and identify and write down the name of the different types of fibre observed.

Jute



Cotton

Silk saree

Rayon material

Wool

Polyester

ACTIVITY 4

Synthetic or Natural Fibres : The teacher can give the learner a piece of each and every type of fibre. The learner can feel the fibre and write down the name of the fibre and state whether it is natural or synthetic fibre.

S.No	Name of the fibre	Type of the fibre– Natural /Synthetic

We have done four activities so far. Which activity helped you better to identify the type of fibre? ……..... (Both the use of familiar images as well as touch can help us to identify the different types of fibres. Right!) We have learned about fabrics such as polyester, nylon and acrylic and their common uses. These synthetic fibres are polymers which we will learn about later in this chapter.

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Characteristics of Synthetic Fibres

ACTIVITY 5

Burning A Piece of natural fibre and a synthetic Fibre

Note: This activity should be performedonly by the teacher.

Take a piece of cotton cloth and a piece of polyester cloth. Both the pieces of cloth can be of same size (2cm x 2cm is enough). Hold the pieces of cloth using tongsto protect yourself from the flame and heat. Burn both the pieces of cloth one by one and see what happens when they burn.

What do you observe while the cotton cloth burns?

……

What do you observe while the polyester cloth burns?

……

You must have noticed that natural (cotton) fibresburn very differentlycompared tosynthetic (polyester) fibres.

The cotton cloth will burn when it is held in flame. On the other hand, the synthetic polyester cloth will melt on burning. This is one of the disadvantages of wearing clothes madeout of synthetic fibres. If a synthetic cloth comes into contact with fire the fabric melts and sticks to the body causing severe burns. Therefore, one should not wear synthetic clothes while cooking or working in a laboratory.

Cotton Laboratory Coat

ACTIVITY 6

Wetting A Cotton Cloth And An Umbrella Cloth

We use an umbrella on rainy days. What kind of umbrella do we use?

……

Can you use an umbrella made of cotton?

Let us do an activity to see why we do not use a cotton umbrella to protect ourselves from the rain.

Take a piece of cotton cloth of approximately 10 cm X 10 cm size and a piece of nylon or polyester cloth 10 cm X 10 cm in size from an old unusable / untorn umbrella. Ask four students to hold the four corners of the piece of cotton cloth and pour a glass of water over it. Then ask four students to hold the piece of umbrella cloth and pour a glass of water over it. Compare the effect of water on the piece of cotton cloth and umbrella cloth and record your observation in the notebook.

……

Which of these fabrics allows water to pass through?

Cotton cloth or Umbrella cloth (nylon or polyester) Now ask the students to put both the pieces of cloth in the hot sun to dry. Which of these fabrics dries the fastest? The cotton cloth or the umbrella cloth? ……...

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DO YOU KNOW?

Synthetic fibres are made from the byproducts of processing petroleum oil and gas. You will learn about fractional distillation of petroleum in your higher classes.

3.3.3 Advantages of Synthetic Fibres

Do you ever think about why some of your clothing does not need ironing and looks bright and colourful for many years? This is because they are made from synthetic fibres such as polyester and the advantages are that they do not wrinkle easily and they keep their colour and brightness for a much longer time than natural fibres such as cotton.

A lot of materials such as fishing nets are made from synthetic fibres. One of the main advantages of using synthetic fibres such as nylon, is that they are stronger than many natural fibres such as silk or wool. For example a trampoline is made of woven synthetic fibres. These fibres are strong and elastic which gives it the properties to bounce.

3.3.4 Drawbacks of Synthetic Fibres

We have already learned that it is safer to use cotton clothing instead of synthetic clothing when a person is cooking or working in a laboratory. This is because one disadvantage of synthetic fibres such as polyester is that they are not heat resistant and catch fire easily. In summer it is better to wear clothing that is made out of cotton materials rather than synthetic. This is because most synthetic fibres absorb very little moisture and do not allow air circulation making them hot and uncomfortable to wear.

If you could recall that we already found out that synthetic fibres are made out of petrochemicals and last in the environment for a very long time. The disadvantage is that they break down into very small pieces called **microplastics** which cause pollution to soil and water bodies such as rivers, lakes and oceans.

3.4 Plastics

Ask yourself what is the first plastic thing you touched today! Maybe it was your alarm clock or the filling in your pillow or the synthetic clothes that you were wearing. Almost everything around us today is plastic. You have seen water and oil in polythene pouches. Right! In the past, people used to bring milk, oil and other liquids from a shop in vessels made of materials such as metal and glass. Think about what the containers, buckets, mugs, chairs and tables used in the past were made of? What do we use today to make many of these products?

Plastic as a material has taken over and replaced metal and wood which were previously used. Plastics have also replaced many glass items. If we continue to write the list of everyday items that are made of plastic, it will be endless! Why is plastic so popular? What are the different uses of plastic? What are the various types of plastics? Let us now learn about plastics:

Plastics have helped us to make advancements in technology, building, healthcare, transport and food safety. Plastics have completely occupied our life because of

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their characteristic qualities. Plastics have many positive qualities such as lightweight, strong and they can be moulded into complex shapes. They are also flexible and waterproof and some plastics are even UV resistant. Plastics are also cheap and convenient for us to use. Now that you have discovered why plastics are so popular, let us find out more about the different uses of plastics.

Health care items

Items that are waterproof or UV resistant

3.4.1 Do plastics give benefits in human life?

There are different types of plastics that are excellent materials when they are used for the right application. For example, let us take a syringe that is made from a type of plastic called polypropylene. These syringes do not have to be sterilized and reused; hence they provide a high standard of hygiene and eliminate the risk of spreading diseases.

Just as plastic is a material that can be used for a good application, it can also be used for the wrong application. Think about the different items you use that are plastic. For example, a simple article such as a thin plastic carry bag. You use this bag for a very short time and then throw it in a dustbin. Many of these carry bags do not get recycled and they litter and pollute our environment for a long time.

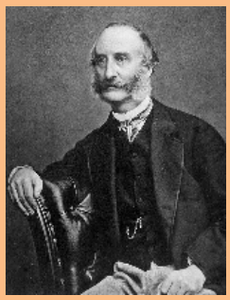
If you want to learn more about plastic which is used for the wrong application then you can refer to the Government of Tamil Nadu's ban on one-time use and throwaway plastics (Environment and Forests Department, T.N. G.O. No: 84, dated 25/06/2018, with effect from 1st January 2019).

DO YOU KNOW?

It is estimated that every year we use a trillion plastic carry bags (2 million a minute) around the world and out of which only 1 to 3% are recycled.

DO YOU KNOW?

Plastic has been around for less than 200 years. Edmund Alexander Parkes was the creator of the first plastic called 'Parkesine'.



Edmund Alexander

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ACTIVITY 7

Right and wrong application of plastics

Look at the list of eight plastic items. Decide which fourplastic itemsare used for the right application and which four are used for the wrong application by filling in the chart below:

Plastic items: straws, helmets, cutlery, thin carry bags, syringes, electrical wires,tea cups and blood bags

Straws

Helmets

Cutlery

Thin carry bags

Syringes

Electrical wires

Tea cups

Blood bags

Right application	Wrong application

3.4.2 Types of plastics

The plastics we use in our daily life are also made up of polymers. All plastics do not have the same type of arrangement of units. In some articles, the arrangement of a monomer is linear, and in some other items, the arrangement of articles is cross-linked. Depending on the type of arrangement, we have two main types of polymers – thermoplastics and thermoset. Let us see what these are!

Thermoplastics : Polyethylene (also called polythene) is an example of a plastic. It is used for making polythene carry bags which are commonly used. When you burn a polythene carry bag, it melts and turns into liquid along with the production of an offensive odour, a bright flame and soot. Another example is a **PET (Polyethylene Terephthalate)** bottle, when we fill it with boiling water, it gets deformed. Plastics which can be easily softened and bent when heated are known as thermoplastics. These plastics can be modified and turned into another plastic item through the process of recycling.

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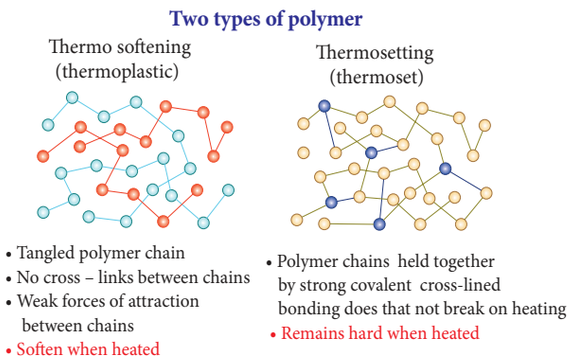
Thermoset : On the other hand, there are some plastics, which once they are moulded, cannot be softened through heating them. These are called thermosetting plastics. Bakelite and melamine are some examples of thermosetting plastics. Bakelite is a poor conductor of heat and electricity. It is used for making electrical switches and handles of various utensils. Melamine resists fire and can tolerate heat. It is used for making floor tiles and fabrics that resist fire.



Example of thermoplastic: PET water bottles

Example of thermoset plastic: electrical switches

3.4.3 Resin code of plastics

Now that you have learnt about the differences between Thermoplastic and Thermosetting polymers, let us find out more about the different types of plastics that you use in your daily life. Plastics are very useful in our daily life but some types contain dangerous chemicals.

Did you know that there are many different types of plastics?

You can tell these plastics apart by searching for a resin code. The resin codes are a universal way of categorising different types of plastic, which helps us separate plastics so that it is easier to recycle them. How can you identify the resin code? Where can you find the resin code on a plastic item?

Look at the chasing arrow triangle-shaped symbol on the bottom of a bottle, on the brand label sticker or on the lid of a container. What number is marked in the centre of the triangle? What letters (acronym) are below this? This is what we call a resin code.

If the number is 1 within the chasing arrow triangle and/or has the acronym PET or PETE, then it is a type of plastic which is called PET. Now that you have found out that the bottle has a specific resin code, let us see what gives the bottle and other plastic products certain qualities. Different chemicals (additives) are added to plastic to give them various qualities and characteristics, for example flexibility, strength, softness or transparency. There are some chemicals that are used in plastics that are dangerous for our health, animals and the environment. For example, Polyvinyl Chloride- PVC resin code #3 has heavy metals such as cadmium and lead which are toxic chemical which are harmful to your health. Polystyrene- PS resin code #6 has styrene which is a toxic chemical known to cause cancer.

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PLASTIC RESIN CODE CHART

Plastic resin codes can be found on the label or bottom of most plastic items.
It is a number or acronym found in the middle of a chasing arrow triangle.
There may be other numbers or letters on the plastic items, but these are not resin codes.

KNOW PLASTICS

RESIN CODE	OTHER NAMES	COMMON ITEMS	ABOUT
01 PET	PETE, Polyester	Umbrella, sports clothing, warm fleece jackets/sweaters, rope, sails, polyester fibre made into sleeping bags.	This plastic is designed to be used only ONCE. Reusing PET plastic can release a chemical called antimony which is not good for your health. Polyester is the most widely used synthetic fibre for clothes.
02 HDPE	PEHD	Cement/rice/cow food sacks, crocheted/woven tiffin bags, rope, fishing nets, shade nets/structures, fibre reinforced concrete (taken from plastic cans), bulletproof material-vests (Ultrahigh Molecular Weight Polyethylene- UHMW).	Considered one of the safer plastics. It is light, very strong and has excellent impact strength. It is an effective moisture barrier. It is widely recycled.
03 PVC	V, Vinyl	PVC fibres/Vinyon fibres are used to make shower curtains, outdoor fabrics, raincoats, boots, fishing nets, synthetic yarns, children's clothing & blankets. Vinyl is used for stickers on clothing, dress costumes and fake leather.	The most toxic plastic. Vinyon has good resistance to weathering and fire.
04 LDPE	PELD, LLDPE	Heavy-duty sacks, artificial grass/turf for football.	Considered one of the safer plastics. It is very flexible and soft but strong.
05 PP		Disposable absorbent articles- diapers, wet wipes for cleaning. Ropes, carpets, clothing, for filtration, battery separators & geotextiles (drainage and erosion control). PP micro-fibers are added to concrete to stabilise the mix.	Considered one of the safer plastics. Nonwoven PP fabrics are made so that they can be used in disposable products that you usually throw away after one use.
06 PS	Thermocol, EPS XPS and HIPS	Pens, rulers, throwaway tea & juice cups, plates and cutlery and toys.	One of the unsafe plastics as it has toxic chemicals. Most PS in the world is made for one-time use/throwaway food and drink packaging.
07 OTHER	Polycarbonate (PC), acrylonitrile butadiene styrene (ABS), acrylic (AC), bioplastics, nylon, polyurethane (PU), etc.	PC: baby bottles & food containers. ABS: helmets & car bumpers. Acrylic: fibre optical cables & paints. Bioplastics: plastic bags & tableware. Nylon: clothes, kites & toothbrush bristles. PU: mattress foam & shoe soles.	This code includes all plastic types that do not fit into the resin codes 1- 6. PC and ABS are two of the unsafe plastics and are considered toxic. When you see a #7 plastic try to know more before buying and using it.
NO CODE	Does not have resin code or an acronym	Can be any plastic item.	The company did not follow the rules and mark what type of plastic was used. It could be harmful but you do not have the information to know for sure. Avoid using plastic without a resin code.

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ACTIVITY 8

Identify the different types of plastics

Collect different kinds of plastic products and look carefully for the resin code and/or acronym on them.With the help of the resin code chart,mark the resin code number, acronym, if you think it is a safer, unsafe or questionable (when you cannot find the resin code on the article) type of plastic. What resin codes do you find? Is the resin code safer,unsafe or questionable?

Product	Resin code number	Acronym	Category of safety	Use of product

Look at the resin code chart on the previous page to find out more about the different types of plastic, what are common items and which plastics are safe and unsafe for us, animals and the environment.

Look at the resin code chart to find out more about the different types of plastic, the common items and the plastics that are safe and unsafe for us, animals and the environment.

3.4.4 Impacts of plastics

Plastics are cheap, light weight, strong and durable and have contributed to a range of advances and benefits to our modern life. But the increase in the use of plastics, particularly the one-time use and throwaway plastics has serious impacts on the environment, animals and our health.

We have seen garbage dumps with different plastics. One big problem with plastics is that they do not decompose or biodegrade. This leads to large amounts of waste that will not disappear and end up accumulating and polluting the environment.

A lot of one-time use plastic such as polythene bags and food packaging that are thrown away are responsible for littering the environment and clogging drains. Standing water breeds mosquitoes that can spread diseases such as malaria, dengue and chikungunya and also lead to flooding.

Why do you think some animals eat plastic? Many animals confuse plastic for food and eat it by accident. When left over food is thrown away it is often packed in plastic. Animals smell the leftover food and eat the plastic by accident. For example animals in urban areas, particularly cows, often eat polythene plastic bags by accident as they contain food waste. Can you imagine the consequences?

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A lot of the plastic waste we use such as plastics bags, bottles and straws end up in the oceans. Plastics in the ocean are exposed to sunlight, water and the physical movement of

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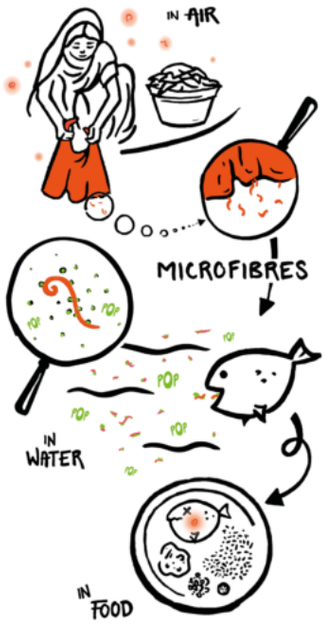
the waves, which breaks it down in tiny pieces called microplastics. Some microplastics are also found in household products. Examples are microbeads that can be found in toothpaste, face wash and body scrubs. Microbeads are washed down in drains and end up in the soil, rivers, lakes and the ocean Microbeads are washed down in drains and end up in the soil, rivers, lakes which cause pollution.

Microplastics in the Ocean

Many birds eat plastic items and small pieces of plastic, which are covered in algae. Once in the stomach of animals, plastics cannot be digested and this decreases the amount of space for food and can lead to starvation. In 2015, plastics were found in 90% of seabirds.

We have already read that Government of Tamil Nadu has banned one-time use and throwaway plastics such as plastic carry bags, plates, straws and water pouches. This is an indication that important efforts are taking place to reduce negative consequences of plastics on the environment.



3.4.5. PLA Plastics

Can you see how much plastic litter pollutes our environment? How nice would it be if a material that had similar qualities to plastic could be biodegradable, be absorbed by the soil and give nutrients to the soil!

DO YOU KNOW?

We have seen that synthetic clothes are made from plastic. Every time we wash synthetic clothes, small fibres called microfibers escape and end up in the soil, streams, rivers and oceans.

Dangerous pollution called Persistent Organic Pollutants (POPs) floating in the ocean sticks to these small pieces of plastic making them toxic. Marine animals such as shrimp and fish often eat microplastics, confusing them for their natural source of food. The toxins build up in these animals and move up the food chain and can end up in our bodies. Microplastics can be found in the food we eat, the water we drink, and the air we breathe.

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Yes, scientists have thought about alternatives to synthetic plastics and have found Poly Lactic Acid (PLA) –a substitute for some types of plastics. Poly Lactic Acid or polylactide is compostable and bioactive thermoplastic. This polymer is obtained from plant starch such as corn, sugarcane and pulp from sugar beets. PLA is a biodegradable material. It is useful for making food packaging, garbage bags and disposable table ware.

PLA food containers

Tea bags

3.4.6. Various methods of disposing plastics

Plastics are everywhere! Our increasing consumption and production of plastic waste needs a solution. Let us find out more about how and where plastic waste is disposed of and the better methods of disposing plastics.

Organic waste such as the peels of vegetables, fruits and food remains can get broken down by bacteria in the soil to create a rich source of nutrients in the form of compost. A material that gets decomposed through natural processes and action by bacteria is called biodegradable.

Plastics do not decompose by natural processes and action of bacteria and are therefore not biodegradable. It is important for us to separate our biodegradable and non-biodegradable waste and dispose of them separately. A lot of the plastic produced globally is designed to be used only once and thrown away, creating a large amount of plastic waste. Plastic waste ends up being recycled, incinerated, landfilled, dumped or ends up littering our environment. It is estimated that from all the plastic waste ever produced, 79% is in landfills, dumps or in the environment, 12% has been incinerated and only a small 9% is recycled.

Let us learn more about what happens with the plastic waste. One way to look at plastic disposal is the 5R Principle – **Refuse, Reduce, Reuse, Recycle and Recover.** We have already learned about the waste pyramid and how the different methods of waste disposal can be seen in terms of the best option to the least favourable in this order: Refuse (Avoid), Reduce, Reuse, Recycle, Recover (Compost and Incinerate) and Landfill.

Refuse (Avoid)

The best thing to do is to avoid using plastic products. One-time use throwaway plastics can often be avoided. For example, we can carry cotton or jute bags when we go shopping and say no when a shopkeeper offers us a plastic bag.

Reduce

Reducing the amount of plastic we use is important. Before buying a plastic product we can check to see if there are any substitutes or alternatives that can be used. If we use fewer plastics, we will create less plastic waste. However, even if we try to reduce the amount of

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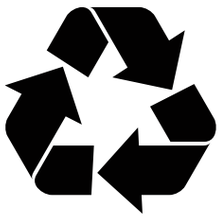
plastics we use and throw away, it is impossible to stop using plastics completely.

Reuse

If possible products made of plastics can be used again and again. For example, if we have a plastic bag in good condition, instead of throwing it away we can use it again the next time we go for shopping. If we have a plastic product and if you do not feel like using it again, we can give it to others instead of throwing it out.

Recycle



It is better to recycle plastic waste. Separating plastic waste and making sure it gets recycled is good as it turns waste materials into something new. Then it will not be thrown away in landfills, open dumps or ending up as litter in the environment. Many thermoplastics can be recycled. They can be softened by heating and can be made into another article by recycling, but thermosetting plastics cannot be recycled. Recycling of plastics is challenging and it is important to know that plastics cannot be recycled forever. There are so many different types of plastics, which are often mixed together making it difficult to separate them back into the original material. Every time plastic is melted and recycled it loses quality, this is called 'downcycling'. Recycling of plastic waste cannot be the only solution to plastic pollution.

Recover (Compost And Incinerate)

Solid waste can be converted into resources such as electricity and compost through thermal and biological means. Burning plastics in a large furnace or in the open is bad for the environment. Open burning releases toxic pollutants into the air and soil, which are harmful to our health, animals and the environment. Burning plastics at high temperatures in incinerators and trapping the gases and collecting the toxic ash is widely used to produce energy. This is often seen as a positive way to deal with plastic waste. However, burning plastics releases super toxic gases, and the remaining ash contains toxic chemicals and heavy metals. Burning of plastics is not a good solution, as we end up wasting non-renewable resources and produce super toxic chemicals that are difficult to store or dispose safely.

Compost your organic waste

Open burning and incineration

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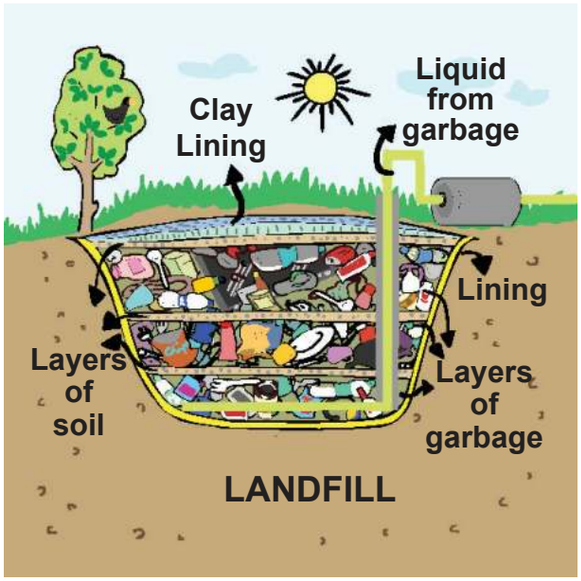
Landfill

Plastic waste often ends up in landfills that are huge holes where waste is buried to keep it separate from the environment. This is the most common way for plastics to be disposed of around the world. Plastics make up 7-13% of waste that is sent to landfills on a global scale. Plastics in landfills can still lead to pollution of the air, soil and groundwater. Over time landfills can degrade, and the toxic chemicals in certain plastics can leak out into the environment.



3.4.7. Biodegradable plastics

The concept of biodegradable plastics or bio-plastics was first introduced in the 1980s. Based on the nature of degradation, there are two main types of plastics: degradable plastic and compostable plastic.

Degradable plastics are made from petroleum oil or gas which is the same as conventional plastics. The difference is that they have a chemical or additive added to them to make them breakdown faster than conventional plastics when they are exposed to sunlight, oxygen or water. What do you think will happen to degradable plastics? Degradable plastics breakdown into tiny pieces called microplastics and these stay in our environment for a very long time. It is very important to understand that degradable plastics do not breakdown completely in the environment! Scientists have found that microplastics in the ocean are really bad and it is likely that these tiny pieces in the soil are also harmful.

Compostable plastics are derived from renewable resources such as corn, sugar cane,

DO YOU KNOW?

A recipe for PLA a compostable plastic!

What you need

i) 1 tablespoon of corn starch
ii) 1 teaspoon of vegetable glycerin (available at the pharmacy)
iii) 1 teaspoon of vinegar (5% acidity)
iv) 4 Tablespoons of water.
v) Cooking spoon
vi) Cooking pot
vii) Stove
viii) Aluminium foil

Method

Mix the water with the starch in a cooking pot. Add the vinegar and the glycerin. Mix all the ingredients on medium heat. Make sure you continuously stir. The mixture should turn from liquid white into a clear gel. When it begins to bubble, then it is ready and should be taken off the stove.

Spread the gel onto the aluminium foil. Let it cool down for one hour. You can then shape the material to form a cup or bowl. Let the article you made cool for another 24 hours before you try and use it.

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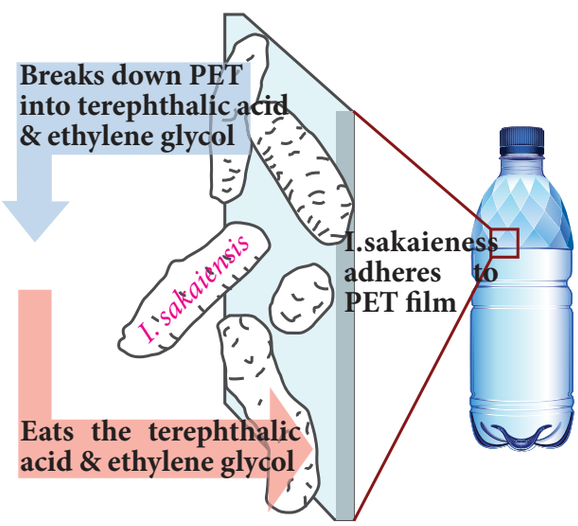
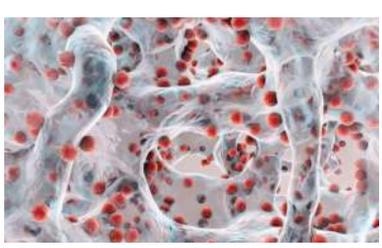
avocado seeds or shrimp shells. Compostable plastics can be broken down completely by microbes and turned back into food for plants- carbon dioxide, methane, water and other natural compounds.

3.4.8. Plastic Eating Bacteria

In 2016, scientists from Japan tested different bacteria from a bottle recycling plant and found that Ideonellasakaiens is 201-F6 could digest the plastic used to make single-use drinks bottles that are made of polyethylene terephthalate (PET). The bacteria works by secreting an enzyme known as 'PETase', that breaks down plastic into smaller molecules. These smaller molecules are then absorbed by the bacteria as a food source. The working of the enzyme is diagrammatically shown below:





Although the discovery of the bacteria breaking down plastics is seen as a potential solution to the plastic pollution – it is still very complex! A big issue is the scale of the plastic pollution problem. We consume and produce such large quantities of plastics and this is only increasing. The scale of the bacteria breaking down plastics is much slower and will therefore not solve the crisis we are facing.

Another limitation is that it is restricted to PET resin code #1 plastics, which currently is one of the most recyclable plastics world wide. It will not be a feasible solution to the issue of the large quantities of non-recyclable low-grade plastics which are polluting the environment. That is why it cannot be the solution to plastic pollution on its own!

3.5. Glass – Types And Uses

Glass can be found wherever we look; a glass window or glass mirror or glass light bulb. Glass is one of the world's oldest and most versatile human created materials. Glass is the only material that can be recycled over and over again without losing its quality. Glass is bit of a riddle. It is hard enough to protect as, but it shatters with incredible ease. It is made from opaque sand, yet, it is completely transparent. Most surprisingly, it behaves like a solid material, but it is also a sort of weird liquid in disguise!

Glass is prepared by heating (SiO_2) silicon-di-oxide until it melts, say to about 1700°C and Sodium Carbonate is added to it. Then it is cooled down really fast. When SiO_2 silicon-di-oxide melts, the silicon and oxygen atoms break out of their crystal structure. If we cooled it slowly, the atoms would slowly line up back into their crystalline arrangement. But if we cool the liquid fast enough, the atoms of the silica will be halted in their tracks, they won't

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have time to line up, and they will be stuck in any old arrangement, with no order to the arrangement of the atoms. We call materials like this as amorphous. At this stage, glass is linear in arrangement inorganic in nature and has a structure very similar to glass and they are considered as polymers.

In a commercial glass plant, sand is mixed with waste glass (obtained from recycling collections), soda ash (sodium carbonate) and limestone (calcium carbonate) and heated in a furnace. The soda ash reduces the sand's melting point and produces a kind of glass that would dissolve in water. The limestone is added to stop that happening. The end product is called soda-lime-silica glass. It is the ordinary glass we mostly use in our daily life.

Usually, other chemicals are added to change the appearance or properties of the finished glass. For example, iron and chromium based chemicals are added to the molten sand to make green-tinted glass.

Oven-proof borosilicate glass (widely sold under the trademark PYREX) is made by adding boron oxide to the molten mixture.

Adding lead oxide makes from a sandwich or laminate of multiple layers of glass and plastic bonded together.

Bulletproof glass is made a formed by compressing different layers of glass and plastic one after another.

Toughened glass used in car winds hields is made by cooling molten glass very quickly to make it much harder.

When silver iodide is added to molten glass the glass obtained becomes dark glasses when exposed to sunlight or any other light. These glasses are used in the production of lenses for eyes and spectacles

Points to Remember

- Fibres are long strands of molecules interwoven to form linear, string-like structures that can be woven, knitted, matted or bonded.
- Fibres can be natural or synthetic.
- Our increasing consumption and production of waste has negative impacts on humans, animals and the environment.
- Nylon is a synthetic fibre made from petrochemicals oil and gas.
- Polycot is a mixture of polyester and cotton, Polywool is a mixture of polyester and wool.
- Synthetic fibres melt on burning while cotton fibres catch fire on burning.
- Polymers are very long chains made of repeating smaller molecules called monomers that are joined together with different types of bonds.
- Plastics that get deformed easily on heating and can be bent are known as thermoplastics.
- Plastics that do not get deformed easily on heating and cannot be bent are known as thermosetting plastics.
- There are many different types of plastics. Some of which are safe or unsafe for us. We can find out what type of plastic an item is by identifying the resin code or acronym found on it.
- Poly Lactic Acid or polylactide is a biodegradable and bioactive thermoplastic.
- The management of plastics can be considered by the 5R Principle – **Refuse, Reduce, Reuse, Recycle** and `**Recover** as well as to **Landfill**.
- Ideonellasakaiensis 201-F6 is a bacteria discovered by scientists that digests plastic resin code #1 PET used to make single-use drinks bottles.

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EVALUATION

I. Choose the correct answers

1. The first man-made fibre is _____
   a) Nylon b) Polyester
   c) Rayon d) Cotton
2. Which of the following is the strongest? _____
   a) Rayon b) Nylon
   c) Acrylic d) Polyester
3. When you place a natural fibre in a flame it_____
   a) melts b) burns
   c) gets nothing d) explodes
4. A synthetic fibre which has similar properties to wool is _____
   a)Nylon b) Polyester
   c) Acrylic d) PVC
5. A good application of plastic is the use of _____
   a) Blood bags b) Plastic cutlery
   c) Plastic straws d) Plastic carry bag
6. _____ is a non-biodegradable material
   a)Paper b) A plastic bottle
   c) Cotton cloth d) Wool
7. PET is the acronym for _____
   a) Polyester
   b) Polyester and terylene
   c) Polyethylene terephthalate
   d) Polyetheneterylene

II. Fill in The Blanks

1. _____ is an example of polyester fabric.
2. _____ are used to identify different types of plastics.
3. A_____ is a long chain made up of many repeated small units called monomers.
4. A natural fibre is called _____
5. A natural fibre obtained by boiling cocoons is called_____

III. True or False

1. A lot of plastic pollutes our environment.
2. Refuse (avoid) is the best way to manage plastic.
3. It is good to wear clothes made of synthetic fibres while cooking.
4. Degradable plastics break down into tiny pieces called microplastics.
5. Cotton is a natural polymer.

IV. Match the Following

A	B
Nylon	Thermoplastic
PVC	Thermosetting plastic
Bakelite	Fibre
Teflon	Wood pulp
Rayon	Non-stick cookwares

V. Arrange in Correct Sequence

1. Mix water, starch, vinegar and glycerin in a cooking pot.
2. Let the article cool for 24 hours before we use it.
3. Shape material to form a cup or bowl.
4. Continuously mix on medium heat until the liquid turns clear.

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5. When the liquid begins to bubble it is ready to be taken off the stove.

6. Spread the gel onto aluminium foil and cool.

VI. Analogy

1. Cotton: natural : Polyester: _____

2. PLA spoon : compostable : Plastic spoon : _____

3. Nylon :melts on heating : Silk:_____

VII. Assertion and Reason

1. A: Vegetable peels buried in the soil disappear within two weeks.
   R: Vegetable peels are compostable.

2. A: It takes a very long time for nylon clothes to breakdown into microfibers but cotton clothes need only six months to decompose.
   R: Nylon made out of petrochemicals is non-biodegradable and cotton cloth is biodegradable.

3. A: It is good to avoid plastics.
   R: Plastics end up polluting the environment.

VIII. Crossword

Across

1. Fibre that is used as synthetic wool.
2. A plastic used for making water bottles.
3. A long chain made of small repeatingmonomers.
4. Another name for this semi-synthetic fibre is artificial silk.

Down

5. A type of fibre that is naturally obtained from a cocoon.
6. A synthetic fibre classified as polyester.
7. A polymer used for making rope.

					5					
1	C			L	I					
		2 P				6		E		E
3	O					R				
				4	A			7 N		
								O		

IX. Very Short Answer

1. What is the chemical name of the polymers that make up cotton?
2. What gives plastic different qualities and characteristics?
3. It is not advisable to burn plastic and synthetic fabrics. Why?
4. A bucket made of plastic does not rust like a bucket made of iron. Why?
5. Why is it better to avoid the use of plastic products?
6. Give two examples of thermosetting plastics.
7. What is the 5 R principle?

X. Short Answer

1. What does the term biodegradable mean?
2. What kind of fabric is suitable to dress-up and play in the summer?
3. How do plastics impact animals and the environment?

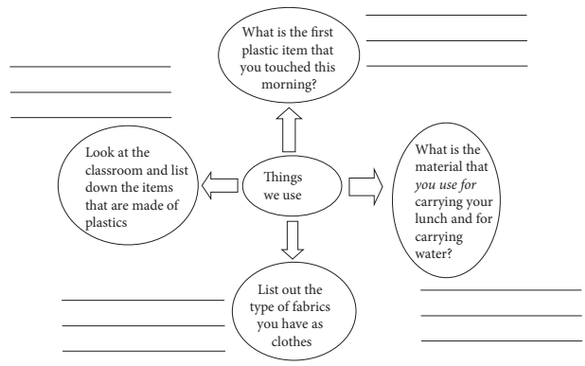
XI. Long Answer

1. List the advantages and disadvantages of synthetic fibres.
2. Suggest safe methods of disposing plastics.

XII. HOTS

1. The Tamil Nadu Government has banned the use of one-time use throwaway plastics. Why do you think this is important?
2. A plastic bag dumped in the soil stays without breaking down for 500 years. If a new generation starts in every 30 years, how many generations would it take to see the plastic bag finally broken down?

XIII. i) Fill in the blanks



ii) Look at the following picture and explain what is happening.

iii) Read the following information and convert them into a graph to compare the countries and the amount of plastic they use.

China contributes the highest share - that is around 28%, of the total plastic used globally. Indonesia uses 10%, both the Philippines and Vietnam use 6% each; Thailand uses 3.2%, Egypt 3%, Nigeria 2.7% and South Africa 2%.

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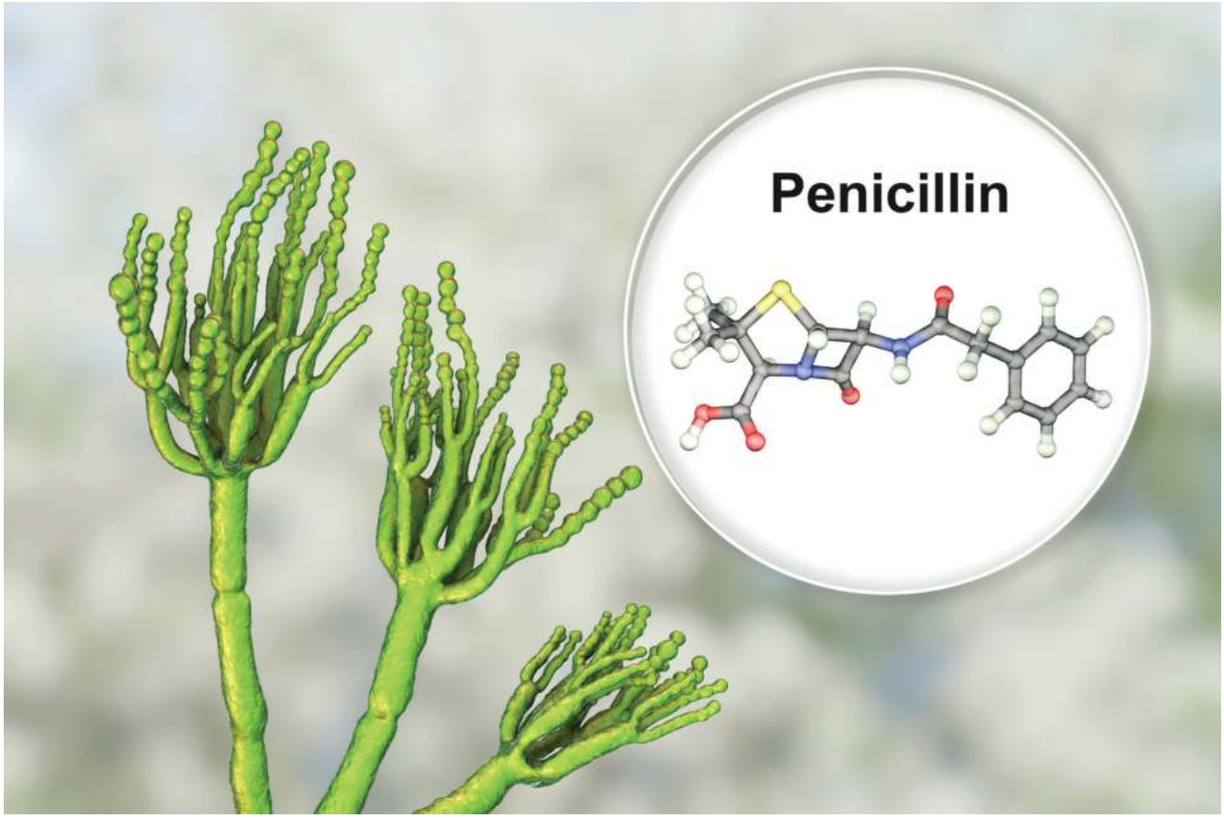
Unit 4

Chemistry in Daily Life



Learning Objectives

- Understand the meaning of Medicines, Antibiotics, Analgesics, Antiseptics, Antihistamines, Antacids and Oral Rehydration Solution (ORS).
- Understands combustion and its types
- Recognizes flame and its structure.

TMX1C

Introduction

During the Bangladesh liberation war, Therapy with Oral Rehydration Solution (ORS) in 1971 reduced cholera death rates from 50% to 3% among thousands of refugees. An Indian doctor, Dilip Mahalanabis, had to manage the shortage of saline bottles and coup up with the dehydration faced by the refugees.

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Dr. Dilip Mahalanabis showed the efficacy of ORS in cholera cases among Bangladeshi refugees (1971-72). Further field trial during the cholera epidemic in Manipur attested to its efficacy, ORS has since saved the lives of millions of children around the world.

Look at the above information. What do you infer from this? Now you get the curiosity to know about ORS and its function. Don't you? In addition to this, let us know about some of the common medicines and how do they work.

In the normal healthy intestine, there is a continuous exchange of water through the intestinal wall. Up to 20 liters of water is secreted and very nearly as much is reabsorbed every 24 hours. This mechanism allows the absorption of soluble metabolites into the bloodstream from digested food. However when a person becomes sick, due to diarrhea, water is expelled and the body is not able to retain the liquid balance. This is called as 'dehydration'. It is not the diarrhea that kills, but the dehydration' resulting from the infection that kills. If more than 10% of the body's fluid is lost death occurs.

DO YOU KNOW?

UNICEF/WHO norms the O.R.S should be prepared as follows

S.No.	New ORS	gram/Litre	%	New ORS	mmol/litre
	Sodium chloride	2.6	12.683	Sodium	75
	Glucose, (anhydrous)	13.5	65.854	Chloride	65
	Potassium chloride	1.5	7.317	Glucose, anhydrous	75
	Trisodium citrate, (dehydrate)	2.9	14.146	Potassium	20
				Citrate	10
	Total	20.5	100.00	Total Osmolarity	245

4. 1 Oral Rehydration Solution (ORS)

ORS (Oral Rehydration Solution) is a special combination of dry salt and sugar that is mixed with safe water. It can help to replace the fluids lost due to diarrhea, vomiting and sweat. In a state of diarrheal disease there is imbalance and much more water is secreted than reabsorbed causing a net loss to the body which can be as high as several liters a day. In addition to water loss, sodium and potassium are also lost.

Certain concentration of sodium (Na) is needed for proper functioning of the body. For example, only with adequate sodium concentration in the intestinal wall, water can be absorbed by it through a process known as osmosis. If there is inadequate salt in the intestinal wall the body will not be able to absorb water.

The saline bottle directly transfers water and sodium into the blood stream. However, for the saline water is administered through mouth, intestinal wall, is a not able to absorb neither water nor sodium. Dr. Dilip Mahalanabis found that if glucose (sugar) is added to the salt solution, then all the three- water, sodium and glucose are absorbed by the body.

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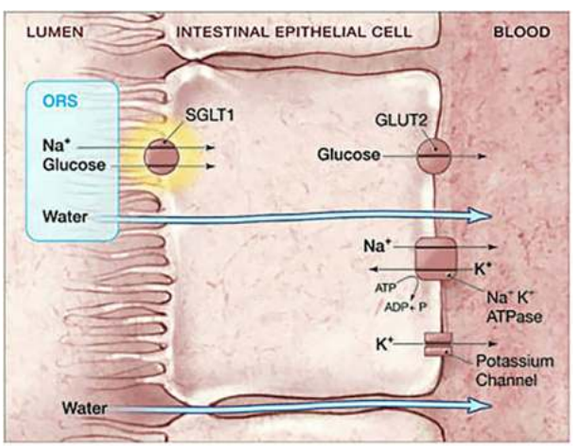
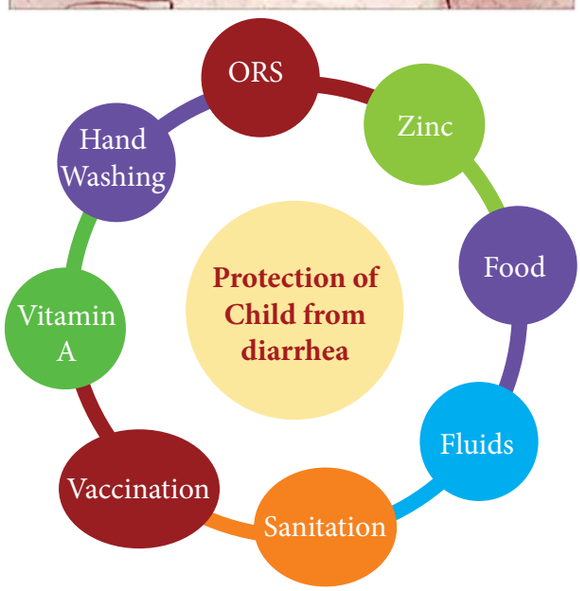
During diarrhea the intestine is still able to absorb glucose molecules. Thus, the ORS solution uses the glucose molecules to enable the sodium to be is carried through by a co-transport coupling mechanism. ORS is an effective treatment for 90 – 95% of patients suffering from diarrhea, regardless of the cause. As the water is replaced balance is attained saving the patience in most cases.

Let us see homely made of ORS, be very careful to mix 6 level teaspoons of sugar and 1/2 level teaspoon of salt dissolved in 1 litre of clean water. Too much sugar can make diarrhea worse. Too much salt can be extremely harmful to the child. Making the mixture a little too diluted (with more than 1 litre of clean water) is not harmful.





Through the process of osmosis, the salts and sugars pull water into your bloodstream and speed up rehydration.

4. 2 Antacid

Acidity is a set of symptoms caused by excess production of acid by the gastric glands of the stomach. Your stomach naturally produces gastric juices or hydrochloric acid (HCl) to help digestion and break down food. Acidity issues arise when there is excess production of this acid due to triggers such as acidic foods, spicy food, alcohol, dehydration and stress. When acidity occurs, the excess acid may move up from your stomach to your esophagus.

The lining of your stomach with a pH of 1 to 3 is designed as such to withstand a high acidic environment.

When we have acidity or heartburn, we are administered with a class of medicines known as antacids. They are actually weak bases. As learned in chemistry, when a base is mixed with an acid a neutralization reaction occurs. When antacids are consumed, it creates a chemical reaction in the stomach lowering the acidity and makes the digestive acids less corrosive and damaging.

Most of the common antacids are Sodium Bicarbonate Calcium Carbonate, Magnesium Hydroxide, Magnesium Carbonate and Aluminium Hydroxide.

The chemical reaction created when Magnesium Hydroxide neutralizes HCI in the stomach and intestine.

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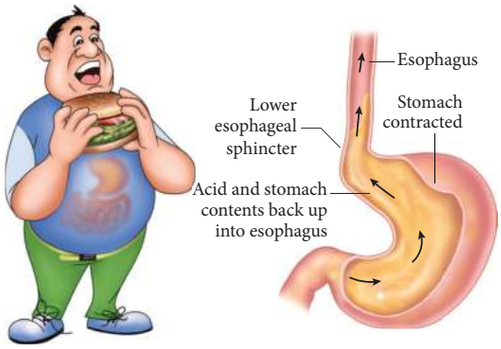
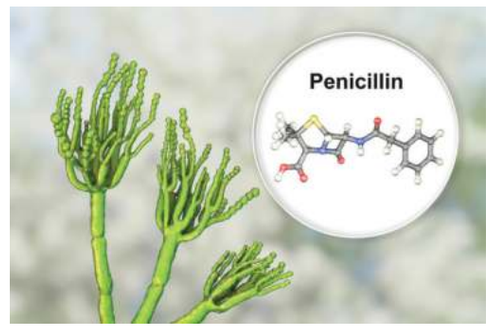


4. 3 Antibiotics

Ages ago, there was a time where even a small infected wound can cause death in human beings. The discovery of antibiotics changed all. Now armed with antibiotics, many deadly infectious diseases can be tackled, which once meant to cause serious illness and death.

The discovery of antibiotics was an accident, which happened in 1928 while a British bacteriologist, Dr. Alexander Fleming was involved in research on staphylococcus bacteria. This bacterium was meant to cause deadly diseases such as pneumonia, sour throat, etc. The discovery happened while he was culturing the bacteria on a nutrient agar media in a Petri dish. He went on a holiday carelessly leaving the dish in his laboratory table without cleaning and sterilization.

After several days, when he returned back, he observed the growth of mould (kind of common fungus, which grows on stale bread/ cheese) on a part of the Petri dish. He also observed that there was no bacterial growth surrounding the mould, which indicated that something in the mould had prevented the growth of bacteria in the culture medium. On further research, Fleming identified that the "mould juice" was capable of killing a wide variety of harmful bacteria, such as streptococcus, meningococcus and diphtheria bacillus.



And that was how the world's first antibiotic – penicillin – was discovered. Fleming named the mould penicillum notatum, from which the antibiotic penicillin was isolated. However, Fleming was not the first using moulds and other living micro organisms to treat infections. Thousands of years ago, the ancient Egyptians, had used mouldy bread to treat infected wounds. Similar practices were observed among ancient Greeks, Serbians and even among Indians. While these were perhaps partially effective, their efficacy is nowhere near the modern antibiotics.

Naturally, many micro organisms and plants synthesize chemicals which are toxic in nature to protect them from invading organisms. The biosynthesized chemicals isolated from the plants/micro organisms and used as medicines against infectious diseases. These substances were called as antibiotics. Ex: Chloramphenicols, tetracyclines, Penicillin derivatives, cephalosporin's and their derivatives. Today, many infectious diseases in the world are rare due to the advancement in antibiotic research.

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DO YOU KNOW?

Antibiotics don't work for viruses like cold and the flu.

However, the over use of antibiotics makes it inactive or less effective. Antibiotic resistance is defined as the ability of the microorganisms to resist the effects of an antibiotic to which they were once sensitive. Thus the antibiotics become less effective and we are forced to either consume a larger dose or shifting towards the use of other virulent variants of antibiotics. Thus the research on antibiotics is of great importance to combat the virulent and mutated microorganisms.

4.4 Analgesics:

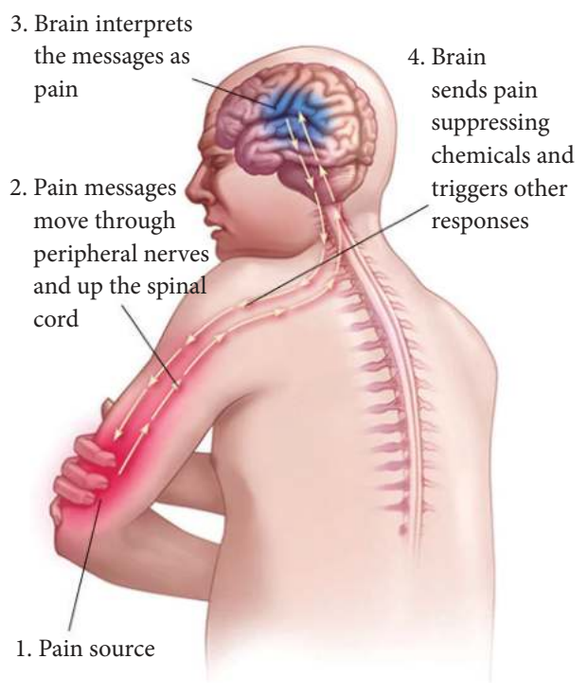
Injury, burn, pressure from sharp objects and other conditions cause pain in our body. The unpleasant feeling may be a burning sensation in the tissue around the injury, throbbing headache or ache of arthritis. Back pain, neck pain, joint pain, headaches, pain from nerve damage, pain from an injury and pain related to diseases are some of the most common pains.

The unpleasant emotion of 'pain' is created in the brain and not at the spot of the injury. If the pain is severe, say from burn, the impulse sent to brain trigger immediate response. Reacting to the signal from the brain, muscle pull our hand from the fire.

Reacting to the message received from the pain spot, the brain sends back messages that initiate healing process. It can trigger to release pain suppressing chemical and additional flow of additional white blood cells and platelets to help repair tissue at an injury site.

Analgesics or pain killers are the pain-suppressing chemicals released by the body. They suppress the feeling of 'pain'. This analgesics drug selectively relieves pain by acting either in CNS (Central Nerves System) or on peripheral pain mechanism, without significantly altering consciousness.

When we are affected by fever, often we are administered Paracetamol. Paracetamol interact with the receptors and reduce the intensity of pain signals to the brain, also suppresses the release of substances, called prostaglandins that increase pain and body temperature.



DO YOU KNOW?

Anesthetics

The first local anesthetic was cocaine was isolated from coca leaves by Albert Niemannin Germany, 1860.

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Traditional anti inflammatory agents

Peppermint

Catnip

These are classified as follows,

i) Non – narcotic (Non – additive) analgesics Eg. Aspirin

ii) Narcotic drugs. E.g. codeine

4.5 . Antipyretic:

In normal course our body temperature is ranges from 98.4 to 98.6 degrees Fahrenheit. When the temperature goes above this level it is called fever. Most common cause of fever is infection. Bacteria and virus cannot thrive above a certain temperature. To defend the invading virus and bacteria the immunity system increases the body temperature.

Once infection is sensed, the immune system releases a chemical called pyrogen. These pyrogens released into bloodstream reaches the hypothalamus, present at the basal part of the brain. The function of Hypothalamus is to control the body temperature. Sensing the pyrogens, hypothalamus increases the body temperature by releasing a chemical called prostaglandin.

Normally little fever is good as it helps to arrest the growth of infection. However if the internal body temperature exceeds 105°F, this may cause damage to our body protein and the brain may experience seizures and delirium. The prolonged high fever may also cause death.

Antipyretics (anti - against and pyretic -Feverish) are chemical substances that reduce fever. They suppress the release of prostaglandin and reduce fever. The most common and well known anti pyretic is paracetamol. Other antipyretics and anti inflammatory agents include Aspirin, Ibuprofen, Diclofenac.

4.6 Antiseptic

Antiseptics are substances applied to the exterior of a body that kill or inhibit microbes and infective agents. Antiseptics can be effective against one or a combination of bacteria, fungi, viruses or other microorganisms.

DO YOU KNOW?

1. Dettol
Mixture of chloroxylenol and terpincol

2. Tincture
Iodine + 2 to 3% alcohol – Water mixture

Soap, Iodoform, phenolic solutions, ethanol, Boric acid are examples.

Natural antiseptics

1. Garlic 2. Turmeric 3. Aloevera

4. Onion 5. Radish

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Difference between Antiseptic and Disinfectants	
Antiseptic	**Disinfectants**
1. All antiseptic are disinfectants.	All disinfectants are not antiseptic .
2. It can be applied on the live tissues.	It can be applied on inanimate object.
For example. Skin / Mucous.	For example. Surface, lab working tables, floor.

4.7 Antihistamine

Anti histamines are defined as drugs that combat the histamine in the body that are used for treating allergic reactions and cold symptoms. Histamine is a chemical messenger involved in number of complex biological reactions. When a foreign body such as pollens enters the body, the immune system believes those substances to be harmful and generates the release of histamine. When histamine is released, it will interact with the histamine receptors on the cell surface or within a target cell and cause changes in the bodily functions. This stimulates many smooth muscles to contract, such as gastrointestinal tract and bronchi. In certain smooth muscles, they cause relaxation of blood capillaries which increase the flow of lymph and its protein content and lead to the formation of edema (redness and rashes).

Antihistamines or histamine receptor antagonists oppose selectively all the pharmacological effects of histamines. For, Ex. Diphenhydramine, chlorpheniramine, cimetidine. The adverse effects of antihistaminics are mouth dryness and sleepiness.

Medicine:

Medicines are used to treat the disease and to improve our health.

"Diagnose the disease and understand its seeds; Identify the cause and make sure it succeeds".

Medicine is the science or practice of the diagnosis, treatment, and prevention of disease. There are many ways to intake the medicine.

1. Oral use
2. External use
3. Injections (Intra muscular/Intra venous)

The medicines we take treat our disease and lead us to a good health.

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Combustion

Can you guess what is common in rusting of iron, burning coal and the flame of candle? They all undergo a chemical reaction known as combustion. Combustion is a chemical reaction that occurs in the presence of a fuel and an oxidizing agent that produces energy, usually in the form of heat and light.

PVKT8

What we call as 'burning' is really a combustion reaction. In fact combustion is one of the first chemical reactions intentionally harnessed by humans. Any reaction that involves reaction with oxygen is called oxidation reaction. In the combustion of hydrocarbon with oxygen, typically carbon dioxide and water are produced.

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ + Heat energy

Hydrocarbon + Oxygen → Carbondioxide + Water

All combustion reactions are exothermic; that is they release heat.

Ignition Temperature:

The minimum temperature at which a substance catches fire and burns is called its ignition temperature.

A substance will not catch fire and burn if its temperature is lower than its ignition temperature. Different substances have different ignition temperatures.

Substances which have very low ignition temperature and can easily catch fire with a flame are called inflammable substances. E.g. Petrol. Alcohol, LPG (Liquefied Petroleum Gas), CNG (Compressed Natural Gas), etc.

Flame

Flame is actually a chemical reaction. To be specific, the flame is a mixture of gases (vaporized fuel, oxygen, carbon dioxide, carbon monoxide, water vapor, and many volatile materials) and so is matter. The light and heat produced by the flame is energy, not matter. But fire is a matter.

Flame and its structure

Fact

Chemical Reaction in Ignition

Oxygen + Heat + Fuel → Fire

Which is the festival of light? What is the speciality of that festival? Yes. We will light more lamps to decorate the houses. Won't we? Now how do the lights glow? Yes, with flame.

Here is an experiment with colorful flame

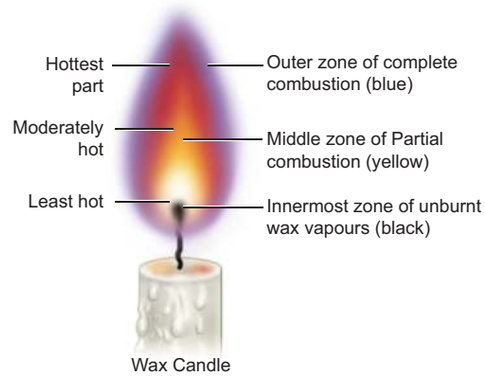
- White flame – Epsom salt ($MgSO_4$)
- Violet flame – Lithium Chloride
- Indigo flame – Potassium Chloride
- Blue flame – Bleaching powder
- Green flame – Borax powder
- Yellow flame – Calcium chloride
- Orange flame – Table salt
- Red – Strontium chloride

Teacher shows the experiment with these salts soaked in alcohol and makes fire.

Flame:

Flame is a zone of combustions of a combustible substance. Substances which vaporize during burning produce flames. E.g. Wax, Kerosene etc.

Substances which do not vaporize during burning do not produce flames e.g. coal.



Structure of a Candle flame

A candle flame has three main zones, they are

i. The outer zone – complete combustion of the fuel takes place and the colour of the flame is blue and is the hottest part of the flame. It is the non-luminous part of the flame.

ii. The middle zone -partial combustions of the fuel takes place and the colour of the flame is yellow and is moderately hot part of the flame. It is the luminous part of the flame.

iii. The inner zone: There are unburnt vapours of the fuel and the colour is black and is least hot part.

Finger inside the flame

Why is the candle flame straight?

DO YOU KNOW?

A candle flame is caused by vapour burning above the candle. This burning vapour is hotter than the surrounding air and is therefore less dense. So, by the principle of convection, it "rises" so the flame is always upwards

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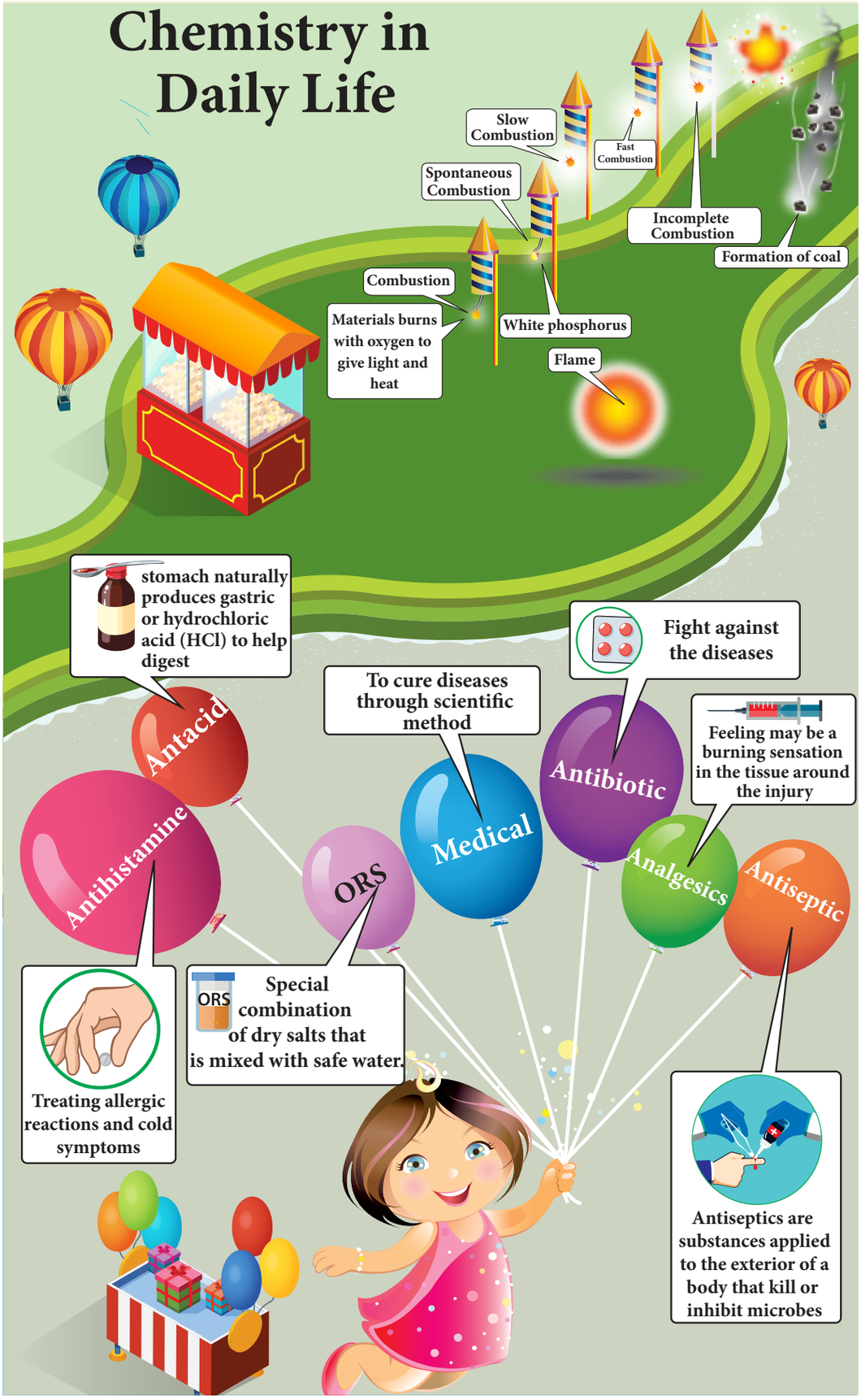

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Calorific value of different fuels

Fuel	Calorific Value (kJ / kg)
Cow dung cake	6000-8000
Wood	17000-22000
Coal	25000-33000
Petrol	45000
Kerosene	45000
Diesel	450000
Methane	500000
CNG	50000
LPG	55000
Biogas	35000-40000
Hydrogen	150000

The amount of heat energy produced on complete combustion of 1kg of fuel is called its calorific value. The calorific value of a fuel is expressed in a unit called kilo joule per kg (kJ/kg)

Calorific value = Heat produced / Amount of fuel used for burning in kJ/kg

If 4.5 kg of fuel is completely burnt and the amount of heat produced stands measured at 1, 80,000 kJ what is its calorific value.

Calorific value = 1, 80,000 / 4.5 = 40,000 kJ/Kg

Types of combustion

There are three main types of combustion. They are,

Rapid combustion: It is a combustion process in which a substance burns rapidly and produces heat and light with the help of external heat. E.g. Burning of LPG.

Spontaneous combustion: It is a process in which a substance bur without the help of external heat. Eg. Phosphorus burns spontaneously at room temperature.

Explosion: It is a type of combustion in which a substance burns suddenly and produces heat, light and sound with the help of heat or pressure. Eg. Explosion of crackers.

More Environmental Impacts

CO- Leads to respiratory problem

CO_2- Global warming

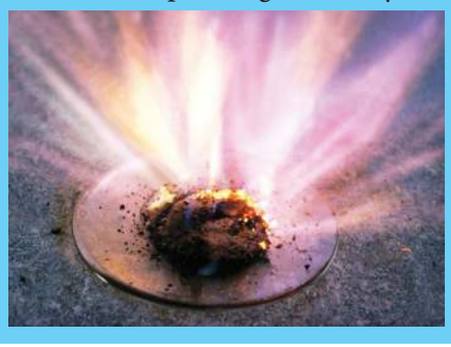
SO_2/NO_2 – Acid Rain

Remedies

ACTIVITY

What happens when you add with these chemicals?

Sugar+Potassium permanganate+ Glycerin.



Characteristics of good fuel

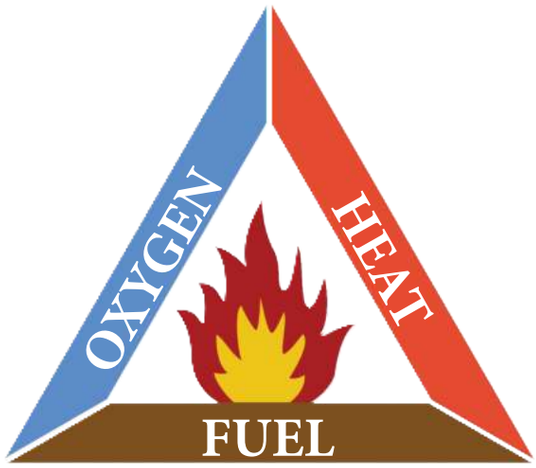
- Readily available
- Cheap
- Easy transport and store
- Burns at moderate rate
- Produce large amount of heat
- Do not leave behind any undesirable substances.
- Does not cause pollution.

Slow combustion:

Slow combustion is a form of combustion which takes place at low temperatures. Respiration is an example of slow combustion.

Fire control:

The Fire Triangle



Experiment: QR code videos
Make your own fire extinguisher

The conditions necessary for producing fire are,

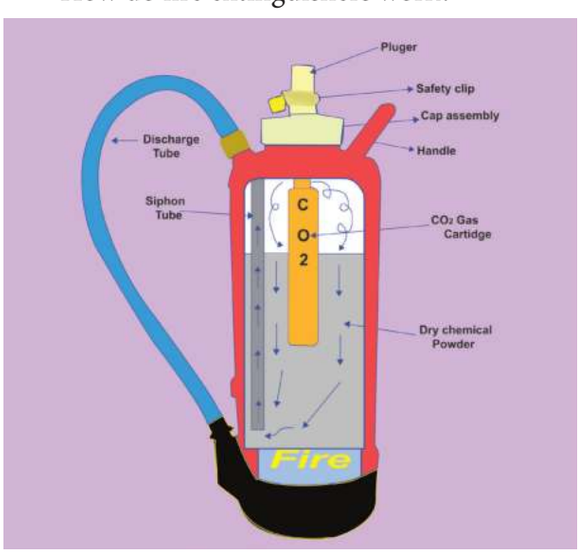
- Fuel
- Air (to supply oxygen)
- Heat (to raise the temperature of
- the fuel beyond its ignition temperature)

Fire can be controlled by removing any one or more of these conditions.

Fire extinguisher:

A fire extinguisher cut off the supply of Air or bring down the temperature of the fuel or both and controls the fire.

How do fire extinguishers work?



Portable fire extinguishers apply an extinguishing agent that will either cool burning fuel, displace or remove oxygen, or stop the chemical reaction so fire cannot continue to burn. When the candle of an extinguisher is compressed, it opens and inner canister of high pressure gases forces the extinguishing agent from the main cylinder through a siphon tube and out the nozzle. A fire extinguisher works much like a can of hair spray.

Types of fire extinguisher:

The most common types of fire extinguishers are,

- Air pressurized water extinguishers,
- Carbon-di-oxide extinguishers.
- Dry chemical powder extinguishers.

The different types of extinguisher tackle different types of fire

Type	Class A Combustible materials (e.g. paper & wood)	Class B Flammable Liquids (e.g. paint & petrol)	Class C Flammable Gases (e.g. butane & methane)	Class D Flammable metals (e.g. lithium & potassium)	Electrical Electrical Equipment (e.g. computer & generators)	Class F Deep fat fryers (e.g. chip pans)	Comments
Water	✓	✗	✗	✗	✗	✗	Do not use on liquid or electric fires
Foam	✓	✓	✗	✗	✗	✗	Not suited to domestic use
Dry powder	✓	✓	✓	✓	✓	✗	Can be used safely up to 1000 volts
CO_2	✗	✓	✗	✗	✓	✗	Safe on both high and low voltage
Wet chemical	✓	✗	✗	✗	✗	✓	Use on extremely high tempertures

Fire extinguishers can be broadly classified into five types:

1. Water, 2.Foam, 3.Dry Powder, 4.CO_2, 5.Wet Chemical.

The classes of fire

There are five classes of fire: Class A, Class B, Class C, Class D, and Class E.

Class A fires	–	**Combustible materials:** caused by flammable solids, such as wood, paper, and fabric.
Class B fires	–	**Flammable liquids:** such as petrol, turpentine or paint.
Class C fires	–	**Flammable gases:** like hydrogen, butane or methane.
Class D fires	–	**Combustible metals:** chemicals such as magnesium, aluminum or potassium.
Class E fires	–	Typically a chip-pan fire.
Electrical fires	–	**Electrical equipment:** once the electrical item is removed, the fire changes class.

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Points to remember

- Oral Rehydration Solution (ORS) is a mixture of electrolytes, sugar, and water taken by mouth to absorb water and electrolytes in the body and properly restore the electrolyte and find balance lost by excessive sweating, vomiting or diarrhea,
- ORS is an effective treatment for 90 – 95% of patients suffering from diarrhea, regardless of the cause.
- Antacid is one that neutralize stomach acid
- Medications, drugs, substances used to treat and cure diseases, and to promote health.
- Some micro organisms and plants produce their own toxic substances. These substances those help to destroy other living things are called as antibiotics.
- The chemical process in which a substance reacts with oxygen to produce heat is called combustion
- Flame is a zone of combustion of a combustible substance. Substances which vapourise during burning produce flames. E.g. Wax, Kerosene.
- The minimum temperature at which a substance catches fire and burns is called its ignition temperature.
- The amount of heat energy produced on complete combustions of 1kg of fuel is called its calorific value.
- A fire extinguisher cut off the supply of air or bring down the temperature of the fuel or both and controls the fire.

EVALUATION

DXQ9B

I Choose the correct answers

1. A drug effective in the treatment of pneumonia, and bronchitis, is _____

   a. Streptomycin b. Chloramphenicol

   c. Penicillin d. Sulphaguanidine

2. Aspirin is _____

   a. Antibiotic b. Antipyretic

   c. Sedative d. Psychedelic

3. _____ are that neutralize stomach acid.

   a. Antacid b. Antipyretic

   c. Analgesic d. Antihistanics

4. The lowest temperature at which a substance catch the fire is called its _____

   a. Boiling point

   b. Melting point

   c. Critical temperature

   d. Ignition temperature.

5. Which is the hottest part in the flame of candle _____

   a. Blue b. Yellow

   c. Black c. Way part

II. Fill in the blanks.

1. Penicillin was first discovered by _____
2. World ORS Day is _____
3. Combustion is a chemical reaction in which and substance react with _____
4. In the presence of water, the ignition temperature of paper is _____

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5. Fire produced by oil cannot be controlled by _____

III True or False – If False give the correct answer

1. Antibiotics does work for viruses like cold and flu.
2. Analgesics are the substances that lower the temperature during fever.
3. All fuels form flame.
4. Oxygen is necessary for combustion
5. Burning wood and coal causes pollution of air.

IV Match the following

1.	Antipyretic	-	reduce pain
2.	Analgesic	-	reduce body temperature
3.	Antacid	-	spontaneous combustion
4.	Phosphorus	-	ORS Solution
5.	Carbon – di – oxide	-	leads to respiratory problem.

V Analogy

1. Inner zone of flame : :----------, outer zone of flame : :----------
2. Tincture: :----------, histamine : :----------.

VI Very short answer

1. First viral disease detected in human being was :---------- (Yellow fever / dengue fever)
2. :----------, :---------- , :---------- are called green house gases.
3. Name a substance which can be used as an antiseptic as well as disinfectant?
4. What are the main constituents of Dettol?
5. Name the unit in which the calorific value of a fuel is expressed?
6. How many types of combustion are there?
7. What are the essential requirements for producing fire?

VII Short Answer Questions

1. Why should not medicines be taken without consulting doctors?
2. Why do antiseptics differ from disinfectants? Give one example of each.
3. What is ignition temperature?
4. If 4.5kg of fuel is completely burnt and amount of heat produced stands measured at 1, 80,000 KJ what is the calorific value.

VIII Answer in Detail

1. Explain briefly about antibiotic and analgesic?
2. Make labeled diagram of a candle flame.

IX. Picture based question

Arul and Aakash were doing an experiment in which water was to be heated in a beaker. Arul kept the beaker near the wick in the yellow part of candle flame. Aakash kept the beaker in the outer most part to the flame. Whose water will get heated in a shorter time?

Websites:

http://memorize.com/medical-terminology-prefixes.

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ICT CORNER

CHEMISTRY IN DAILY LIFE

Explore the activity to know about Flame test.

PROCEDURE :

Step 1: Use the URL or scan the QR code to open the activity page.

Step 2: Use the platinum wire to scoop up chemicals, and then put them in the flame to see how each chemical changes the flame's colour.

Step 3: Press the space bar to select the new chemical.

Step 1

Step 2

Step 3

Step 4

Chemistry in daily life URL:

https://scratch.mit.edu/projects/138778000/

*Pictures are indicative only

*If browser requires, allow Flash Player or Java Script to load the page.

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www.tnschoolbooks.in

Unit 5

Animals in Daily Life

Learning Objectives

- To know animals are used as food and for making clothes
- To know how wool and silk is produced
- To understand the hazards of silk and wool industries and learn how to avoid it
- To gain knowledge about AHIMSA (or) Peace silk
- To understand the importance of Animal protection and their maintenance

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Introduction

In earlier class you have studied how plants are used in our daily life. Now you are going to learn how animals are useful in our daily life. Animals are closely associated with human beings in their daily life. They are the greatest gift of nature. They are of great economic importance to our nation. Animals contribute many things for our use, as food, clothing and transportation. Let us learn the importance of animals and how to protect and maintain them.

5.1 Animal Products used as food:-

Milk

Milk is white liquid food produced by the mammary glands of mammals. It is the primary source of nutrition for infant mammals. We use milk in our daily life for the following.

- Milk is the daily essential product which is obtained from animals like cows, buffaloes goats and camels.

ACTIVITY 1

Some of the food items are given below. Find out their ingredients and sources.

S.No	Food Item	Ingredients	Sources
1		Chicken	Animals
		Spices	
		Oil/Ghee	Plants/Animals
		Curry leaves	
		Coriander leaves	
2		Fish	
		Spices	
		Oil/Ghee	
		Lemon	
3		Milk	
		Tea leaf/Coffee nut	
		Water	
		Sugar	
4		Oil/Ghee	
		Sugar	
		Milk	
		Nuts	
		Flavour	
		Honey	
5		Rice	
		Egg	
		Spices	
		Oil	
		Coriander leaves	

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- Milk is necessary in our daily diet to prepare tea, coffee, ice creams, chocolates, sweets and other related products.
- Highly recommended nutritive food containing protein and calcium are made from milk like, Paneer, Cheese, Cream, Butter, Ghee and curd.

Curd

Ghee

Eggs

Eggs are laid by female birds of many different species to produce their young ones like hen, duck, turkey and ostrich. We use these in our daily life for the following.

- They are used in our daily diet to get energy and good health.
- It is highly nutritious and rich in protein.
- Eggs have 6 grams of high-quality protein. A protein packed breakfast helps to sustain mental and physical energy throughout the day. Consuming egg daily is good for any age people.

Eggs

Egg omlet

ACTIVITY 2

Can you distinguish a fresh egg from a rotten one?

1. Take a bowl of water.
2. Put the egg in the bowl.
3. Observe now, the fresh egg will sink. But the rotten egg will float.

DO YOU KNOW?

Honey

Where from honey comes? How it is produced? Have you seen a beehive where many bees are seen buzzing about? Bees collect nectar (sweet juices) from flowers, convert it into honey and store in their honey comb.

- Honey is a sweet liquid produced by honey bees from the nectar of flowers. It is extracted from beehives by us.
- Raw organic wild honey is extracted from selected hives by tribal honey hunters, who collect it from jungles.
- Honey has more medicinal values and highly nutritious food.

Beehive

Honey oozing out

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ACTIVITY 3

Aim : To find out the purity of honey

Materials required : Water and honey.

Procedure : Take a glass of water, add a drop of honey to it. Observe carefully.

Inference : If the drop of honey reaches the bottom without dissolving, then the honey is pure. If the drop of honey dissolves before reaching the bottom then the honey is impure.

DO YOU KNOW?

The worker bees collect the nectar from the flowers. They nourish the young ones and repair the bee hive and also protect it.

Meat

Meat is animal flesh that is eaten as food. Most often it is used to describe skeletal muscle and fat that is found with it. Some people eat the flesh of animals such as chicken, sheep, rabbit, pig, goat, camel, buffalo (beef), fish, crab, prawn, lobster and many more.

- Animal meat is considered as the part of diet by most of the people.
- Meat consumption is considered essential for its nutritive values. Especially chicken breeding is done in large scale in the form of poultry farming for economic purpose.

Poultry Farming

Poultry farming is the process of raising domesticated birds such as chicken, duck, turkey and geese for the purpose of getting meat and egg for food. Poultries are reared in large numbers and chickens being the most common one. Chickens are broadly of two types.

1. Layers (egg laying chickens)
2. Broilers (one's that are reared for meat)

Poultry farming requires safe and sufficient space (wired gages) for the birds. Plenty of water, proper ventilation and regular feed that is rich in proteins, fats and vitamins. Poultry feed is comprised of maize, wheat, millet and rice bran in mashed form and ground nut cakes.

Diseases

Poultry birds suffer from various diseases caused by some microbes. It is important to keep their shelters clean and get the birds vaccinated against common diseases. Some of the common diseases of poultry birds are the following.

Salmonellosis (diarrhoea)		Caused by bacteria
Ranikhat disease, (Fowl pox)		Caused by virus
Aspergilleses		Caused by fungus

Poultry Farm

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5.2 Animal products used as clothing

Animal hair has a great demand. The hair from goat and sheep is used for manufacturing woollen clothes, shawls and blankets, mufflers and socks. Similarly horse hair is used as bristles in small painting brushes. Even fur of animals including the skin is used to make warm and modern style clothes.

Animal Fibres

Some fabric fibres such as cotton, jute, silk are called natural fibres. Cotton and jute are examples of plant fibres. Wool and silk fibres are examples of animal fibres. Wool is obtained from the fleece of sheep or goat. It is also obtained from the hair of rabbit, yak and camel. Silk fibre is obtained from the cocoon of silkworm.

Wool

What type of clothes are being used by people of snow capped region?

Why such kind of clothing is preferred by them?

Wool is the fibre derived from the fur of animals of the Caprinae family principally sheep. The hair of other mammals like goat, yak, alpaca and rabbit may also be called wool. Mostly, wool is produced from the outer coat of sheep. The processing of wool involves five major steps. They are as follows Shearing, Grading (or) Sorting, Washing (or) Scouting, Carding and Spinning.

Sheep

Shearing

Washing

Carding

Spinning

Shearing:- The hair or fur of the sheep is removed from its body. This is called shearing.

Grading (or) Sorting:- The fleece from the same sheep may be different from different parts of the body. It is sorted out into separate piles of similar nature. This is known as Grading (or) Sorting.

Washing (or) Scouting:- The sheared skin is washed thoroughly with soap (or) detergents to remove dirt, dust and grease.

Carding:- The dried wool is carefully removed. These fibres then passed through the rollers which are covered with fine sheet of thin wire teeth. This process arranges the wool into a flat sheet called a web.

Spinning:- The web is drawn into narrow strand and then passed through spinning machines. The spinning machines twist the strands into yarn. The yarn is wound to form balls of wool. This yarn is either weaved into fabric (or) retained for knitting.

Characteristic features of wool

- It is resistant to heat, water, wear and tear.
- It absorbs moisture.
- Wool insulates against cold. So wool is a good insulator.
- It does not wrinkle easily.

Uses of wool

Wool is a multifunctional fibre with a range of diameters that makes it suitable for clothing, household fabrics and technical textiles. Two third of wool is used in the manufacture of garments including sweaters, dresses, coats and active sportswear. Blended with other natural (or) synthetic fibres wool used as adds drape and crease resistance blankets, anti-static and noise absorbing carpets.

Silk

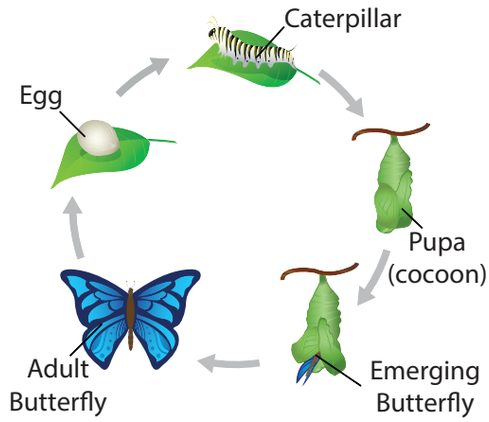
Have you ever attended marriage functions? What type of dresses the bride and bridegroom wear? What is it made up of?

Silk is the secretions of the silk moth. Silk is obtained from the cocoon of silk worms, which feed on the mulberry leaves. Silk worms live for a very short time, only about two months. During this period they pass through four stages of development. They are eggs, caterpillars, cocoon and adult moth. These stages are called as life cycle of a silk worm.

The cultivation and production of silk is known as Sericulture. An adult female silk moth lays about 500 eggs. The eggs are then kept in cold storage for six weeks. The eggs are placed in the incubator. After about ten days, the eggs hatch out and the larvae spend the next 35 days eating mulberry leaves.

D9LRA

Life cycle of butterfly



The silk worms spend about five days producing silk and spinning its cocoon of a single long thread. The cocoons are boiled to make it easier to unwind the silk and kill the pupae inside. If the silk moths were allowed to hatch, the long silk fibres will get turned by the hatching of moth. Cocoons are unwind and then the individual silk filament is reeled together to form a thread large enough for weaving. The silk thread is cleaned, dyed, woven into fabric.

Characteristic features of Silk

- It is very soft, comfortable and versatile
- It can be easily dyed.
- It is the strongest natural fibre.
- It has a poor resistance to sunlight exposure.

Uses of Silk

Silk has natural beauty and elegance. It gives comfort in warm weather and warmth during colder months. It is used in the manufacture of classical and high fashion clothes, modern dresses particularly silk sarees, the elegant of beautiful dresses. It is also used in household for making wall hangings, curtains, rugs and carpets. It is also being used in the manufacture of surgical threads for sutures.

DO YOU KNOW?

India is the world's second largest silk producing country. Kancheepuram, Thirubhuvanam and Arani are famous places for silk production in Tamil Nadu.

5.3 Hazards in Silk and Wool Industry

Hazard is any industry has the potential to cause injury, ill health or damage to human being and their property or the environment.

Hazards in Silk Industry

Generally, the workers in silk industry affected with arthritis is they stand for a long time reeling the silk into yarn. They also develop back pain and visionary problem and skin injuries. Some time they may suffer from respiratory problem like asthma and bronchitis due to poor ventilated area of their work.

Similarly, hazards in wool industry the workers are exposed to various chemicals and detergents which causes allergies of the skin. They also get infected to anthrax bacterium which leads to fatal dead disease called the sorters disease.

Anthrax is caused by *Bacillus anthracis* by handling contaminated animal hair and contact with the live stock during hair processing. The symptoms are fever, cough and shortness of breath, similar to a typical pneumonia. Sometimes it may leads to nausea, vomiting and diarrhoea.

Treatment

- Pencillin or Ciprofloxacin is given as the best medicine for treatment of anthrax.
- The spread of the disease is controlled by vaccination of animals and by burning or burial of infected animal's carcases.
- It is the duty of the employer to take care of the industrial workers by providing hygienic and well ventilated work place.

Sericulture and Ahimsa silk (Peace silk)

Sericulture or silk farming is the cultivation of silk worm to produce silk. It is the rearing of silk worms to obtain silk.

Ahimsa silk

It is also known as Peace silk. In 1992, Kusuma Rajaiah, a Government officer from Andhra Pradesh state of India proposed ahimsa way of silk production for the making silks without killing the silkworm. It involves a humane method specifically letting the worms to hatch and then using the vacant cocoons.

Traditional silk manufacturing methods involve boiling the cocoons of the silk worms and then sorting out the threads, which is used later in silk production. It has been supported by many people who are interested in the welfare of animals.

5.4 Animal protection and maintenance

Protecting animals is like protecting our own children

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Animals used as food

An animal raises for its flesh and products are consumed by human is called animal food.

Animals used as Cloth

Animals skin is used for making woolen dresses and some leather goods.

Types of Wool

Alpaca, Fiber, Moheir, Cashmere and Lambs Wool

Types of Silk

Eri Silk, Muga and Spider Silk

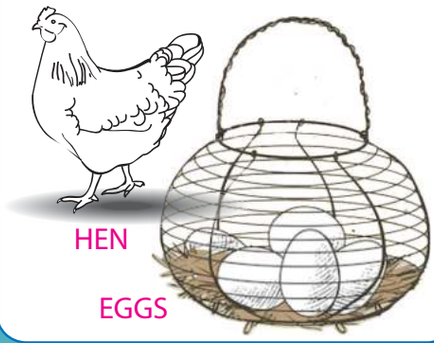
Ahimsa Silk

Ahimsa means non-violence. It is used to describe this innovation because the fabric is manufactured in a process where Silkworms are not killed.

Ahimsa Silkworm and cocoon

Poultry Farming

Poultry farming - domestically or commercially primarily for meat, eggs and also for feathers.



Animal protection and maintenance

Protecting an animal's welfare means providing for its physical and mental needs.

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or parent. They are living things similar to human beings. As an elite, most intelligent and responsible human being on the planet, it is our duty to protect all the living organisms on earth. The human tendency and conscience towards the animals should be considerate to protect and safe guard the animals, hence as human it becomes a great responsibility and obligatory to protect the animals.

DO YOU KNOW?

Study of breeding of animals and their maintenance is called Animal Husbandary

The Ministry of Environment, Forest and Climate change has released four New Gazette Notifications under the Prevention of Cruelty to Animals Act 1960 to regulate dog breeders, animal marketers, aquarium and pet fish owners. This progress has come about as a joint effort by animal protection groups. With the protection of animals we actually protect ourselves and protect the environment. So we have to love and protect the animals and treat them as our family members.

EVALUATION

23R58

I. Choose the correct answers

1. _____ is the daily essential product which is obtained from cattle.

   a) Egg b) Milk
   c) Both of them d) None of them

2. Eggs are rich in _____.

   a) Protein b) Carbo hydrate
   c) Fat d) Acid

3. Which parts of the goat and sheep is used for manufacturing clothes.

   a) Leg b) Hand
   c) Fur d) Head

4. The cultivation and production of silk is known as _____.

   a) Horticulture b) Floriculture
   c) Agriculture d) Sericulture

5. Sorter's Disease is otherwise known as _____.

   a) Asthma b) Anthrax
   c) Typhoid d) Cholera

II. Fill in the blanks.

1. Proteins and _____ is rich in milk.
2. _____ is extracted from bee hives.
3. Anthrax is caused by _____.
4. _____ is the strongest natural fibre.
5. Peace silk was produced in the year _____.

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III. True or False – If False give the correct answer

1. Animals are the greatest gift of nature.
2. Horse hair is used as bristles in small painting brushes.
3. Wool is the fibre derived from the silk worm.
4. Ahimsa silk is otherwise known as Mulberry silk.
5. Pencillin is the best medicine for curing Anthrax.

IV. Match the following

1. Cocoons	-	Meat
2. Peace silk	-	Poultry
3. Broilers	-	Silk worm
4. Sweet Liquid	-	Andhra pradesh
5. Goat	-	Honey

V. Very short answer

1. Write about any two dairy products.
2. What are the two types of fibres that are obtained from animals?
3. What is shearing?
4. Write the symptoms of Anthrax
5. Define – Sericulture
6. How should we treat animals?
7. Who invented the Ahimsa silk?

VI. Short Answer Questions

1. What are the characteristics of wool? Give any three.
2. Write about any three uses of silk.
3. What are the common diseases that are found in Poultry?

VII. Answer in Detail

1. Write about Ahimsa Silk.
2. Write about the hazards of silk industry.
3. What are the major steps involved in this wool factory.
4. Write the uses of the wool.

VIII. HOTS

1. Silk fiber is used to manufacture parachute. Why?
2. Honey is recommended for all. Why? What is its significance.

IX. Assertion and Reasoning

1. Assertion : Wool is the fibre derived from the fur of animals.

Reason : Animals like goat, Yak, Alpaca and rabbit yields wool.

a. Both Assertion and reasoning is correct

b. Assertion is correct but reason in wrong

c. Assertion is wrong but reason is correct

d. Assertion and Reason are incorrect

2. Assertion : Pencillin or ciprofloxacin

Reason : These medicines cures cow pox.

a. Assertion is correct Reason is wrong

b. Assertion is wrong reason is correct

c. Assertion is wrong reason is also wrong

d. Assertion is correct and reason is correct.

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ICT CORNER

ANIMALS IN DAILY LIFE

This activity helps the students to know about the farming and how to do the milking.

PROCEDURE :

Step 1: Type the URL link given below in the browser or scan the QR code. A page opens. Press Play button.

Step 2: A farm scene will come. Come along with that a hand.

Step 3: According to the instruction of the hand sow crop for cow then feed the cow.

Step 4: Follow the instruction of the hand you will end up with milk.

Step 1

Step 2

Step 3

Step 4

Animals in daily life – cow farm and milking URL:

https://play.google.com/store/apps/details?id=com.playnfun.cowfarmday

*Pictures are indicative only

*If browser requires, allow Flash Player or Java Script to load the page.

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Unit 6

Visual Communication

Learning Objectives

After learning this lesson, the students will be able to

- know how to create a document through the LibreOffice software
- explore their creative thinking
- learn how to align and format the document

Introduction

In this chapter, the students will learn to use the software LibreOffice

LibreOffice is a powerful and free office suite, used by millions of people around the world. It's clean interface and feature-rich tools help you unleash your creativity and enhance your productivity. LibreOffice includes the following components.

Text Document:

Writer (word processor) is a feature-rich tool for creating letters, books, reports, newsletters, brochures and other documents.

Calc (spreadsheet)

Calc has all of the advanced analysis, charting and decision making features expected from a high-end spreadsheet. It includes over 300 functions for financial, statistical and mathematical operations, among others.

Impress (presentations)

Impress provides all the common multimedia presentation tools, such as special effects, animation, and drawing tools.

Drawing (vector graphics)

Draw is a vector drawing tool that can produce everything from simple diagrams or flowcharts to 3D artwork.

Base (database)

Base provides tools for day-to-day database work within a simple interface. It can create and edit forms, reports, queries, tables, views and relations, so that managing a relational database is much the same as in other popular database applications.

Math (formula editor)

Math is the LibreOffice formula or equation editor. You can use it to create complex equations that include symbols or characters not available in standard font sets.

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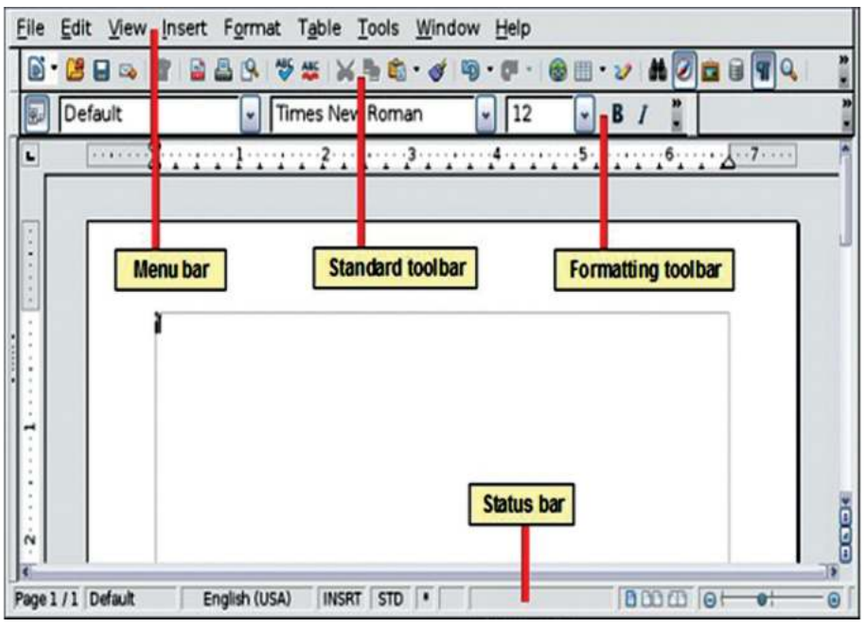
How to get the software

Versions of LibreOffice for Windows, Linux and Mac OS X can be downloaded free from http://www.libreoffice.org/download.

TEXT DOCUMENT

In this chapter, we will discuss about the word processing. You can use it to type letters, reports and other documents. This lesson introduces you to the Word window. You use the Word window to interact with Text Document.



Managing Documents

This section of the lesson explains how to open a new/existing document, save a document, renaming a document and closing an opened document. There are several ways to create a new document, open existing documents and save documents in Word.

Create a New Document

To create a new document, do any one of the following methods:

1. Click the New Document button on the menu bar.

2. Choose File→New command from the menu bar.

3. Press CTRL+N keys on the keyboard.

Open an Existing Document

To open an existing document, do any one of the following methods:

1. Click the Open File button on the menu bar.

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2. Choose File→Open command from the menu bar.

3. Press CTRL+O keys on the keyboard. Each of the above method will show the Open dialog box. Choose the file and click the Open button.

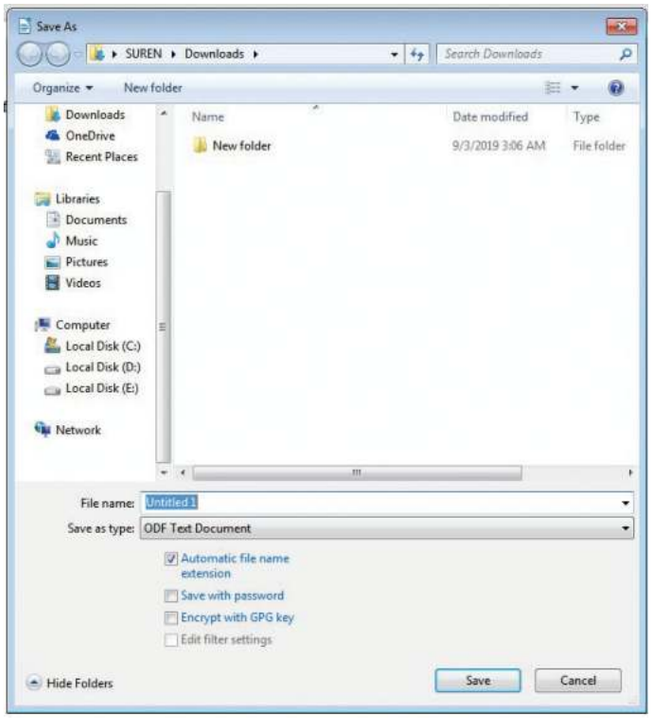
Save a New/Existing Document

To save a new/existing document that is opened, follow any one of the following methods:

1. Click the Save button on the menu bar.

2. Select File→Save commands from the menu bar.

3. Press CTRL+S keys on the keyboard.



If the document is already named and saved earlier, it will simply save the document. On the other hand, if the file is a new document then it will prompt you by opening 'Save As' dialog box. Select the folder where you want to place your document. Type the name of the document in File Name and then click OK. You can also save a document by choosing File→Save As commands on the menu bar.

Close the Document

Close the current document by selecting File→Close command on the menu bar or click the Close icon if it is visible on the Standard toolbar.

Printing a Document

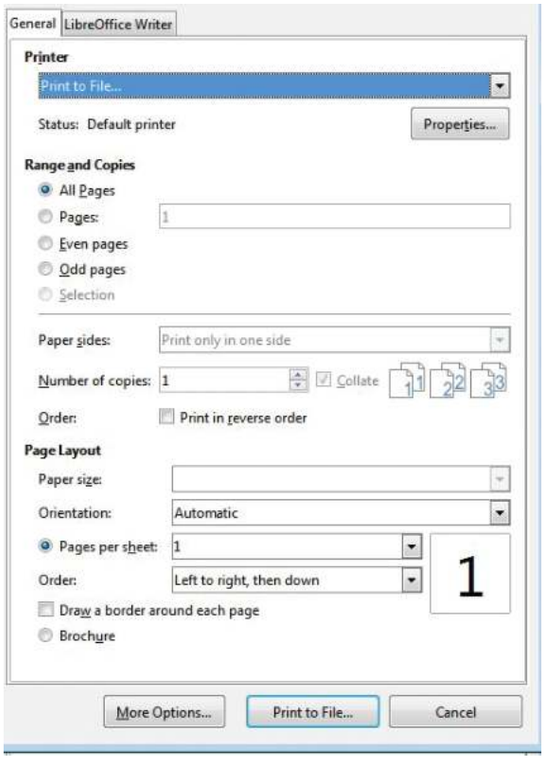
To print a document or selected pages follow the steps given below:

1. Open the document to be printed.

2. Choose File → Print command on the menu bar.

The Print dialog box will open. Select the Options like print range, Number of copies, Printer name etc. See that printer is switched on and the paper is available in the printer tray.

3. Click OK.



Print Preview

Print preview provides a way to see how your document will look when printed. You can see several pages at once. It is similar to Print Layout View. An advantage of Print preview is that it has its own toolbar. The toolbar allows you to easily view multiple pages and change the magnification of the screen. You can also edit your document in print preview mode. To switch to print preview, use one of these methods:

1. Click on the Print preview in the file menu.

Or Press CTRL+Shift+ O keys.

EXIT TEXT DOCUMENT

When finished you can close all the files and quite the Word program by selecting File→Exit command on the File menu bar.

Selecting Text

Even though the document is built up by typing one character at a time, while editing and formatting one always work with words, lines, paragraphs and sometimes with the whole document. For this purpose one should learn how to select the text. Once the text is selected, change can be made to that text. The text can be moved, copied and made as bold. The font and colour of the text can also be changed. For selecting text, the mouse or the keyboard can be used.

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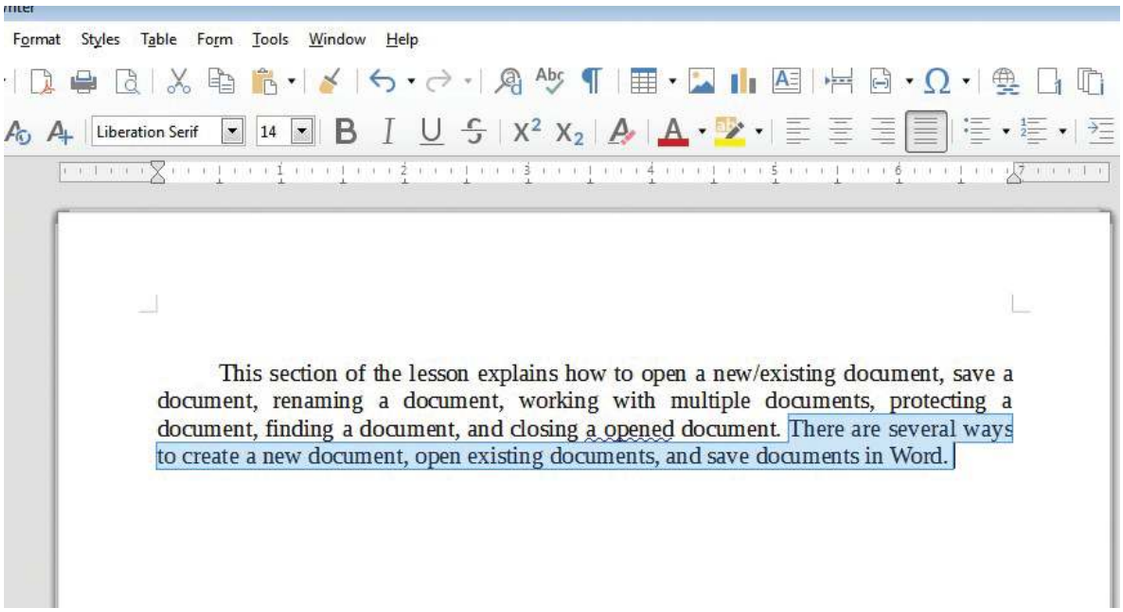

Selecting Text with Mouse

Following steps are to be followed:

1. Insertion point is moved to the start of the text to be selected.
2. The left mouse button should be clicked, held down and dragged across the text to be selected.
3. When the intended text is selected, the mouse button should be released.

Selecting Text with Keyboard

Following are the steps to be followed:

1. Insertion point is moved to the start of the text to be selected.
2. The Shift key is pressed down and the movement keys are used to highlight the required text.
3. When the Shift key is released, the text is selected.

Cut and Copy

The main difference between Cut and Copy is that cut removes the selected data from its original position while copy creates a duplicate of the original content.

Moving the Text

The selected text can be easily cut and pasted in the required location. Following steps are to be followed.

1. The text to be moved to a new location is selected.
2. Edit → Cut or in the tool bar select cut option to remove the selected text.
3. Insertion point is moved to the place where the text is to be pasted.
4. Edit → Paste or in the tool bar Select paste option to copy the selected text in the new location. The text can also be pasted in this way from one to another type of document.

The following keyboard shortcuts can be used to move text.

Ctrl + X → to Cut

Ctrl + V → to Paste

Copying the Text

1. The text to be copied is selected.
2. Edit → Copy is selected or is clicked.
3. The insertion point is selected where the copy of the text should appear and is clicked.

The following keyboard shortcuts can also be used for copy and paste:

Ctrl + C → to Copy

Ctrl + V → to Paste

Formatting Options

Almost all the formatting options are available under Format menu. LibreOffice Writer also conveniently provides buttons for the most commonly used options. But before these options can be used, the text on which they are to be used has to be selected. Once the desired portion of the text is selected then depending on the need any one of the following buttons are clicked:

Click **B** to make text Bold.

Click *I* to make text Italic.

Click U to make text Underlined.

The same can also be achieved by clicking on Format → Character

Alternatively Ctrl + B, Ctrl+I and Ctrl+U keys can be used to make the selected text bold, italic and underlined respectively.

Changing the Fonts

A font is a set of characters and numbers in a certain style. Each font looks different from other fonts.

Click the down arrow in the Fonts Combo box of font tab in Character dialog box.

Use Format →Character to open the Character dialog box.

From the list of available fonts, click the required one.

The text changes to the selected font.

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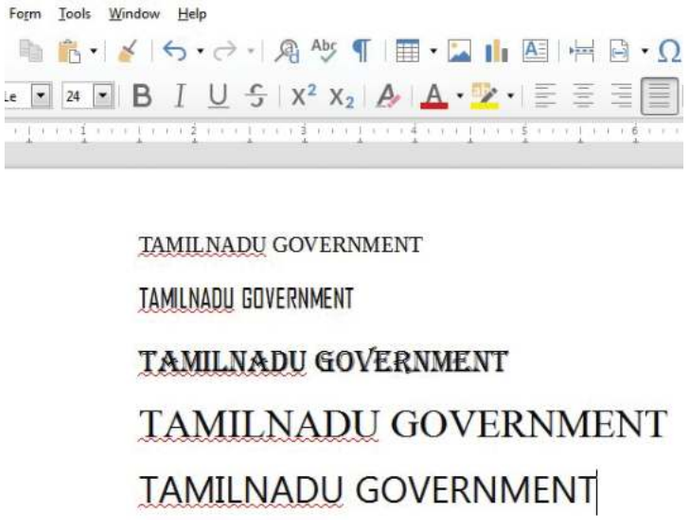


Font Size

The size of the text is also important. The same size of the text cannot be used for a legal document, and an advertisement material.

Click the down arrow in the Size combo box of Fonts tab in Character dialog box.

The text changes to the selected font size.

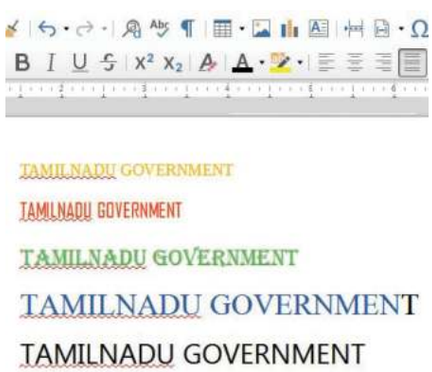
Changing the Font Colour

A different colour for selected text can be used. Colour printers are becoming more and more popular. With the help of a colour printer, some splash can be added to the documents by changing the colour of text.

To use a different text colour, select the text and click the arrow in the

Font Colour icon. A colour palette is displayed from which the required colour can be selected.

Alternatively, select the text and click on the Font color icon, to apply the current colour of the Font Colour.



Paragraph Alignment

Paragraph alignment refers to the appearance of the left and right sides of the paragraph. By

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default, Word aligns paragraphs to the left. You can align paragraphs in Word so the right sides are symmetrical. This is called right alignment. You can also align them so you center the lines with even space on both sides. This is called center alignment. Finally, you can justify the alignment, which aligns both the left and right sides.

Four types of alignment can be selected, and the best way to make a change is to use the Formatting toolbar.

Following steps are used:

To change the alignment of one paragraph, first click within that paragraph.

To change the alignment of several paragraphs, select the ones needing change.

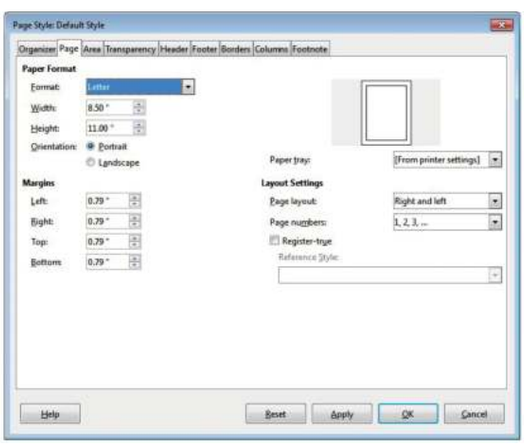
Changing Page Orientation

Usually the length of a document will be more than the width. This orientation is called portrait. But in some of the documents the width will be more than the length. This type of orientation is called landscape. The default orientation is portrait.

To change the orientation or paper size, the following steps are used:

- The Format Page option is clicked.

Click the Page tab, if necessary.



- Select the necessary paper format from the Format drop-down list in the Page. Format section or enter the values in the Width and Height spin boxes.
- For changing the orientation Portrait or Landscape radio buttons are used.

Changing Margins Using Rulers

If the user is not having the exact value for the margins then the Ruler option on the View menu can be used to change the margins.

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Following steps are used in this method:

- If the ruler is not displayed in the screen, View → Ruler option is clicked.
- The gray area of the ruler indicates the margin's top area.
- The mouse pointer is then moved in between the gray and white area of the ruler.
- When the pointer is in the right spot, it changes into a line with arrows on both sides
- The margin guide is dragged to a new location.

EVALUATION

UXZL4

I. Choose the correct answer.

1. The Keyboard shortcut is used to copy the selected text

   a) Ctrl+c b) Ctrl+v

   c) Ctrl+x d) Ctrl+A

2. The Keyboard shortcut is used to cut the selected text

   a) Ctrl+ c b) Ctrl+v

   c) Ctrl+x d) Ctrl+A

3. How many types of page orientation are there in Libre office Writer?

   a)1 (b) 2 (c) 3 (d) 4

4. If the ruler is not displayed in the screen, _____ option is clicked.

   a) View-> ruler b) view-> task

   c) file-> save d) edit->paste

5. The menu is used to save the document

   a) File-> open b) file-> print

   c) file-> save d) file->close

II. Answer the following Questions.

1. What is the use for Text document software?
2. What is selecting text?
3. How to close a document?
4. What is right alignment?
5. How to open an existing document?

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STANDARD SEVEN

TERM - III

VOLUME - 3

HISTORY

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Assessment

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Unit -1

New Religious Ideas and Movements

Learning Objectives

To acquire the knowledge of

- Devotional movement of Azhwars and Nayanmars
- *Advaita* philosophy of Adi Shankara and *vishistadvaita* of Ramanuja
- Bhakti cult in Northern India and its prominent exponents
- Interaction between Hinduism and Islam, leading to the birth of new cults notably Sufism
- Teachings of Kabir and Guru Nanak
- Impact of Bhakti Movement

Introduction

Medieval India saw an extraordinary production of devotional poetry, which were not restricted to one particular religion but inspired by different religious movements. The exponents of these movements held the view that total devotion (*bhakti*) to God could save man from the pitfalls of life and earn him salvation. It was also believed that one does not have to go to temples or perform rituals, for God is omnipresent and resides inside every human. The *Bhagavad Gita* proposed that the path of *bhaktimarga* (the path of *bhakti*) is superior to the two other religious approaches, namely, the path of knowledge (*jnana*) and the path of rituals and good works (*karma*), providing inspiration to the exponents of Bhakti cult.

Bhakti Movement: The Beginnings

The Bhakti movement, or the resurgence of devotional practices, started in Tamil Nadu around seventh century AD (CE). It included reciting the name of the God or Goddess, singing hymns in their praise, wearing religious marks or carrying identity emblems, and undertaking pilgrimages to sacred places associated with the deity. It emphasised the mutual emotional attachment and love of a devotee towards a personal God and of the God for the devotee

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This view was also preached by Sufism, which appeared as a reaction against worldliness of the early Islam. Sufis believed that realisation of God can be achieved only through passionate devotion to God and intense meditation. Sufis were of the view that this type of meditation would enable the devotee to understand the true nature of God. They argued that doing so would liberate the devotee from all worldly bonds and help them become one with God. Several mystical religious movements, in both Hinduism and Islam, had no hesitation to freely include elements of different faiths in their teachings. 'There is only one god, though Hindus and Muslims call him by different names', stated Haridasa.

1. Devotional Movement in Tamizhakam (Azhwars and Nayanmars)

The Azhwars, the Vaishnavite Bhakti sages and the originators of Bhakti cult, and the Nayanmars, the worshipers of Siva or the Saivites, composed devotional hymns in Tamil language, dedicated to their respective gods. Siva-bhakti is associated with Siva's manifestations on earth. Poems to Siva and Vishnu, particularly to Krishna, were composed in Tamil and other South Indian languages such as Kannada and Telugu. These poet-saints criticised caste-based social status and advocated gender equality in order to make it good to stand the onslaught of Buddhism or Jainism.

Vishnu-*bhakti* or Vaishnavism is based on Vishnu's avatars (incarnations), particularly Krishna and Rama. The 12 Tamil Azhwars are chiefly known for their immortal hymns. Two Azhwars stand out distinctly for their contribution to the promotion of the Bhakti movement. Nammazhwar's fame lies in his 1,102-stanza *Tiruvaimozhi*. Nathamuni collected the 4,000 poems of Nammazhwar, in the form of *Divya Prabandham*. Andal, the only female Azhwar, is another. Periyazhwar, who was earlier known as Vishnu Chittar, made lots of songs on Krishna putting himself in the place of mother Yashoda. Periyazhvar is said to have found Andal as a baby in the tulsi garden at Srivilliputhur temple and adopted her. She grew up in the temple town of Srivilliputhur and became known as Andal-she who ruled. *The Thiruppavai* (The Path to Krishna) and the *Nachiyar Thirumozhi* (The Sacred Songs of the Lady) are her celebrated works. Her poems expressing her love for Ranganatha, the incarnation of Vishnu worshiped at a temple at Srirangam, are used in Vaishnava wedding ceremonies in Tamil Nadu.

Vaishnavite Saints (12 Azhwars)

Three Muthal Azhwars: Poigai Azhwar, Bhoothathu Azhwar and Pei Azhwar.
Other Azhwars: Thirumalisai Azhwar, Periyazhwar, Thondaradippodi Azhwar, Thirumangai Azhwar, Thiruppanazhwar, Kulasekara Azhwar, Nammazhwar, Mathurakavi Azhwar and Andal.

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Saivite Saints (63 Nayanmars)

There are 63 legendary Nayanmars. Among them, Gnanasampandar, Appar, and Sundarar (often called "the trio") are worshipped as saints through their images in South Indian temples. Nambi Andar Nambi 1000 AD (CE). is said to have compiled the songs of all of the Nayanmars that form the basis of *Tirumurai*, the basic Tamil Saivite sacred canon. It consists of 12 books, and 11 of them were assembled by Nambi. The 12th book is Sekkizhar's *Periyapuranam*.

(a) Adi Shankara

Adi Shankara

Adi Shankara or Shankarachariar 700–750 AD (CE) preached the *Advaita* philosophy. The essence of this philosophy is that the soul (*atma*) unites with the universal soul (*brahma*) through the attainment of knowledge. He set up *mathas* (*mutts*), centres of learning and worship, at Badrinath, Puri, Dwarka and Sringeri. These places have become prominent pilgrim centres today. Shankara enthusiastically endeavoured to restore the orthodox Vedic tradition without paying attention to the Bhakti movement of his time. His masterpiece is the commentary on the *Brahma-sutra*, which is a fundamental text of the Vedanta school. His commentaries on the principal Upanishads are also considered equally important.

(b) Ramanuja

Ramanuja

Ramanuja, a 11th century Vaishnava saint, was the most influential thinker of Vaishnavism. His philosophy, known as *vishistadvaita,* proclaims that the soul retains its identity even after uniting with *brahma.* After a long pilgrimage, Ramanuja settled in Srirangam. Ramanuja articulated ideas of social equality and condemned caste-based restrictions on entering the temples. He established centres to spread his doctrine of devotion, *Srivaishnavism,* to God Vishnu and his consort Lakshmi.

In the 16th and 17th centuries, Vaishnavism spread across India. The Vadakalai Vaishnavism originally flourished around Kanchipuram, which was a popular

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education centre. Thenkalai Vaishnavism centred on Srirangam. Vadakalai sect focused on Vedic literature, which is written in Sanskrit. The Thenkalai sect stressed the importance of *Divya Prabandhams,* written by the 12 Azhwars in Tamil.

2. Bhakti Movement in North India

While dealing with the religious movements of the fourteenth and fifteenth centuries in northern India, one has to keep in mind the two very different attitudes which Hindu religious leaders had towards Islam. One group accepted what was best in Islam; the other adopted a few elements in order to prevent conversion to Islam. Both reacted to Islam, but one was sympathetic while the other was hostile. Kabir and Guru Nanak, and other founders of new sects are included in the first group, while the movement in Bengal, associated with Chaitanya deva, or Chaitanya Mahaprabu, belongs to the latter tendency.

(a) Exponents of Bhakti Movement

It was Ramananda who spread the Bhakti ideology in northern India where it became a mass movement. Vallabhacharya, a Telugu philosopher, built a temple for Lord Krishna on the Govardhan Hills near Mathura. Surdas, a blind poet and musician, was associated with this temple as well as that of Agra. His famous collection of poetry is called *Sursagar.* Meera Bai, wife of the crown prince of Mewar, was an ardent devotee of Lord Krishna. She was a disciple of Ravidas. Meera Bai gained popularity through her *bhajans.* Chaitanyadeva popularised Krishna worship through ecstatic songs and dancing that had a profound effect on Vaishnavism in Bengal. In the 16th century, in Tulsidas's Hindi retelling of the story of Rama in the *Ramcharitmanas,* the sentiment of friendship and loyalty is stressed. Many of those poems continue to be recited and sung often at all-night celebrations.

Ramananda

Vallabhacharya

Surdas

Meera Bai

Chaitanya

Tulsidas

Tukaram

Panduranga Temple, Pandaripuram

Tukaram, a 17th century saint poet of Maharashtra, is known for his spiritual songs (*abangas* or *kirtanas*), devoted to Vitthoba, an avatar of Krishna. There is a Vitthoba/Panduranga temple at Pantharpur or Pandaripuram in Sholapur district, Maharashtra. What is Chaitanyadeva to Bengal is Tukaram to Maharashtra.

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3. Sufism in India

The advent of Sufis to India dates back to the Arab conquest of Sind. It gained prominence in the 10th and 11th centuries during the reign of the Delhi Sultans. Sufism adopted many native Indian concepts such as yogic postures, music and dance. Sufism found adherents among both Muslims and Hindus.

Sufism: The word Sufi takes its origin from *suf,* meaning wool. The Sufis wore course garments made of wool and hence they were called Sufis. Sufism was basically Islamic but was influenced by Hindu and Buddhist (Mahayana) ideas. It rejected the stringent conduct code of the *ulemas.* Sufis lived in hermitages akin to monasteries and functioned outside society.

Sufis in medieval India were divided into three major orders. They were Chisti, Suhrawardi and Firdausi. Moinuddin Chishti made Chisti order popular in India. He died in Ajmer (1236) and his resting place is in the Ajmer Sharif Dargah in Ajmer, Rajasthan. The best known Sufi sage of the early medieval period was Nizamuddin Auliya of the Chishti order, who had a large number of followers among the ruling class in Delhi. Poet Amir Khusru was one of its distinguished followers. Suhrawardi order was founded by an Iranian Sufi Abdul-Wahid Abu Najib. The Firdausi order was a branch of Suhrawardi order and its activities were confined to Bihar.

4. (a) Kabir

Kabir

Kabir, came under the influence of Varanasi-based Saint Ramananda. He accepted some Hindu ideas and tried to reconcile Hinduism and Islam. However, it was the Hindus, and particularly those of the lower classes, to whom his message appealed. Kabir believed that God is one and formless, even though different religious sects give him different names and forms. He opposed discrimination on the basis of religion, caste and wealth. He also condemned meaningless rituals. Kabir's verses were composed in Bhojpuri language mixed with Urdu. The Kabir's *Granthavali* and the *Bijak* contain collections of Kabir's verses.

(b) Guru Nanak

Early Life: Guru Nanak, born in a village near Lahore in 1469, showed interest in religious discussions with other saints right from his early childhood. His parents were keen to involve him in worldly life. But he was inclined towards spiritualism. He visited many holy places and finally settled in Kartarpur near Lahore. He died there in 1539. To mark the 550th birth anniversary of Guru Nanak, a corridor constructed by the Indian government that links the Nanak shrine in Gurdaspur with Gurudwara Darbar Sahib at Kartarpur in Pakistan.

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Guru Nanak

Gurudwara Granth Sahib, Kartarpur

Guru Nanak's Teachings: Guru Nanak preached that God is without form and wanted his followers to practice meditation upon the name of God for peace and ultimate salvation. He is considered the first guru by the Sikhs. Guru Nanak had great contempt for Vedic rituals and caste discriminations. The teachings of Guru Nanak formed the basis of Sikhism, a new religious order, founded in the late 15th century. His and his successors' teachings are collected in the *Guru Granth Sahib,* which is the holy book of the Sikhs. Guru Nanak's teachings were spread through the group singing of hymns, called *kirtan*. The devotees gathered in *dharmashalas* (rest houses), which became *gurudwaras* in course of time.

Guru Nanak nominated his disciple Lehna to succeed him as the guru. Following this precedent, the successors are named by the incumbent Sikh Guru. At the time of Guru Gobind Singh, the custom of *pahul* (baptism by sweetened water stirred with a dagger) was introduced. Those who got baptised became members of a disciplined brotherhood known as the *Khalsa* (meaning the pure). The men were given the title Singh (lion). Every member of the *Khalsa* had to have five distinctive things on his person. These were *kesh* (uncut hair), *kangha* (comb), *kirpan* (dagger), *kada* (steel bangle) and *kachera* (underpants). After Guru Gobind Singh, the holy book *Guru Granth Sahib* is considered the guru and its message is spread by the *Khalsa*.

Five distinctive things of the *Khalsa* members

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5. Impact of the Religious/ Bhakti Movement

- The Islamic tenets – unity of God and universal brotherhood – emphasised by the saints promoted harmony and peace.
- Bhakti was a movement of the common people; it used the language of the common people for its devotional literature.
- Bhakti movement opened up space for Indian languages to grow. It stimulated literary activity in regional languages.
- What sustained Sanskrit, despite its decline during this period, was the support extended by the rulers of Hindu kingdoms.
- Tamil was the only ancient Indian language remained vibrant during this period. But the ethos of Tamil literature in medieval time had changed. In the classical period, it had secular literature depicting the everyday life, its joys and sorrows, but under the influence of devotional cults, its emphasis shifted to religion and religious literature.
- Caste system and social disparities came to be criticised.

Summary

- ❖ The Bhakti movement is explained. Azhwars' initiatives followed by Nayanmars in Tamil country are described.
- ❖ Adi Shankarar's *advaita* philosophy and Ramanujar's *vishistadvaita* philosophy are explained.
- ❖ The devotional paths of saints, notably Tulsidas and Meera Bai, in northern India and Chaitanyadeva in Bengal are examined.
- ❖ Mutual influence of Islam and Hinduism and birth of Sufism, Sikhism and mystical Hinduism are discussed in brief.
- ❖ Radical versions of Bhakti Movement: Contribution of Kabir and Guru Nanak are detailed.
- ❖ The essential features of Bhakti Movement are highlighted.
- ❖ The impact of the Bhakti Movement on the medieval Indian society is analysed.

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Glossary			
1.	salvation	a way of being saved from danger, loss or harm	நிவர்த்தி, விமோசனம்
2.	omnipresent	present everywhere at the same time	எங்கும் நிறைந்திருக்கின்ற
3.	incarnation	a living being embodying a deity or spirit	அவதாரம்
4.	hostile	showing enmity or dislike, unfriendly	விரோதமாக, பகைமையுள்ள
5.	prominence	importance	முக்கியத்துவம்
6.	adherent	supporter (of a person, cause or belief)	ஆதரவாளர், பின்பற்றுபவர்
7.	stringent	severe, harsh	கடுமையான, கெடுபிடியான
8.	ulema	Islamic scholar trained in Islamic law	இஸ்லாமியப் பேரறிஞர்
9.	hermitage	the dwelling of persons living in seclusion	ஆசிரமம், துறவி வாழிடம்
10.	akin	similar	ஒத்த இயல்புடைய
11.	dagger	short, pointed knife that is sharp on both sides	குத்துவாள், குறுவாள்
12.	depicting	showing, portraying	சித்தரிக்கும், விவரமாக விளக்கும்
13.	disparity	a great difference, the state of being unequal	வேறுபாடு, சமமற்ற

Evaluation

I. Choose the correct answer:

1. Who of the following composed songs on Krishna putting himself in the place of mother Yashoda?
   a) Poigaiazhwar b) Periyazhwar
   c) Nammazhwar d) Andal

2. Who preached the *Advaita* philosophy?
   a) Ramanujar b) Ramananda
   c) Nammazhwar d) Adi Shankara

3. Who spread the Bhakthi ideology in northern India and made it a mass movement?
   a) Vallabhacharya b) Ramanujar
   c) Ramananda d) Surdas

4. Who made *Chishti* order popular in India?
   a) Moinuddin Chishti
   b) Suhrawardi
   c) Amir Khusru
   d) Nizamuddin Auliya

5. Who is considered their first guru by the Sikhs?
   a) Lehna
   b) Guru Amir Singh
   c) Guru Nanak
   d) Guru Gobind Singh

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II. Fill in the Blanks:

1. Periyazhwar was earlier known as _____.
2. _____ is the holy book of the Sikhs.
3. Meerabai was the disciple of _____.
4. _____ philosophy is known as *vishistadvaita.*
5. Gurudwara Darbar Sahib is situated at _____ in Pakistan.

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III. Match the following:

1. *Pahul* – Kabir
2. *Ramcharitmanas* – Sikhs
3. *Srivaishnavism* – Abdul-Wahid Abu Najib
4. *Granthavali* – Guru Gobind Singh
5. *Suhrawardi* – Tulsidas

IV. Find out the right pair/pairs:

1. Andal - Srivilliputhur
2. Tukaram - Bengal
3. Chaitanyadeva - Maharashtra
4. Brahma-sutra - Vallabacharya
5. Gurudwaras - Sikhs

2. Assertion (A): After Guru Gobind Singh, the holy book *Guru Granth Sahib* came to be considered the guru.

Reason (R): Guru Gobind Singh was the compiler of *Guru Granth Sahib.*

a) R is not the correct explanation of A
b) R is the correct explanation of A
c) A is correct but R is wrong
d) Both A and R are wrong

3. Find the odd person out

Poigai Azhwar, Bhoothathu Azhwar, Periazhwar, Andal, Nammazhwar.

V. State true or false:

1. Sufism was responsible for the spread of Islamic culture.
2. The best known Sufi sage of the early medieval period was Nizamuddin Auliya of the *Chishti* order.
3. Guru Nanak is considered the first guru of Sikhs.
4. Sufis believed that realization of God can be achieved only through passionate devotion to God and intense meditation.
5. The basic Tamil Saivite sacred canon consists of 12 books.

VI. Give short answers:

1. What do you know about *Tirumurai?*
2. How many Nayanmars were there and who were prominent among them?
3. How did Gurunanak help to found Sikhism?.
4. What had Tukkaram to do with the Vitthoba temple of Pantharpur?
5. Highlight the spiritual ideas of Kabir that appealed to lower classes.

VII. Answer the following in detail:

1. Give an account of the contributions of exponents of Bhakti Movement in the southern as well as northern parts of India.
2. What is Sufism? How did it find its footing in India?
3. What impact did Bhakti movement make on Indian society?

VIII. Activity:

Visiting the living places as well as the places associated with the Bhakthi saints in Tamil Nadu.

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Unit -2

Art and Architecture of Tamil Nadu

Learning Objectives

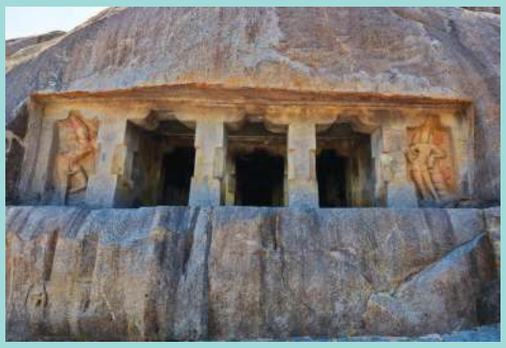
- To understand the evolution of temple architecture in South India
- To gain knowledge about the cultural heritage of Tamils
- To know the contribution of Pallavas, Cholas, Vijayanagara and Nayak rulers to the development of temple art in Tamil Nadu

Introduction

Dravidian architecture is of indigenous origin. It advanced over time by a process of evolution. The earliest examples of the Tamil Dravidian architectural tradition were the 7th century rock-cut shrines at Mahabalipuram. The absence of monuments in South India prior to the 7th century is attributed by scholars to temples ought to have been built in wood, which were eventually destroyed by forces of nature. In Tamil Nadu, the evolution of temple architecture took place in five stages: (1) The Pallava Architecture Epoch AD (CE). 600 to 850); (2) Early Chola Architecture Epoch AD (CE) 850 to 1100); (3) Later Chola Architecture Epoch AD (CE) 1100 to 1350); (4) Vijayanagara / Nayak Architecture Epoch AD (CE) 1350 to 1600); and (5) Modern Architecture Epoch (After AD (CE) 1600).

Pallava Epoch

The Pallava epoch witnessed a transition from rock-cut to free-standing temples. Rock-cut temples were initially built by carving a rock to the required design and then rocks were cut to build temples. The Pallava king Mahendravarman was a pioneer in rock-cut architecture. Mandagapattu temple was the first rock-cut temple built by him. The rock-cut cave structure has two pillars in the front that hold it. All the cave temples have simple sanctum cut on the rear side of the wall with a frontage-projecting *mandapa* (pavilion).



Rock-cut Cave Temple, Mandagapattu

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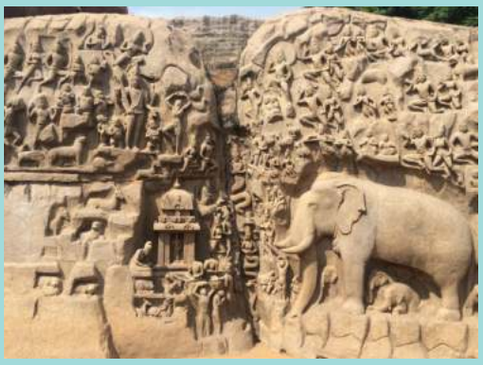
Kanchi Kailasanatha Temple

Kanchi Vaikuntha Perumal Temple

On either side are two *dwarapalas* (gatekeepers). This cave architecture reached its decadent phase after AD (CE) 700 and gave way to the large structural temples probably because the structural temples provided a wider scope to the sculptor to use his skill.

The Shore Temple at Mahabalipuram, also called the Seven Pagodas, was built by the Pallava king Narasimhavarman II. It is the oldest structural temple in South India. The structural temples were built using blocks of rock instead of a whole block as earlier. Narasimhavarman II, also known as Rajasimha, built the Kanchi Kailasanatha temple. The Vaikuntha Perumal temple at Kanchipuram was built by Nandivarman II. Mahabalipuram (Mamallapuram) is built of cut stones rather than carved out of caves. It has two shrines, one dedicated to Siva and the other to Vishnu.

The Tamil Dravida tradition is exemplified by rock-cut monuments such as *Pancha Pandava Rathas*, namely Draupadi ratha, Dharmaraja ratha, Bheema ratha, Arjuna ratha and Nagula-Sahadeva ratha. The outer walls of the rathas, especially of Arjuna, Bhima and Dharmaraja, are decorated with niches and motifs. The niches have the sculptures of gods, goddesses, monarchs and scenes from mythology. The *Arjuna's Penance,* carved on the face of a granite boulder, is a magnificent relief, measuring approximately 100 ft long by 45 ft high.



Arjuna's Penance

The Mamallapuram monuments and temples, including the Shore Temple complex, were notified as a UNESCO World Heritage Site in 1984.

Pandya Temples in the Pallava Epoch

Early Pandyas were the contemporaries of the Pallavas. Unlike the Pallavas, Pandyas installed deities in the sanctums in their cave temples. More than fifty cave temples

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have been found in different parts of the Pandyan Empire. The most important of them are found in Malaiyadikurichi, Anaimalai, Tiruparankundram and Trichirappali. These caves were dedicated to Siva, Vishnu and Brahma. In the Siva temple of Pandyas, the *linga* is carved out of the mother rock. The figure of Nandhi is also carved out of the rock. The Siva lingam in the sanctum is installed in the centre with enough space all around it. The sanctum also has a drainage canal. The pillars are divided into three parts and are of different sizes. The pillars have no uniform ornamentation. The back side walls are divided into four niches on which the bas- relief images of Siva, Vishnu, Durga, Ganapathy, Subramanya, Surya, Brahma and Saraswathi are carved out. The *dwarapalas* figure on either side of sanctum.

Rock-cut and structural temples are significant part of the Pandya architecture. The illustrious example for rock-cut style is unfinished Kazhugumalai Vettuvankoil temple. The Vettuvankoil, a monolithic temple at Kazhugumalai, is hewn out of a huge boulder on four sides. At the top of the temple, sculptures of Uma Maheswarar, Dakshinamoorthy, Vishnu and Brahma are found. Meenakshi Amman Temple in Madurai and Nellaiappar Temple in Tirunelveli represent examples of Pandyas' architectural style.

Monolithic Temple, Kazhugumalai

Nellaiappar Temple Corridor, Tirunelveli

Sculptures

The walls of the caves are decorated with the bas relief of the gods and goddesses. In the case of structural temples, the walls of the sanctums are free from image decorations. Instead the superstructures and the pillars have the sculptures. The sculptures look majestic, having elaborate shoulders, slim bodies, beautiful ornaments and high crowns.

Vettuvankoil Temple Sculptures

Tiruparankundram, Anaimalai and Kazhugumalai have the bas relief of many deities: Siva, Vishnu, Brahma, Parvathi, Subramanya, Ganapathi and Dakshinamoorthy. These are some remarkable images of the cave temples. Many early Pandya images unearthed from Madurai and its surrounding areas are now in Tirumalai Nayakkar museum at Madurai.

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Paintings

Caves at Sittanavasal, 15 kilometres away from Pudukkottai, and at Tirumalapuram in Sankarankovil taluk, Tirunelveli district, have outstanding early Pandya paintings. Sittanavasal was a residential cave of the Jain monks. They painted the walls with fresco painting. Unfortunately, we have lost many of those paintings. Among the surviving ones, the lotus pond is notable for its excellent execution of colours and exposition of the scene. The image of lotus flowers, leaves spread all over the pond, animals, elephants, buffaloes, swans and a man who plucks the flowers look brilliant.

Sittanavasal Paintings

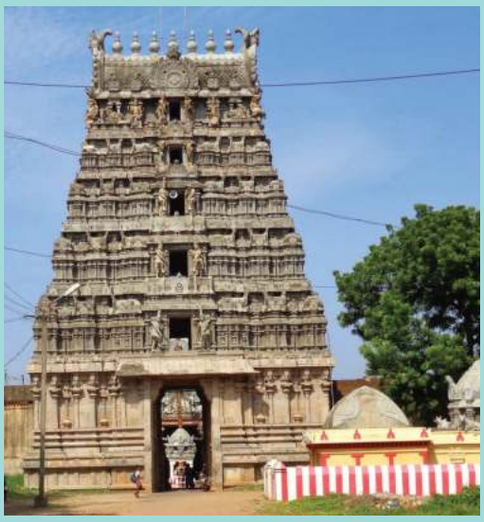
Thirumalaipuram Sculptures

The Sittanavasal paintings have similarities with the Ajantha paintings. Tirumalaipuram, from where we get early Pandya paintings, are in a damaged condition.

The Early Chola Epoch

The Cholas came to limelight in AD (CE) 850 under Vijaylaya Chola and continued to govern the region for about four hundred years. For the Early Chola epoch, the temple at Dadapuram, near Tindivanam in TamilNadu, is worth mentioning.

The early Chola architecture followed the style of Sembian Mahadevi. Temples with the increased number of *devakoshta* (niche) figures can be classified as belonging to the Sembiyan style. Tiruppurambiyam is an illustrious example of early temple that was re-fashioned in the days of Sembiyan Mahadevi.



Tirupurambiyam Temple

Later Chola Epoch

The maturity attained by Chola architecture is reflected in the two magnificent temples of Thanjavur and Gangaikonda

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Brihadeeshwara Temple, Thanjavur

Gangaikonda Cholapuram Temple

Cholapuram. The magnificent Thanjavur Big Temple dedicated to Siva, completed around AD (CE) 1009, is a fitting memorial to the material achievements of the time of Rajaraja.

Thanjavur Big Temple

At the time the Big Temple of Thanjavur was constructed, it was a huge temple complex. The 216 feet *vimana* (structure over the *garbhagriha*) is notable as it is one among the tallest man-made *shikaras* of the world. Due to its massive height, the *shikara* is called the Dakshina Meru. The huge bull statue (Nandi) measures about 16 feet long and 13 feet height and is carved out of a single rock

Gangaikonda Cholapuram

Gangaikonda Cholapuram served as the Chola capital for about 250 years, until the decline of the Cholas and the rise of the Pandyas. The Brihadeeshwara temple of Gangaikonda Cholapuram, built by Rajendra Chola, is undoubtedly as worthy a successor to the Brihadeeshwara temple of Thanjavur. The height of the temple is 55 metres. The sanctum has two storeys as in the big temple at Thanjavur. The outer wall has many projections with niches and recesses on three sides. In the niches there are the images of Siva, Vishnu and other gods. This temple complex has the shrines of Chandeeswarar, Ganesa and Mahishasura Mardhini.

Dharasuram

Dharasuram, near Kumbakonam, is a Later Chola period temple, rich in architectural splendour, dedicated to Iravatheswara (Siva as god of lord Indira's elephant). Rajaraja II constructed this temple. This temple is another landmark of the Chola architecture. The *Mahamandapam* is an elaborate structure. The entire structure looks like a *ratha* because it has four wheels at the *Mahamandapam*. The sanctum and pillars have many sculptures, which are miniatures of various mythological figures. A compound wall runs round the temple with a *gopuram*.

Iravatheswara Temple

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Later Pandyas

The contribution of Later Pandyas to South Indian art was significant. A case in point is the cave temple at Pillayarpatti (near Karaikudi, TamilNadu) belonging to 13th century. This temple is important both for its sculptures and for an inscription. A beautiful Ganesha is carved facing the entrance. The importance of the figure, referred to *Desivinayaga* in the cave inscription, is that there are two arms with the trunk turning to the right

Pillayarpatti Temple and Karpaka Vinayagar

Vijayanagara Epoch

During the Vijayanagara epoch, a new form of construction emerged. It is the *mandapam* (pavilion) to where the gods are carried every year. Pillared outdoor *mandapams* are meant for public rituals with the ones in the east serving as the waiting room for devotees, which adorn the large temples. These *mandapams* attract attention for its monolithic pillars. On these pillars are sculptured horses, lions and the gods. The kalyana mandapam at Kanchipuram (Varadaraja Perumal temple) and at Vellore (Jalagandeshwar temple) are notable examples. The most celebrated of these *mandapams* in temple of Madurai is the Pudumandapam.

Vellore Jalagandeshwar Temple Kalyana Mandapam

The main features of the Vijayanagar and Nayak architecture are decorated mandapas, ornamental pillars, life-size images, gopuras, prakaras, music pillars, floral works and stone windows during the 15th to 17th centuries. Tanks are attached to the temples. Gateways to temple are constructed from four directions with massive *gopurams*.

The practice of fitting the niches with sculptures continued during the Nayak period. There was an increased use of major sculpted figures (relief sculpture) as found at the Alakiya Nambi temple at Tirukkurungudi (Tirunelveli district) and the Gopalakrishna temple in the Ranganatha temple complex at Srirangam. The southern festival mandapam of Adinatha temple at Azhwar Tirunagari and the porch of the Nellaiyappar temple at Tirunelveli are other notable examples.

Mandapam of Adinatha Temple, Azhwar Tirunagari

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In TamilNadu, the image of deities attached to composite columns gradually freed themselves from the core column. The 1000-pillar *mandapam* of the Meenakshi-Sundareswarar temple, Pudumandapam at Madurai, Rathi Mandapam at Tirukkurungudi and Vanamamalai Temple at Nanguneri are illustrious examples for the *mandapam* architecture of this period.

1000-Pillar Mandapam, Madurai Meenakshiamman Temple

The pillars of this period are more decorative than the previous period. Monolithic gigantic *yazhi* pillars, horse pillars with life-size portraits of mythological and royal family members, common folk, animals and floral works were made. Musical pillars were the peculiar feature of this time. A sitting lion at the top of the pillars is a common feature in the *mandapams*. The windows are carved out on the walls of the sanctum and *mandapams*.

The Jalagandeshwara temple at Vellore, the temples at Thadikompu near Dindugal and Krishnapuram near Tirunelveli and the Subramanya shrine in the Big Temple Thanjavur are most remarkable edifices of this time. Vijayanagar and Nayak paintings are seen at Varadharaja Perumal temple at Kanchipuram, Kudalazhagar Temple at Madurai and the temples of Srivilliputhur, Tiruvellarai, Azhaharkoil, Tiruvannamalai and Srirangam. The paintings mostly have the stories from Ramayana, palace scenes and mythological stories.

Sculptures in Varatharaja Temple, Kanchipuram

Modern Period (After AD(CE) 1600)

The Sethupathis, as the feudatories of Madurai Nayaks, ruled Ramanathapuram and contributed to the Ramanathaswamy temple architecture. In the temple of Rameswaram, the predominance of corridors is striking. It is claimed that this temple has the longest set of corridors in the world. The temple has three sets of corridors. The outer set of the temple's corridors has a height of almost 7 metres and stretches for about 120 metres in both the eastern and western directions. The corridors to the north and to the south, on the other hand, are about 195 metres in length. The outer corridor is also remarkable for the number of pillars that support it, which is over 1200 in number. Moreover, many of these pillars are decorated by ornate carvings. The innermost set of corridors is the oldest of the three.

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Ramanathaswamy Temple Corridor, Rameswaram

Summary

In sum, the Pallava period featured sculptural rocks. The early Chola period was marked by grand *vimanas.* The Later Chola period was known for beautiful *gopurams.* Vijayanagar period's unique feature was the *mandapam* and the modern period was when corridors were given prominence.

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Glossary

1.	indigenous	native	சுதேசம், உள் நாடு
2.	epoch	era, age	சகாப்தம், வரலாற்றின் ஒரு காலகட்டம்
3.	sanctum	a sacred place set apart in a temple	கருவறை
4.	decadent	corrupt, a state of moral decline	சீர்கேடான
5.	exemplified	illustrated, represented	எடுத்துக்காட்டாய் திகழ்கிறது
6.	niche	a cavity, especially in a wall to display a statue	சிலை வைக்கப்படும் இடம்
7.	motif	a decorative design forming a pattern in an artistic work	கலைப்பண்புக் கூறு
8.	boulder	a very large rock	பெரிய கற்பாறை, பாறாங்கல்
9.	contemporaries	living or occurring at the same time	சமகாலத்தைச் சேர்ந்தவர்கள்
10.	hewn	cut out and shaped	செதுக்கப்பட்ட
11.	bas-relief	a sculpture carved into a wall	சுவற்றில் செதுக்கப்படும் சிற்பம்
12.	execution	carrying out	செயல் திறன், ஒன்றைச் செய்து முடித்தல்
13.	recesses	hollow spaces inside the wall or a structure	உட்பகுதிகள், இடைவெளிகள்

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Evaluation

I. Choose the correct answer:

1. Which is the oldest structural temple in south India?
   a) Shore Temple
   b) Mandagapattu
   c) Kailasanatha Temple
   d) Vaikuntha Perumal Temple

2. In which year were the Mamallapuram monuments and temples notified as a UNESCO world Heritage site?
   a) 1964 b) 1994
   c) 1974 d) 1984

3. What was the special feature of the architecture of early Chola period?
   a) bas-reliefs b) *vimanas*
   c) corridors d) *gopurams*

4. Where is the Azhakiya Nambi Temple situated?
   a) Tirukkurungudi b) Madurai
   c) Tirunelveli d) Srivilliputhur

5. Who built the Vaikuntha Perumal Temple?
   a) Mahendravarman
   b) Narasimhavarman
   c) Rajasimha
   d) Rajaraja II

II. Fill in the Blanks:

1. _____ was the first rock-cut cave temple built by the Pallava king Mahendravarman.
2. The early Chola architecture followed the style of _____.
3. The most celebrated *mandapam* in Madurai Meenakshiamman temple is the_____.
4. Later Chola period was known for beautiful _____.
5. Vijayanagar period's unique feature is the _____.

III. Match the following:

1. Seven Pagodas	–	Madurai
2. Rathi mandapam	–	Darasuram
3. Iravatheswara temple	–	Tirukkurungudi
4. Adinatha Temple	–	Shore temple
5. Pudumandapam	–	Azhwar Tirunagari

IV. Find out the wrong pair/pairs:

1. Krishnapuram Temple	–	Tirunelveli
2. Kudalazhagar Temple	–	Azhwar Tirunagari
3. Sethupathis	–	Feudatories of Madurai Nayaks
4. Jalagandeshwara temple	–	Vellore

2. **Assertion (A):** The predominance of corridors of Rameswaram Temple is striking.
   Reason (R): The Temple has the largest set of corridors in the world.
   a) R is not the correct explanation of A
   b) R is the correct explanation of A
   c) A is correct but R is wrong
   d) Both A and R are wrong

3. Find out the odd one out:

Srivilliputhur, Azhaharkoil, Srirangam, Kanchipuram, Tiruvannamalai.

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4. Find out the correct statement/s:

1) The *Arjuna's Penance* is carved out of a granite boulder.
2) Meenakshi Amman temple in Madurai represents Pallava's architectural style.
3) The cave temple at Pillayarpatti is a contribution of Later Pandyas.
4) The Sethupathis as feudatories of Madurai Nayaks contributed to Madurai Meenakshiamman Temple.

V. State true or false:

1. Rajasimha built the Kanchi Kailasanatha temple.
2. Early Pandyas were the contemporaries of Later Cholas.
3. Rock-cut and structural temples are significant parts of the Pandya architecture
4. Brihadeeshwara temple was built by Rajendra Chola.
5. Vijayanagar and Nayak paintings are seen at temple at Dadapuram.

VI. Give short answers:

1. Write a note on *Pancha Pandava* Rathas.
2. Throw light on the paintings of Sittanavasal.
3. Point out the special features of Thanjavur Big temple.
4. Highlight the striking features of Rameswaram Temple.

VII. Answer the following in detail

1. The Pallava epoch witnessed a transition from rock-cut to free–standing temples – Explain.
2. Discuss how the architecture of Vijayanagara and Nayak period was different from the one of Pallavas and Later Cholas.

VIII. HOTS:

1. Dravidian architecture is of indigenous origin - Explain.
2. Temple art was at its best during the Nayak Period - Elucidate.

IX. Activity:

Visiting temples built during the times of Pallavas, Cholas, Pandyas and Nayak rulers and see the differences in the structural and sculptural designs of each epoch.

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Unit -3

Jainism, Buddhism and Ajivika Philosophy in Tamil Nadu

Learning Objectives

- To know the sources and literature of heterodox religious sects: Jainism, Buddhism and Ajivikam
- To gain knowledge of the teachings of Mahavira, Buddha and Gosala, the founder of Ajivika sect.
- To acquaint ourselves with the monuments of the above-mentioned religious sects in Tamil Nadu.

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Introduction

During the 6th century BC (BCE), according to the *Bigha Nitaya* (an ancient Buddhist tract), as many as 62 different philosophical and religious schools flourished in India. However, among these numerous sects, only the Ajivikas survived till the late medieval times. But Jainism and Buddhism continued to flourish until the modern times. Buddha and Mahavira, the founders of these two faiths, based their ethical teachings against the sacrificial cult of the Vedic religion. Their teachings were preserved and passed on through monks, who were drawn from various social groups.

Sources and Literature: Jainism

Mahavira's preaching was orally transmitted by his disciples over the course of about one thousand years. In the early period of Jainism, monks strictly followed the five great vows of Jainism. Even religious scriptures were considered possessions and therefore knowledge of the religion was never documented. Two hundred years after the attainment of *nirvana* (death) of Mahavira, Jain scholars attempted to codify the canon by convening an assembly at Pataliputra. It was the first Jain council to debate the issue, but it ended as a failure because the council could not arrive at a unanimous decision in defining the canon. A second council held at Vallabhi, in the 5th century AD (CE) was, however, successful in resolving the differences. This enabled the scholars of the time to explain the principles of Jainism with certainty. Also, over time, many learned monks, older in age and rich in wisdom, had compiled

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commentaries on various topics pertaining to the Jain religion. Around 500 AD (CE) the Jain *acharyas* (teachers) realised that it was extremely difficult to keep memorising the entire Jain literature complied by the many scholars of the past and present. In fact, significant knowledge was already lost and the rest was tampered with modifications. Hence, they decided to document the Jain literature as known to them.

Five Great Vows of Jainism: 1. Non-violence – *Ahimsa;* 2. Truth– *Satya;* 3. Non-stealing – *Achaurya;* 4. Celibacy/Chastity – *Brahmacharya;* 5. Non-possession – *Aparigraha.*

A major split occurred in Jainism (1st century BC (BCE), giving rise to two major sects, namely *Digambaras* and *Swetambaras.* Both the *Digambaras* and the *Swetambaras* generally acknowledge the *Agama Sutras* to be their early literature, while they do differ with regard to their content and interpretation.

Jain Literature

Jain literature is generally classified into two major categories.

1. Agama Sutras

Agama Sutras consists of many sacred books of the Jain religion. They have been written in the Ardha-magadhi Prakrit language. Containing the direct preaching of Mahavira, consisting of 12 texts, they were originally compiled by immediate disciples of Mahavira. The 12th Agama Sutra is said to have been lost.

2. Non-Agama Literature

Non-Agama literature includes commentary and explanation of Agama Sutras, and independent works, compiled by ascetics and scholars. They are written in many languages such as Prakrit, Sanskrit, old Marathi, Rajasthani, Gujarati, Hindi, Kannada, Tamil, German and English. Recognition was given to 84 books, and among them, there are 41 sutras, 12 commentaries and one *Maha Bhasya* or great commentary. The 41 sutras include 11 *Angas* (scriptures followed by *Swetambaras*), 12 *Upangas* (instructions manuals), five *Chedas* (rules of conduct for the monks), five *Mulas* (basic doctrine of Jainism) and eight miscellaneous works, such as *Kalpasutra* of Bhadrabahu. It is believed that the *Panchatantra* has a great amount of Jain influence.

The *Jainacharitha* of *Kalpa Sūtra* is a Jain text containing the biographies of the Jain Tirthankaras, notably Parshvanatha, founder of Jainism as well as the first Tirthankara, and Mahavira, the last and the 24th Tirthankara. This work is ascribed to Bhadrabahu, who along with Chandragupta Maurya migrated to Mysore (about 296 BC (BCE) and settled there.

Tirthankaras are those who have attained *nirvana* and made a passage from this world to the next.

In addition to these, we have some Jain texts composed in Indian vernacular languages such as Hindi, Tamil and Kannada. *Jivaka Chintamani,* a Tamil epic poem, is a good example, composed in the tradition of Sangam literature by a Jain saint named Tiruthakkathevar. It narrates the life of a pious king who rose to prominence by his own merit only to become an ascetic in the end. Another scholarly work in Tamil, *Naladiyar,* is also attributed to a Jain monk. *Thirukkural* was composed by Tiruvalluvar, believed to be a Jain scholar.

Jains in Tamil Nadu

There is a clear evidence of the movements of the Jains from Karnataka to the Kongu region (Salem, Erode and Coimbatore areas), to the Kaveri Delta (Tiruchirapalli) southwards into Pudukkottai region (Sittannavasal) and finally into the Pandya kingdom (Madurai, Ramanathapuram and Tirunelveli districts). Tamils broadly come under *Digambara* sect. It is believed that the Kalabhras were the patrons of Jainism.

The Sittanavasal Cave Temple

Sittanavasal cave in Pudukkottai district is located on a prominent rock that stands 70 m above the ground. It has a natural cavern, known as Eladipattam, at one end, and a rock-cut cave temple at the other. Behind the fenced cavern, there are 17 rock beds marked on the floor. The stone berths aligned in rows are believed to have served as a Jain shelter. The largest of these ascetic beds contains a Tamil-Brahmi inscription that dates to the 2nd century BC (BCE) There are more inscriptions in Tamil from the 8th century AD (CE) bearing the names of monks. It is believed that they should have spent their lives in isolation here.

Sittanavasal Cave

The Sittanavasal cave temple, named Arivar Koil, lies on the west off the hillock. The facade of the temple is simple, with four rock-cut columns. Constructed in the early Pandya period, in the 7th century AD (CE) it has a hall in the front called the Ardha-mandapam and a smaller cell at the rear, which is the *garbha graha* (sanctum sanctorum).

Fresco Paintings, Sittanavasal

The murals in the temple resemble the frescoes of the famous Ajanta caves. The Archaeological Survey of India (ASI) took over the caves only in 1958. Thereafter it took two decades to cover the cave and regulate the entry of visitors. There are the bas- relief figures of Tirthankaras on the left wall of the hall and acharyas on the right before one enters the inner chamber, the sanctum sanctorum.

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Jains in Kanchipuram (Tiruparuttikunram)

Jainism flourished during the Pallava reign. In his writings, Chinese traveller Hiuen Tsang has mentioned about the presence of a large number of Buddhists and Jains during his visit to the Pallava country in 7th century AD (CE). Most of the Pallava rulers were Jains. Mahendravarman was a Jain initially. The two Jain temples in Kanchipuram are Trilokyanatha Jinaswamy Temple at Tiruparuttikunram, on the banks of the river Palar, and the Chandra Prabha temple dedicated to the Tirtankara named Chandraprabha. The architecture of these temples is in Pallava style, but it has deteriorated in due course of time. During the Vijayanagar rule (1387), Irugappa, a disciple of Jaina-muni Pushpasena; and a minister of Vijayanagar King Harihara II (1377-1404), expanded the Trilokyanatha Temple by adding the Sangeetha mandapa. The grand murals were added only at this time.

Jain Temple, Tiruparuttikunram

Mural paintings in the temples show scenes from the lives of Tirtankaras. Unfortunately the paintings of the Trilokyanatha temple at Tiruparuttikunram have been ruined by over-painting done during renovation. There is rich inscriptional evidence inside the second shrine, the Trikuda Basti, containing information on the development of the temple, and the contributions of various donors over the centuries.

Paintings on the walls of the Trilokyanatha Temple

In the Kanchipuram district, apart from Tiruparuttikunram, Jain vestiges have been found over the years in many villages across the state.

> The total population of Jains in Tamil Nadu is 83,359 or 0.12 per cent of the population as per the 2011 census.

Kazhugumalai Jain Rock-Cut Temple

The 8th century Kazhugumalai temple in Kovilpatti taluk in Thoothukudi district marks the revival of Jainism in Tamil Nadu. This cave temple was built by King Parantaka Nedunjadaiyan of the Pandyan

kingdom. Polished rock-cut cave beds, popularly known as Panchavar Padukkai at Kazhugumalai cavern host the figures of not only the Tirtankaras but also the figures of *yakshas* and *yakshis*.

Sculptures in Kazhugumalai Cave Temple

Jain Temples in other parts of Tamil Nadu

Vellore

Fourteen Jain monk beds, dating back to the 5th century AD (CE) have been excavated inside three caverns on top of a hill in Vellore district. The beds are found at the Bhairavamalai in Latheri, Katpadi taluk, Vellore district. Of the three caverns, two of them house beds. One houses four rock beds while the other houses one bed. Unlike many rock beds found elsewhere, these ones have no head-rests.

Tirumalai

Tirumalai is a Jain temple in a cave complex located near Arni town in Tiruvannamalai district in Tamil Nadu. The complex, dated to the 12th century AD (CE) includes three Jain caves, two Jain temples and a 16.5 feet-high sculpture of Neminatha, the 22nd Tirthankara. This image of Neminatha is considered to be the tallest Jain image in Tamil Nadu.

Madurai

There are 26 caves, 200 stone beds, 60 inscriptions and over 100 sculptures in and around Madurai. The Kizha Kuyil Kudi is a striking example. This hillock is 12 kilometres west of Madurai, on the Madurai–Theni Highway. The sculptures are assigned to the period of Parantaka Veera Narayana Pandyan who ruled from AD CE). 860 to 900. There are eight sculptures. The images of Rishab Nath or Adinath, Mahavira, Parshvanath and Bahubali are found here.

Rock-cut Jain Temple, Kizha Kuyil Kudi

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Contribution to Education

Jaina monasteries and temples also served as seats of learning. Education was imparted in these institutions to the people irrespective of caste and creed. The Jainas propagated their doctrines and proved to be a potential media of mass education. The Bhairavamalai we have mentioned earlier is situated near a small village called Kukkara Palli. 'Palli' is an educational centre of Jains and villages bearing the suffix of Palli are common in many places in Tamil Nadu.

The educational institutions had libraries attached to them. Several books were written by the preachers of Jainism, highlighting the important aspects of Jainism. The permission for women to enter into the order provided an impetus to the spread of education among women.

Buddhism

Buddha's original name, Siddhartha Sakya-muni Gautama, if translated into English, would mean *Gautama who belongs to the Sakya tribe and who has reached the goal of perfection.* Gautama Buddha was a contemporary of Mahavira. His father ruled the tribe of Sakya in a region near the present-day Nepal. Gautama found that he had nothing to learn from the teachers of the old religions. The religions proclaimed that the only way to salvation was through living the life of an ascetic. But despite practicing asceticism, Gautama could not arrive anywhere near the truth. And one night, as he sat under a bodhi-tree struggling with his doubt and his loneliness, a great peace descended on him. He was no longer Gautama, the sceptic, but became Buddha, the Enlightened. At last, he had succeeded in understanding the great mystery of human suffering, its causes and its cure. Asserting that both the king (passion for pleasures) and the hermit (self-mortifications) were wrong, he discovered the middle path. The middle path is based on 'an eight-fold path' of Right understanding , Right thought, Right speech, Right action, Right livelihood, Right effort, Right mindfulness, Right concentration.

Buddha taught not the glory of God but the power of love. He held the view that all men are born to an 'equality of rights'. He undertook long journeys and carried his message far and wide. Buddha preached his teachings in Prakrit. His four noble truths are as follows:

1. Life includes pain, getting old, disease, and ultimately death.
2. Suffering is caused by craving and aversion.
3. Suffering can be overcome and happiness attained.
4. True happiness and contentment are possible, if one pursues the eight-fold path.

Buddhist Literature

Buddha's teachings for a long time were transmitted through the memory of teachers and disciples. They were reduced to writing by 80 BC (BCE). and were written in the Pali language. The Pali canon *Tripitaka* has three divisions, also known as the Threefold Basket. They include *Vinaya Pitaka, Sutta Pitaka* and *Abhidhamma Pitaka.*

Vinaya Pitaka contains the rules of the order of Buddhist monks, which must be observed for achieving purity of conduct.

Sutta Pitaka lays down the principles of religion by citing discourses as evidence.

Abhidhamma Pitaka is the latest of the Tripitaka. It deals with ethics, philosophy and meta-physics. Other prominent canonical literary works in Buddhism include:

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Jatakas – various stories of the lives of the Buddha found in Buddhist literature.

Buddhavamsa – A legend in verse, containing a narration of the life and activities of the 24 Buddhas who are believed to have preceded Gautama. Apart from the above canonical literature, there is a long series of non-canonical literature in Pali. They include:

- ***Milindapanha*** – which means 'questions of Milinda'. It contains a dialogue between Milinda, the Graeco-Bactrian king, and the monk Nagasena over some problems that faced Buddhism. It was originally written in Sanskrit.
- The two famous Ceylonese chronicles are ***Mahavamsa*** and ***Dipavamsa***. The former deals with the royal dynasties of the Indian subcontinent including Sri Lanka, while the latter deals with the arrival of the Buddha's teachings and preachers in Sri Lanka.
- **Buddhagosha's *Visuddhimagga*** is a later work. He is the first Buddhist commentator.
- Sanskrit literature became prominent in Buddhism with the rise of Mahayana Buddhism. However, some of the Sanskritic works were produced by the Hinayana school as well. *Buddhacharita,* written by Asvaghosa, is an epic style Sanskrit work. It tells the life history of Gautama Buddha.

Buddhism in Tamizhakam

Buddhism is believed to have spread to the Tamil country by the Ceylonese missionaries. The evidence in support of this is some monuments of the Pandya country, which are assigned to the 3rd century BC (BCE). The monuments are in caverns known as Pancha Pandava Malai. Buddhism seems to have flourished and co-existed peacefully with Jainism, Ajivikam and also with various sects of Hinduism. Since the time of Bhakti Movement, Buddhism came to be challenged by its exponents and began to lose royal patronage. The *Thevaram* hymns of Saiva saints and the *Nalayira Divyaprabandam* of Vaishnava Azhwars provided evidence to the challenges Buddhism faced in Tamil country. When Hieun Tsang, the Chinese traveller, visited south India in the 7th century, Buddhism was almost on the decline.

But contrary to popular perception, the Buddhism did not disappear completely. The presence of *Virasozhiyam* (a 11th century Later Chola period grammar text, composed by a Buddhist) and the discovery of 13th century Buddhist bronzes in Nagapattinam testify to the presence of Buddhism in later periods. The sculptures of Buddha in Thiyaganur village in Salem district strengthen this conclusion.

Buddha image, Thiyaganur

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Though Buddhism faced challenges from Saiva and Vaishnava sects from the Pallava period onwards. One of the exceptions was Nagapattinam, which was supported by Chola kings, not for religious but for political reasons. Chudamani Vihara of Nagapattinam was constructed by the Srivijaya king with the patronage of Rajaraja Chola. This vihara has been since destroyed. The Tamil epic, *Manimekalai,* written by Kulavanigan Sithalai Sattanar, is considered a typical representation of Tamil Buddhism. Sattanar indigenised Buddhism into Tamil Buddhism by communicating a large set of Buddhist terms in Tamil, as translations from Sanskrit and Pali.

There is a record about a Buddhist monk named Vajrabodhi, who was skilled in tantric rituals, but this monk left the Pallava court for China. Mahendravarman's *Mattavilāsa Prahasana* describes Buddhism as a religion in decay.

In the field of education, Buddhist *Sanghas* and *Viharas* served as centres of education. Students from various parts of the world came here to receive education. Nalanda, Taxila and Vikramshila gained reputation as great educational centres. They were originally Buddhist Viharas. Students from Tibet and China were influenced by Buddhism and they took effective steps to spread Buddhism.

A Vihara in Sanskrit means 'dwelling' or 'house'. Originally, viharas were dwelling places used by wandering monks during the rainy season. Later they transformed into centres of learning through the donations of wealthy lay Buddhists. Royal patronage allowed pre-Muslim India to become a land of many viharas that imparted university education and were treasure troves of sacred texts. Many viharas, such as Nalanda were world famous.

Viharas

Buddhist Vihara of Nalanda in ruins

Excavations of Buddhist Vihara and a temple at Kaveripoompattinam and hundreds of stone and bronze sculptures by ASI from over 125 sites have proved the spread of the religion in the state. A 1.03 metre Buddha statue in *'padmasana'* pose in remote Tirunattiyattankudi village in Tiruvarur district was unearthed when digging a tank in a field.

Buddha in '*padmasana*' pose

3. Ajivika Philosophy

The Ajivikas believed in the doctrine of karma, transmigration of the soul and

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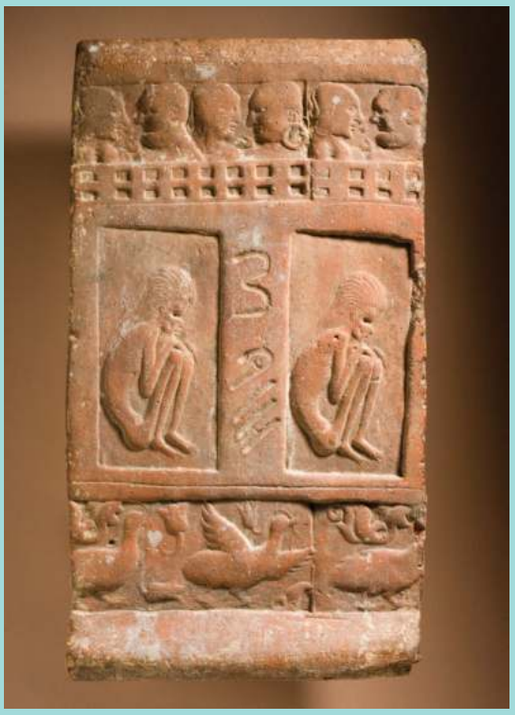
determinism. The head of Ajivika sect was Makkhali Gosalar. The Ajivikas practiced asceticism of a severe type. The Ajivika religious order and school of philosophy is known from the Vedic hymns, the *Brahmanas,* the *Aryankas* and other ancient Sanskrit compilations and treatises of the pre-Jaina and pre-Buddhist age. Gosala's ideas live on in other religions, though no Ajivika literature has survived.

Gosala was closely associated with Mahavira for six years and then they parted company. The Mauryan emperor Asoka and his grandson Dasaratha patronised the Ajivikas. After the collapse of the Mauryan Empire, the sect declined in northern India, but had by then spread into southern India where it continued to exist for many centuries.



Representational Image of Ajivika ascetics

Throughout history, Ajivikas had to face persecution everywhere. Village communities under Pallavas, Cholas and Hoysalas imposed special taxes on them. Despite such obstacles, Ajivikas continued to have influence along the Palar river in the modern states of Karnataka and Tamil Nadu (Vellore, Kanchipuram and Tiruvallur districts) till about the 14th century. In the end, they seemed to have been absorbed into Saivism or Vaishnavism.

Summary

- Sources and literature for study of Jainism are highlighted.
- Presence of Jains in the Tamil country is examined.
- Jain monuments and art in Tamizhakam, in particular Sittanavasal and Kazhugumalai are illustrated.
- The Jain contribution to education through 'Palli' is explained.
- Buddhist teachings are analysed.
- Buddhism in the Tamil country is explored.
- Buddhist legacy in Tamizhakam is discussed.
- The essence of Ajivika philosophy and its presence in Tamil Nadu is detailed.

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Glossary			
1.	heterodox	not conforming to orthodox beliefs, especially religious ones, unorthodox	பழமை சாராத, வழக்கத்திலுள்ள மதக்கொள்கைக்கு மாறான
2.	canon	a rule, an accepted principle	ஒரு விதி, பொது ஒழுங்கு
3.	unanimous	all sharing the same view	ஒருமனதாக
4.	ascetic	monk, hermit	துறவி, சந்நியாசி
5.	deteriorate	to grow worse	சீர்கெடு, மோசமடை
6.	vestiges	things left behind, remains, traces	தடங்கள், அடையாளங்கள், சுவடுகள்
7.	cavern	a large deep underground cave	அடிநில குகை
8.	hillock	small hill, mound	சிறு குன்று
9.	facade	the front of a building	கட்டடத்தின் முகப்பு
10.	frescoes	paintings done in water colour on a wall or ceiling	சுவரில் அல்லது மேற்கூரையில் வரையப்படும் ஓவியங்கள்
11.	mural	a large picture painted on a wall	சுவரோவியம்
12.	impetus	motivation, stimulus	உத்வேகம், உந்துசக்தி
13.	salvation	saving from harm, ruin or loss	இரட்சிப்பு, முக்தி, விமோசனம்
14.	sceptic (skeptic)	someone who habitually doubts accepted beliefs	ஐயுறவுவாத, சமய ஐயுறவாளர்
15.	craving	a strong desire	அடக்கமுடியாத ஆசை, மிகு விருப்பம்
16.	persecution	unfair treatment of a person or a group, especially because of their religious or political beliefs	துன்புறுத்தல், அடக்குமுறை

Evaluation

I. Choose the correct answer:

1. Where was the first Jain Council held to codify the Jaina canon?
   a) Pataliputra
   b) Vallabhi
   c) Mathura
   d) Kanchipuram

2) In which language was Agama sutras written?
   a) Ardha-Magadhi Prakrit
   b) Hindi
   c) Sanskrit
   d) Pali

3) Which of the following was patronised by the Kalabhras?
   a) Buddhism b) Jainism
   c) Ajivikas d) Hinduism

4) Where are the Rock beds found with no head-rests?
   a) Vellore b) Kanchipuram
   c) Sittanavasal d) Madurai

5) Who is believed to have built the Kazhugumalai Rock-Cut Temple?
   a) Mahendra Varman
   b) Parantaka Nedunchadayan
   c) Parantaka Veera Narayana Pandyan
   d) Harihara II

II. Fill in the blanks:

1) The image of _____ is considered to be the tallest Jain image in Tamil Nadu.

2) *Buddhacharita* was written by _____.

3) Chinese traveller Huein Tsang visited Pallava country in _____ century.

4) _____ describes Buddhism as a religion in decay.

5) The Mauryan emperor Asoka and his grandson Dasarata patronised _____.

III. Match the following:

1. *Kalpa sutra* – Tiruthakkathevar
2. *Jivaka Chintamani* – Madurai
3. Neminatha – Nagasena
4. *Milinda Panha* – Bhadrabahu
5. Kizha Kuyil Kudi – 22nd Tirthankara

IV. Answer the following:

1) Find out the odd one

Tiruparuttikunram, Kizha Kuyil Kudi, Kazhugumalai, Nagapattinam, Sittanavasal.

2) **Assertion (A):** Gautama found that he had nothing to learn from the teachers of the old religions.

Reason (R): The religions proclaimed that the only way to salvation was through living the life of an ascetic.

a) A is correct. R is the correct explanation of A.

b) A is correct. R is not the correct explanation of A.

c) Both A and R are wrong.

d) A is wrong. But R is correct.

3) Find out the correct statement/s

i) During the 6th century B.C. as many as 62 religious schools flourished in India.

ii) 'Palli' is an educational centre of Buddhists.

iii) Royal patronage allowed pre-Muslim India to become a land of vihars.

iv) The Ajivikas continued to exist till 15th century.

a) i) and iii) are correct.

b) i), ii) and iv) are correct.

c) i) and ii) are correct.

d) ii), iii) and iv) are correct.

4) Find out the wrong pair/s

1. Parshvanatha – 22nd Tirthankara
2. *Mahabashya* – the Ceylonese Chroniclei
3. *Visuddhimagga* – Buddhagosha
4. Buddha – Eight-fold Path

V. True or False:

1. The 12th Agama Sutra is said to have been lost.
2. Throughout history, Ajivikas had to face persecution everywhere.
3. Education was imparted in institutions of Jains irrespective of caste and creed.
4. Nalanda, Taxila and Vikramashila gained reputation as pilgrim centres.
5. Buddhism faced challenges from Saiva and Vaishnava sects from the Chola period onwards.

VI. Answer the following:

1. Make a list of the Five Great Vows of Jainism.
2. What are the four noble truths of Buddha?
3. Explain the three divisions of Tripitaka.
4. Highlight the importance of Sittanavasal.

VII. Answer in detail:

1. Enumerate the sources of study for Jainism and Buddhism.
2. Give an account of relics of Jainism and Buddhism that have come to light in Tamil Nadu.
3. Discuss the essence of Ajivika philosophy and its presence in Tamil Nadu.

VIII. HOTs:

1. Analyse the commonalities and differences between heterodox religions and Vedic religion.
2. Why did these heterodox religions fail to become mainstream religion in India?

IX. Activity:

Students to visit district museums and places, where excavated Buddhists and Jain relics are on display.

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ICT CORNER

BUDDHISM

To know and learn about the Buddhism through this activity.

PROCEDURE :

Step 1: Open the Browser and type the URL (or) Scan the QR Code.

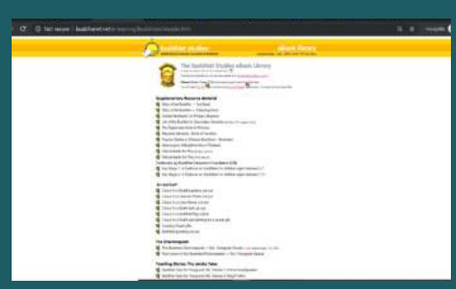
Step 2: Story of Buddha page will appear on the screen.

Step 3: Click on the Image to know about the story of Buddha.

Step 4: Click on the ebook below the image to download the PDF.

Step 1

Step 2



Step 3

Web URL: BUDDHISM

http://www.buddhanet.net/e-learning/buddhism/storybuddha.htm

*Pictures are indicative only

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GEOGRAPHY

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Unit -1

Exploring Continents – North America and South America

Learning Objectives

- To understand the location, boundary and political divisions of North America and South America.
- To understand the physical features and the drainage.
- To understand the climate, natural vegetation and wildlife of the continents .
- To discuss the resources, economic activities and cultural mosaic.
- To develop the skill of locating places on the map.

Introduction

Students : Good morning madam

Teacher : Good morning students. Did you all enjoy your half yearly exam holidays.

Students : Yes madam

Teacher : Fine. How many continents are there in the world? Can anyone of you name them?

Students : Madam there are seven continents. They are North America, South America, Europe, Asia , Antarctica, Australia and Africa.

Teacher : Last year, how many continents you did study?

Students : Madam, we studied about two continents. They are Europe and Asia.

Teacher : Ok, this year we will be learning about North America and South America.

A. North America

North and South America are often referred to as the new world because they were discovered in the late fifteenth century. In 1492 North America was discovered by Christopher Columbus while he was trying to find a new sea route to India. The landmass was named America in 1507 after the Italian explorer Amerigo Vespucci who landed on this

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continent. In this lesson we can learn location, boundaries, relief features, rivers, climate, natural vegetation, minerals and transportation.

Location and Area

The continent of North America lies between 7°N and 84°N latitude which lie entirely in the Northern Hemisphere. The Tropic of Cancer(23 ½°N) passes through the Mexico and Arctic Circle (66 ½°N) runs through northern part of Canada. Longitudinally it extends between 53°W and 180°W and lies entirely in the western hemisphere. This continent has a great longitudinal extent which results in Seven Time Zones. North America covers an area of about 24,709,000 Sq. km. Which occupies 16.50 percent of the entire land area.

Boundaries

North America is surrounded by the Pacific Ocean in the West, the Atlantic Ocean in the east, Arctic Ocean in the north and South America in the south. The Isthmus of Panama joined with the North America and South America. The Bering Strait separates North America from Asia.

Political Division

North America is the third largest continent next to Asia and Africa. North America has three large countries and several smaller ones. Canada is the largest country of North America followed by the United States of America and Mexico. The seven small countries which lies to the south of Mexico are referred to as central America. These include Nicaragua, Honduras, Guatemala, Panama, Costa Rica, El Salvador and Belize.

DO YOU KNOW?

Isthmus : A narrow stretch of land joining two large land masses.

Strait: A narrow stretch of water joining two large water bodies.

Political division of North America

Physiography

North America is a continent of great physical diversity. Mount McKinley is about 6194 m above the sea level and is the highest peak. In North America death valley is about 86 m below the sea level and is the lowest part of the continent of North America. It has some of the oldest and the youngest rocks in the world. On the basis of physiography North America can be classified into four major physical divisions:

1. The Rocky Mountains,
2. The Great Plains,
3. The Appalachian Highlands and
4. The Coastal Plain.

1. The Rocky Mountains

The western part of the continent is occupied by long ranges of young folded mountains interspersed with high plateaus, narrow valleys and broad interior basins. This mountain range extends for about 4800 km from Alaska in the North to the Panama Strait in the South. The width varies from 110 to 480 Kms. They are consists of parallel ranges and are known as the Rockies in the east and the Coast Range Mountains in the west. The Sierra Nevada is a mountain range in the Western United States lies between the Central Valley of California and the Great Basin. In Mexico, they are called Sierra Madre. The Rockies and the Coast Range are together is known as "Western Cordilleras". There are high intermontane plateaus lies between these ranges. Such as the Mexican plateau, the Colorado Plateau and the Columbian plateau.

DO YOU KNOW?

The Cordilleras are also part of the Fire Ring of the Pacific because there are a number of active volcanoes and this area is also subject to earthquakes.

Physiography of North America

DO YOU KNOW?

Highest peaks in different continents:

- **Asia:** Mount Everest (8848 meters)
- **South America:** Mount Aconcagua (6961 meters)
- **North America:** Mount McKinley (6194 meters)
- **Africa:** Mount Kilimanjaro (5895 meters)
- **Europe:** Mount Elbrus (5642 meters)
- **Antarctica:** Mount Vinson Massif (4,892meters)
- **Aust**ralia: Mount Kosciuszko (2,228 meters)

The Great Plains

To the east of the Rockies and the west of the Appalachian Mountains lies the great plains of North America. It covers about three - fifth of the continent. This plain stretches from the Arctic Ocean in North to the Gulf of Mexico in the South and from the Appalachian Highlands in the east to the Rockies in the west. The western part of the plains is called the High Plains spreading roughly over the foothills of the Rockies. Most of the rivers of this region have their source in the Western Highlands and the plains generally slope eastwards and southwards. They are drained by rivers like the Mississippi and the Missouri.

The Appalachian Highlands

The Appalachian Highlands do not form a continuous chain like the Western Highlands (The Rockies). These Highlands are low and wide. They have a very few peaks more than 1800m. They include the High Plateaus of Greenland, Labrador or Laurentian Plateau in Canada and the Appalachian Mountains in the United States. These old fold mountains are worn down by weathering and are much lower than the Western highlands. This region is rich in mineral reserves like coal, iron ore, copper etc., which play a vital role in the North American economy.

The Coastal Plains

The coastal plains of North America are the youngest in age. Most of the Atlantic Plain has been drowned (lies underwater). This is low and relatively plain area with sandy soil which is infertile in nature. Here swamps and marshes are abundant and the coast is indented by river mouths and bays on which many important seaports are located.

Drainage

Many rivers flow across this land and some of them following the valleys are formed by the glaciers. The Mississippi and Missouri rivers are the longest rivers in North America and together they form the fourth longest river system in the world and stretching more than 6114 km from Montana to Gulf of Mexico. After 3700km running the Missouri river joins the Mississippi river. The Mackenzie River is the second largest drainage basin of North America. It has it source from Great Slave Lake and drains into Arctic Ocean.

St. Lawrence has its origin in Lake Ontario which flows north east and drains into the Atlantic Ocean. The plateau of the west has been cut deeply by the River Columbia and its tributary which forms many Gorges called Canyons. The most famous is the Grand Canyon cut by the river

Colorado which all flows over the plateau of Columbia. These rivers form a barrier to communication but whose water has been dammed for irrigation and power. The River Yukon rising in the north-west of the Western mountain system is frozen for eight months in the year. The River Rio Grande flows into the Gulf of Mexico and forms the boundary between USA and Mexico.

DO YOU KNOW?

Grand Canyon is a steep-sided Canyon carved by the Colorado River in Arizona State of USA

Numerous lakes are found in the glaciated parts of the continent and especially in North Minnesota. These lakes are small and they are used for recreational purposes. The Great Lakes are formed across the continent from west to east. The most important chain consists of five lakes. The biggest is Lake Superior and it is the largest freshwater lake in the world. Lake Winnipeg, Great Bear Lake and Lake Athabasca are some of the other lakes in Canada.

Mississippi River

DO YOU KNOW?

The Mississippi river has been given the nickname "The Big Muddy" because it erodes a lot of sand and mud on its passage.

Some of the States in United States of America are named after the tributaries of these two mighty rivers the Mississippi and Missouri.

Climate

The vast latitudinal extend from the Tropical region to the Polar Regions makes the climate of North America as varied as that of Asia. Unlike the Himalayas, the Rockies run north to south which do not act as a climatic barrier and can not prevent the icy winds from the Arctic region. So the cold winds penetrating the central plains which therefore have a very long cold winter and very short hot summer. Precipitation occurs due to cyclonic storms. The Arctic region is cold and mostly dry and has a very short summer and a very long bitterly cold winter. As one proceeds southwards the short summer becomes warm but the winter is very cold. The central plains had extreme climate. Freezing conditions in winter and tropical heat in summer.

The South is usually warm all the year round and the regions around the mouth of the Mississippi-Missouri and the Gulf Coast have summer rain from the North East Trades which blow on-shore in summer. The warm moist South Westerlies not only bring rainfall to the North West coast and also keep it warm. The warm Alaskan Current keeps the North West coast ice free. The State of California in USA has a Mediterranean Climate with moist winter and dry summers.

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DO YOU KNOW?

The **Westerlies or Anti-trades** are prevailing winds from the west toward the east in the middle latitudes between 30° and 60° latitude.

Natural Vegetation

North America is endowed with a diverse and extensive forest cover. Approximately 30 percentage of the total land area is under forest cover. Lumbering is a well developed industry particularly in Canada. North America is a major producer of timber, plywood, wood pulp and paper. It accounts for approximately 20 percent of the world's production of timber. This diversity is brought about primarily because of the different latitudes and variations in altitude, soil and precipitation.

Forest, Flora and Fauna of different regions of North America

S. No.	Types of forest	Climate	Region	Flora	Fauna
1	Tundra	winter is long and severely cold, Summer is short and cool. Rainfall is scanty.	northern coast of Canada and Northern Islands	Mosses, lichens and Dwarf willows	Arctic Fox, Reindeer, Musk Ox, Polar Bears, Wolverin, Sable and Blue Fox
2	Taiga or the Cold temperate Coniferous Forest	winter is very cold, Summer is warm and short. Heavy snowfall during winter	south central Alaska and north eastern Canada	Pine, Fir, Cedar and Spruce	Beaver, Fox, Sable, Ermine, Skunk, Caribou Moose, Elk, Black Bears and Grizzly Bears.
3.	Temperate Prairie Grasslands	winter is very cold, Summer is hot and rainfall is moderate.	central USA and Central Canada	Grasses shrubs, herbs	Coyote, Gophers, Rabbits, Prairie Dogs and Bison
4.	The Mediterranean type	hot summer and, cool winter.	western Coastal margin and Southern California	Olive, Grapes Orange, Cork, Oak, Walnut and Fig	Not much wildlife is found here

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5.	Desert Type	winter is cool and summer is hot. The rainfall is very little	southwest USA, Northern Mexico desert	Cactus, Saguaro Cholla Cacti and yucca	Desert Fox, Gazelles, Scorpions, Lizards and Rattle Snakes
6.	Cool Temperate Deciduous Forests	summer is hot winter is mild and moderate rainfall.	florida, Gulf Coast southeast USA	Chestnut, Oak, and Poplar, Cypress	Foxes, Squirrels, Deer, Raccoon Rabbits, and Musk Ox
7.	The Tropical rain forests	Temperature and rainfall varies on the basis of height.	southern Mexico, Central America and West Indies	Palms, Logwood, Mahogany, Rubber and Cacao Trees	Monkeys and Snakes
8..	Mountain Forests	temperature falls with rise in attitude. The rainfall received on the slopes varies.	rockies Mountain	Pine, Fir, Mosses and Lichens	Deer and Bear

Bison

Raccoon

Rattle Snake

Musk Ox

Natural Regions of North America

Agriculture

Though least proportion of the total workforce is engaged in agriculture. America's agriculture is most productive in the world. Extensive agriculture system is practiced in Canada and USA. Both Canada and USA are the major exporter of wheat than the other countries of the world. Wheat, Corn (Maize), Oats, Soybean, Barley and many other food crops are grow well in the vast interior plains.

Wheat

Wheat was introduced by European settlers in North America. It is grown extensively in the Prairies of North America. North America is the largest exporter of wheat. Vast wheat producing areas are called wheat belt.

Maize

It is the native food crop of North America which is the main staple food grains in Mexico. It is grown in southern Prairies. North America produces more than half of the world total Maize.

Barley and Oats

These are temperate crops which withstand cold climate and less water. Barley is grown in the United States and are produced in Minnesota, North Dakota and Washington. Barley and Oats are used as cattle fodder.

Cotton

Cotton grows well in Southern and Western States and it is dominated in Texas, California, Mississippi, South of the Prairies and the Mexico. Warm summer with frequent rainfall and fertile soil are favourable conditions for growth of cotton crop.

Agriculture of North America

Sugar cane

Sugar cane is cultivated along the Gulf of Mexico, Parts of Central America and West Indies. It is an important Cash Crop of West Indies. Cuba

is known as the "sugar bowl of the world" and it is the world's largest exporter of sugar.

Soya beans

It is raised in the same area where Maize is grown. It is used for extraction of edible oil.

Potatoes and Sugar beet

Prairie Region, North Dakota and Minnesota are the producers of Sugar Beets and Potatoes. Sugar beet is used for making Sugar. Potato and Sugar Beet are used to feed cattle and pigs.

Fruits

Mainly Citrus fruits are cultivated in Texas, California, Great Lakes regions and St. Lawrence Valley. The important fruits of North America are Cranberries, Blueberries, Concord Grapes, Strawberries, Gooseberries and the other fruits.

Cattle rearing

Cattle rearing are carried on a commercial scale in the drier parts of the Prairies in the South Western part of the United States. Vast herds of Cattle and Sheep are kept on large Ranches. Richer pastures are used for cattle and poorer sparse pastures are used for sheep. North America is the largest producer of meat and about one fourth of the world production.

Dairy farming

Dairy farming refers to rearing cattle for milk. It is an important industry of USA and Canada. Dairy farming is found in the cooler and humid part of the Prairies, Great Lakes areas and north east region along the Atlantic coast. North America produces about 25 percent of the world total milk and dairy products.

Fisheries

Fishing is locally important in the seas around the continent. The Grand banks is one of the world's best fishing grounds. It is located in the island of Newfoundland in Canada. Here the meeting of Cold Labrador current and Warm Gulf Stream current provides suitable condition for fish to thrive. The cold Labrador Current brings plenty of plankton which provides food for fish. Cod, Herring, Mackerel, Salmon and Halibut are the major varieties of fish in North America.

DO YOU KNOW?

Grand Banks: The Grand Banks is among the world's largest and richest resource areas, renowned for both their valuable fish stocks and petroleum reserves.

Minerals

North America has rich mineral resources. North America is the leading producer of Iron Ore, Petroleum, Natural Gas, Copper, Silver, Sulphur, Zinc, Bauxite and Manganese. Lead and Uranium are the other important minerals. North America has vast deposit of Oil and Natural Gas. The United States, Canada and Mexico are among the world top Oil producers.

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Minerals of North America

Important Minerals in North America

Mineral	Area
Iron Ore	Canadian shield, Great Lake region, Appalachian Highlands, central Alabama, Minnesota's
Copper	Great lakes, Arizona, Utah, New Mexico, Nevada, Montana and Rockies mountains, Ontario, British Columbia
Silver	Nevada, Utah, British Columbia, Ontario, Quebec.
Gold	Canada –Ontario, Quebec USA – California, Colorado, Utah, Nevado.
Coal	Appalachians, Pennsylvania, Ohio,Alabama,Alberta and Columbia.
Petroleum	USA – Alaska to Texas Canada, Mexico
Oil and Natural Gas	Central low lands, Gulf coast Rockies, Appalachian, Alaska

Industries

North America has plenty of resources and is needed for industrial development. Industries are highly concentrated in the north eastern part of the continent because of large minerals deposits like coal, iron ore etc., and good transportation network like roads, railways and canals. The United States is one of the most industrialized countries in the world. Industries contribute about 25% of Gross National Product. The United State ranks first in Iron and Steel industry. They use the latest technology in developing their industries.

Major industries in North America

1. Iron and Steel Industry

The North American continent is the world's most important Iron and Steel industrial centre. Iron and Steel industries require Iron Ore, Coal and transportation. The important centres of the Iron and Steel industries in North America are Pittsburgh, Chicago and Birmingham in the United States and Hamilton in Canada.

2. Heavy Engineering Industries

Industries which require heavy and bulky raw materials using enormous amounts of power, involvement of huge investment and large transport costs are called heavy Engineering industries. These industries depend heavily on the Iron and Steel industry. The important Heavy Industries are automobile industries, aircraft industries, ship building industries, Railway Wagon industries and farm equipment industries. The USA is the largest producer of automobiles. The important Centres of heavy engineering industries are Detroit, Chicago, Buffalo, Indianapolis, Los Angeles, Saint Louis, Philadelphia, New York, Baltimore, and Atlanta in USA and Windsor in Canada.

3. Wood Pulp and Paper Industry

About 50 per cent of the world's wood pulp and newsprint is produced by North America. Canada is the largest producer and exporter of all kinds of paper in the world. Paper industries are particularly concentrated in Ontario in Canada.

4. Textiles Industry

The textiles industry includes the manufacturing of all textiles like cotton, woolen, and synthetic. The United States is the largest producer of Cotton Textiles. The industries are mainly located in Texas. California, Arizona, Mississippi, Arkansas, and Louisiana. Toronto, Cornwell and Kingston are the major centres in Canada. Moreover, the cool and wet climate of the area is most suitable for spinning and weaving, as the yarn does not break frequently. The Woolen Textile industries are located in the east of the Alleghany Plateau. The New England region contains 70% woolen textile industries. North America is the second largest producer of synthetic fibers. Rayon and other synthetic fibers are made up of cellulose obtained from wood Pulp.

5. The Meat - Packing Industry

This is an important industry in Canada and USA where cattle rearing is done on a large scale in the Prairies. Chicago, Kansas City, Saint Louis in the United States and Calgary and Winnipeg in Canada are the important meat-packing centres.

Population

Most of the people in North America are descendants of settlers from other parts of the World. The first among them were, the Europeans, arrived in the 16th century. Today, the small groups of Native Americans that remain have their own territories and followed a traditional way of life.

Population distribution

The current population of North America as 364,446,736 in the year 2018. North America has about 4.77 % of the total world's population. The largest country by land area is Canada. The largest city by population is Mexico City. The population density is about 20 persons per Sq. km.

Population and Density of North America

S. No.	Country	Population (in Millions)	Density
1.	United States	327.16	30 persons
2.	Canada	36.95	3 persons
3.	Mexico	123.00	51 persons

Densely populated areas: Eastern part of North America, Great Lakes region, Florida, California, Mexico and Central America are the mostly densely populated areas.

Moderate populated areas: Central part of United States, Central Highland, Highlands of Mexico, Central and western Canada are the Moderate populated areas.

Sparsely populated areas: Northern Canada, Alaska, Rocky Mountain regions and desert regions are sparsely populated areas.

Languages and Religions most of the people speak English, Spanish and French. Various faiths have been a major influence of culture, philosophy and law. Between them 80% of the people follow Christianity. United States of America is known as "Melting Pot"

where hundreds of different cultures meet, blend and creating a new culture.

Eskimos live in the very cold and inhospitable region where plenty of fish varieties are available. They were able to dress themselves in thick warm clothes made of fur, they live in igloos.

Eskimos

Igloos

Their lives were very simple and they could not alter the environment to any extent. They specially designed a house by ice and is known as igloos.

Transport

North America has developed a well-designed network of roadways (freeways) railways, waterways and airways.

A) Roadways

North America especially USA and Canada have the best laid roadways in the world. They are made of Asphalt and Concrete roads can be used in all weather conditions. The Super Ways (or) Free ways make travelling easy and fast. The Pan American highway runs from Alaska in the far North west to Panama in the south.

B) Railways

North America is extensively served by an efficient network of railway. Tarns-Continental railways and Tarns-Canadian railways are link the east and west coast of Canada and United States. Chicago has the biggest railway junction in the world. The New York railway junction is one of the busiest railway stations in the world.

C) Waterways

The Great Lakes region along St. Lawrence and Mississippi rivers are the most important inland waterway in North America. Quebec City, Montreal, Boston, New York, Philadelphia, Charleston and New Orleans are some of the important inland ports. New York is the most important port along the East coast. Vancouver and San Francisco are important ports on the West Coast of North America.

DO YOU KNOW?

Panama Canal: In 1914 a Canal was cut across the Isthmus of Panama for 80 kms long which connects the Atlantic with Pacific Ocean.

Panama Canal

It greatly reduced the distance between Europe and the West Coast of North and South America.

D) Airways

Airways provide in valuable means of transport. All the cities and industrial centres in North America are linked by airways.

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New York, Chicago, Los Angeles, Atlanta, Toronto, Montreal and Mexico City are some of the international airports in North America.

Trade

North America exports a host of agricultural and industrial products. The main exports are Industrial Machinery, Automobile, Paper, Fish, Wheat, Bananas, Meat, Aircraft, Telecom Equipments, Chemical, Plastics, Fertilizers, Wood Pulp, Timber, Crude Oil, Natural Gas, Aluminum, Nickel and Lead. The countries of North America Imports include Coffee Cocoa Sugar, Textiles, Iron ore and Electronics goods. The countries of Europe, Japan, China and India are the major trading partners.

B. South America

Next to Asia, Africa and North America, South America is the fourth largest country in the World. Most of the South American continent lies within the Southern Hemisphere and hence called as the "Southern Continent". The Isthmus of Panama in the North West connects South America with North America.

OLF14

DO YOU KNOW?

Together with the Central America, South America is also known as Latin America, having been discovered and colonized mostly by the Latin's, i.e., The Spanish and the Portuguese.

Location

South America lies between 12°N to 55°S latitudes and 35°W to 81°W longitudes. The Equator (0° latitude) passes through the mouth of the Amazon River. The Tropic of Capricorn (231/2° S longitude) passes through the Rio de Janeiro in Brazil. South America is inverted triangular shaped landmass. The area of the continent is 17.8 million Sq. Km., which occupies 12 percent of the world's land area.

Political division of South America

Physiography

South America has marked resemblances in structure and relief of North America. South America has some of the oldest and the youngest rocks of the world. On the basis of topographical features, the continent may be divided into the following physiographic divisions:

- The Andes Mountains
- The River Basin or Central Plains
- The Eastern Highlands

Physiographic of South America

The Andes Mountains

The Andes are fold mountains like the Himalayas. This is the longest mountain range in the world and extends for more than 6,440 km along the Pacific Coast. The highest peak in the Andes is Mount Aconcagua (an extinct volcano) in Argentina border which reaches at an elevation of 6,961m. In Chile, the mountains run very close to the coast. The slopes are steep on the western side and gentle on the eastern side like Rockies in North America. The Andes

being a part of the Pacific Ring of Fire these places are subject to great volcanic eruption and earthquake activities. There are some active volcanoes like Mt Cotopaxi (5,991m) on the Andes range. The Andes are rich in minerals like Copper, Tin and Precious Gems including Emeralds.

Mt Aconcagua

Cotopaxi

The River Basins (or) the Central Plains

Nearly half of the Continent is covered by the plains. Three great rivers drain into the Atlantic Ocean. The biggest of them is the Amazon. The Amazon basin consisting mainly of the alluvial deposits is the thickly forested part of the world. It is widest near the Andes and narrowest near the mouth of the Amazon River. The Orinoco basin is separated from the Amazon basin by low interfluves. It is also one of the most productive parts of the continent. The Parana - Paraguay plain is an ancient rocky surface covered with alluvial deposits and is rich in petroleum deposits.

The Eastern Highlands

These are considerably older than the Andes and are mainly Plateau which is cut by many rivers. They lies to the north and south of the Amazon River. The Guiana Highland is located in the northern part of the continent which has a number of waterfalls including the Angel Falls. The Brazilian Highlands are found to the south of the Amazon basin. They are gently rolling plateaus with steep cliffs along the east coast.

Climate

The climate of the continent of South America has been closely influenced by the latitudes, altitudes and the proximity of the Pacific and Atlantic Oceans. It is hot in the Amazon basin as the equator passes through it whereas Quito, situated almost on the same latitude on the Andes, has "Eternal Spring". That is, it has a pleasant climate throughout the year because of its high altitude at 9,350 feet (or) 2849.88 meter above the sea level. Most of South America regions have its summer from November to January. When it is quite hot in Brazil, Argentina has a relatively cooler climate because of its location in more southerly latitudes.

The rainfall distribution is mainly controlled by the physical features and the distance from the sea. The trade winds bring a lot of rain to the east coast and the Westerlies to the west coast. However, the Amazon basin gets rainfall everyday because of its equatorial location. The regions around the Equator get what is called "4'o Clock

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Rains" which are convectional rains. Rainfall decreases towards the interior.

DO YOU KNOW?

In equatorial regions convectional rain occurs almost daily in the afternoons. It generally occurs at 4pm that's why it is known as 4' o Clock Rain.

Drainage

Owing to the position of the Andes all the great rivers of the continent drain into the Atlantic. The Pacific streams are short and swift but along the coastlands of Peru their waters are used for irrigation and to some extent for hydro-electric power. Amazon is the longest river of South America (6,450km) and is the largest river system in the world. This river have over a thousand of tributaries. The rivers Rio Negro, Madeira and Tapajos are important tributaries. At the point where it enters the sea the river is so wide and powerful that it flows even at a distance of 80 km into the high seas. The Orinoco River originates in the Guiana Highlands and flows northwards into the Caribbean Sea. The river Paraguay has the Paraná and Uruguay rivers as the main tributaries which together form and known as the Platte River system. All the rivers are navigable for quite some distance in the interior.

DO YOU KNOW?

Amazon is the greatest river of South America and the largest drainage system in the world in terms of the volume of its flow and the area of its basin.

Natural Vegetation

There are four main natural vegetation areas of South America and are the Amazon basin (the Selvas), the Eastern Highlands, the Gran Chaco and the slopes of the Andes. The Selvas of the equatorial regions are called the "lungs of the world". The Amazon rainforest are the largest of their kind in the world. They abound in hardwood trees such as mahogany and Ebony which are very valuable. The other common species are Rosewood Cinchona and a variety of Palm trees. The bark of the cinchona tree is used for making quinine - the drug to cure Malaria. The Amazon rainforest are gradually getting depleted. Various developmental activities such as construction of transportation lines, human settlements and agriculture have led to widespread deforestation. Environmentalist fear that this might lead to serious ecological disturbance in future.

Amazon rainforest

The Eastern Highlands have many varieties of trees which are of economic importance. The leaves of the Yerba Mate tree are used to make you tea - like drink. The Gran Chaco region has thick deciduous forests. An important hardwood tree found in these forests is the Quebracho Tree (axe breaker). Quebracho tree yields tannin which is used for tanning leather. The forests

on the slopes of the Andes have coniferous such as pine, fir and spruce. These forests are also called Montana. They yield valuable softwood for the paper and pulp industry.

Climatic Region of South America

Wildlife

South America is blessed with a variety of wildlife. The dense forests, swamps and rivers of the Amazon basin are particularly rich in different species of animals, birds and reptiles. More than 1,500 types of birds are found in the continent. The Condor is the largest bird prey, Rhea is the flightless bird much like the ostrich of Africa. Toucans, Macaw, Hummingbirds, Flamingoes and different type of Parrots are also found here. The forest is home to a variety of monkeys. The spider monkeys, howler monkeys, owl monkeys and squirrel monkeys are very gentle. The Anaconda which is one of the largest snakes in the world is also found here. Ancient madammals such as anteaters and armadillos are found in South America. Llamas are animals typical found only in South America. The rivers of South America have a rich variety of fish. The Piranha found in the Amazon is a fierce flesh eating fish.

Types of Forest, Flora and Fauna in South America

S. No	Type of Forest	Climate	Region	Flora	Fauna
1.	Equatorial Forest	Hot and wet climate throughout the year	Amazon Basin, North eastern Brazil and Coastal Columbia	Rubber, Mahogany, Ebony, Log wood, Brazil nuts and Ceiba	Anaconda, Armadillo, Piranha, Monkey, Snake, Crocodile and Parrots.
2.	Temperate Forest	Mild and wet climate throughout the year	Southern Brazil, Southern Chile, Brazilian Highlands, Paraguay and Uruguay	Beech, Conifers, Parana Pines and Quebracho	White tailed Deer, Rraccoons, Opossums, Porcupines and Red Fox.

3.	The Mediterranean	Summer is hot and dry, Winter is mild and wet	South Atacama desert, Central Chile	Thorny Shrubs, Cactus, Evergreen Laurel and Acacia	Not much wildlife is found here.
4.	The Savanna Grassland	Summer is hot and Moist, winter is cold and dry	Guiana Highlands, Brazilian highland, Northern Argentina and Paraguay	Tall coarse grass and Acacias	Capybara, Marshy Deer, White-bellied and Spider Monkey
5	The Pampas Grassland	Summer is quite warm, Winter is cold and moderate rainfall	North Eastern part of Argentina, Uruguay and Southernmost Brazil	Short grass	Rhea, Pampas Deer, Jaguar, Guanaco, Camel, Mule and Stag
6.	The Desert	Summer is hot and winter is cold	Southern Argentina, Atacama desert, Southern Peru, Northern Chile and Northeast Brazil	Scrubs, Cactus, Scrubs, Cactus, Cacti, Lichens and Acacia,	Geckos and Iguana

Rhea – Flightless bird

Llamas

Agriculture

More than half of the people of South America live by farming. Subsistence farming is practiced in this continent. Most of areas are covered by forest like the Amazon basin. Only three countries,

the Argentina, Uruguay, and Brazil have well developed agriculture. Argentina is one of the leading agricultural countries of South America. The agricultural activities are mainly concentrated in the wet Pampas. The Geo - climatic condition of Pampas are ideal for agriculture. Wheat and Maize are grown on extensive forms in the Argentine Pampas. In the piedmonts of Andes, where rivers descend and the climate is favourable, the farmers concentrate on the agricultural vineyards and other citrus fruits. Cash crops like coffee, cocoa, sugarcane, banana, cotton etc., are also grown in this continent.

Wheat

The major wheat producers are Argentina, Brazil, Paraguay, Uruguay and the Chile. The Wheat is grown extensively on the Pampas of Argentina. Argentina is one of the largest producer and exporter of wheat in the world.

Sugarcane

Sugarcane has been cultivated in the humid tropics of South America. Spanish and Portuguese introduced sugarcane to the West Indies and Brazil. Brazil is the largest producer of sugar in South America.

Maize

Maize is also known as corn. Maize is grown in the warmer part of the Pampas and coastal regions of Brazil and in some parts of the Amazon basin. It requires warm climate and frequent showers in summer. Argentina is one of the largest producer and exporter of maize in the world.

Coffee and Cocoa

Coffee and Cocoa are the most important crops of South America. These crops need a warm temperature with frequent heavy rainfall and well-drained soil. They grow well in the red soil of the Brazilian Highland. Brazil is essentially an agrarian country. Brazil stands first in the production of Coffee and third in Cocoa in the world. Minas Gerais and Sao Paulo are the important Coffee growing areas in Brazil. It is also known as the "coffee pot" of the world. Colombia and Venezuela also grow large quantities of coffee. Coco is also grown in Ecuador and Colombia.

Coffee Plant in South America

Cotton

Cotton is another important cash crop of South America. Warm climate with frequent rainfall provides suitable condition for growing cotton. Cotton is the second most important crop in Brazil. Sao Paulo State produces half of the Country's total cotton. Equator, Venezuela and Peru are the other important cotton growing countries in South America.

Barley, Rye and Oats

These are grown extensively in the Pampas. Barley is a member of the grass family and is a major cereal grain grown in temperate climates. Oats are grown in Argentina, Uruguay, Chile, Andean region, highlands of Bolivia, Ecuador and Peru. In most countries Oats are more important as fodder for livestock in the field.

Animal rearing

Animal rearing is an important activity in South America. The Llanos and Campos in South America are the extensive Tropical Grasslands. Beef cattle are raised in Pampas in Argentina. Here cattles are mainly raised for draught purposes and meat. Llano grassland are found in the basin of Orinoco of Venezuela, Brazil and Columbia. Here most of the cattle are of Criollo breed well suited to the climatic conditions. Cattles are fed on alfalfa and the breeds raised here on large pasturelands known as "Estancias".

Sheep are reared in the drier parts of South America. The temperate grasslands of Tierra Del Fuego and Falkland Islands are well suited for Sheep grazing. Argentina and Uruguay are the important sheep rearing countries. Argentina is one of the largest exporters of beef in the world.

Sheep in South America.

Estancias

The Breeds raised on large pasture lands is known as Estancias. These are divided into several paddocks. Besides this, there are small yards known as corrals where animals are sorted and branded. The owner is the Estanciera who has a number of gauchos.

Fisheries

Peru is one of the world's largest producers of tropical fish. Here the cool Humboldt Current helps to bring plankton, which is the main food for fishes. Commercial deep sea fishing off of Peru's coastal belt of over 3000 km. Peruvian waters normally abound with sword fish, mackerel, yellow fin, pompano and shark. More than 50 species are caught commercially. There are over 40 fishing ports on the Peruvian coast. Paita and Callao are being the most important centers in Peru. Besides coastal fishing inland fishing are also carried out in South America. River Amazon is a great aquarium. As many as 750 varieties of fish inhabit this river.

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Minerals

South America is rich in minerals. These mineral deposits are unevenly distributed. South America has many valuable deposits of minerals particularly of iron ore, manganese, petroleum, copper and bauxite. There are some active mines producing silver and gold. The continent has little coal which is still one of the mainstays of industrial economies. Northern Chile has the world's only natural deposits of sodium nitrate an important ingredient of fertilizers.

Iron ore

South America contains about one fifth of the world's iron ore reserves. Brazil and Chile both have massive deposits of iron ore. Brazil has the second largest iron ore deposits in the world after Russia. Brazil is estimated to have about 15% of the world export of iron ore. High grade iron ore has long been mined at Itabira, Minas Gerais and new site in the Carajas.

Manganese

Brazil also has large deposits of Manganese. Manganese ore is mined at Lafaiete, Minas Gerais and in the Northern State of Amapa.

Petroleum

Venezuela is rich in petroleum deposits. Argentina, Colombia, Ecuador, Peru, Chile and Bolivia are the other valuable oilfields. Petroleum is the only mineral produced in substantial quantity. Argentina is almost self-sufficient in petroleum. Venezuela is one of the world's leading producers of oil and largest oil exporter outside the Middle East.

Copper

Chile is the third largest producer of copper in the world. Copper provides over 40% of exports by value. Some of the biggest copper mines of the world are located in Peru. It is found in the Atacama Desert.

Bauxite

Brazil is the third largest bauxite producing country. An important bauxite mining centre is located near the mouth of the Amazon River. Bauxite is used for aluminum production.

Industries

Industries in South America have developed slowly Argentina, Brazil and Chile are the most highly developed industrial countries in this continent. Until World War I, the continent exported most of its mining production and large amount of minerals particularly Petroleum, Copper and iron are still exported. The continent lacks infrastructure (especially transport) which is an essential need for Industrialisation. Railways and the roads could not be developed sufficiently owing to a rugged terrain. The Amazon and the La Plata rivers, provide cheap water transport. In spite of having an abundance of natural resources, industrialisation started quite late in South America. Recently, new industries are being set up with locally available raw materials. Brazil is the most industrialized country in the continent followed by Argentina.

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S.No.	Country	Industries
1.	Brazil	Iron and steel, cotton textiles, sugar, food processing, oil refining, chemicals and automobiles
2.	Argentina	Meat processing and Canning, dairy products, food processing, leather processing, woolen textiles, sugar and oil refining
3.	Chile	Oil refining, chemical fertilizers and copper smelting
4.	Peru	Mining and the processing of minerals, chemicals, fertilizers, sugar, coffee and wool textiles
5.	Uruguay	Dairy products, meat processing and woolen textiles
6.	Venezuela	Oil refining, chemical fertilizers and copper smelting

Trade

South America has significant role in the world trade. More than half of the South America's trades are shared by Brazil, Argentina, Venezuela, Peru and Chile. South America's major exports are mostly primary commodities such as sugar, coffee, cocoa, tobacco, beef, corn, wheat, petroleum, natural gas, linseed, cotton, iron ore, tin and copper. South America's products include mostly exported to North America and Europe. It's imports are machinery, vehicles, chemicals, pharmaceuticals, paper are textiles. These are imported from North America and Europe.

Transport

Unlike North America, South America still does not have an adequately integrated transportation network. Significant efforts have been made to improve both the connection within the countries and the linkages between them.

Roadways

South America has an extensive and rapidly expanding network of roads. In many countries, however only a relatively small percentage of roads are paved and the most remote areas, they may be barely wide enough for two Vehicles to pass easily. A Road linking Venezuela and Brazil allows north to south movement through the Amazon Basin. Brazil continues to have the largest network of roads belonging to the Pan American Highway System which extends throughout the America's.

South America- Roadways

Railways

In most South American countries, railways have lost their dominant position of the major mode of transportation and have

been replaced by the road networks that have developed rapidly since the 1960's. Moreover, rail transport is plagued by operational problems as well as by obsolete equipment. Almost all lines are single-tracked which makes traffic slow and discourages passenger service. Many countries have two or more track gauges which impedes the efficient integration of the rails system.

South America- Railways

Waterways

Seaways have long been a vital component of the transport systems of South American countries. Majority of imports and exports to and from the continent are moved by ship. South America has a number of outstanding natural harbours. They are Rio de Janeiro, Salvador, Montevideo and Valparaiso. Several countries such as Chile and Brazil are making a determined effort to develop and enlarge their sea routes.

South America - Waterways

There are two inland waterways system of international importance. They are (i) The Paraguay - Uruguay basin which includes territory in four countries and (ii) The Amazon basin which includes six countries. Each has several thousand miles of navigable waterways.

Airways

Airways have developed rapidly since World War II. The increase is particularly significant with respect to passenger traffic and also handling of bulky freights. All the South America capitals and most of the large cities are linked by direct air services to the major traffic centres of the United States and Europe.

Population

South America contains the world's most mixed population. Many people in South America are descended from European, especially the Spanish and Portuguese, who begin to arrive during the 15th century. The descendants of African slaves brought over by the Europeans. Native people still live in the mountain and the rainforests and keeping their own languages and traditions. There are three major races found in South America and are (i) American Indian, (ii) European and (iii) Blacks. The mixed population of Native Indians and Europeans is known as 'Mestizo'. The mixed population of European and the Blacks is called 'Mulato' and the mixture of Native Indians and Blacks is called 'Zambo'. The current population of South America is 429, 115, 060 (42.25 cores). Population density of South America is 21 persons per square kilometer. South America is positioned 5th rank in total population among the continents.

Population distribution

- **High densely populated** areas are Guiana, Venezuela, Suriname, Columbia, Brazil and Peru.
- **Moderate populated** areas are Paraguay, Chile and Uruguay and
- **Sparsely populated** areas are Argentina, Bolivia and Amazon Basin.

Languages and Religions

Portuguese and Spanish are the primary languages of the South America. Among other languages used by many South Americans are Dutch, French, English, German and Hindi. Christianity is the dominant religion in South America. Other than Christianity, Hinduism and Islam are also followed by South Americans.

DO YOU KNOW?

South American nations have variety of music. Some of the most famous genres include Samba from Brazil, Tango from Argentina and Uruguay and Cumbia from Colombia..

North America and South America

S. No.		North America	South America
1.	Geographical extent	7^0N to 84^0N latitude and 53^0W to 180^0W longitude.	12^0N to 55^0S latitude and 35^0W to 81^0W longitude.
2.	Major countries	Canada, United States of America, Mexico	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela
3.	Smallest country	Grenada	Suriname
4.	Highest point	Mount McKinley	Lake Maracaibo
5.	Surrounding water bodies	Arctic Ocean, Pacific Ocean, Atlantic Ocean, Gulf of Mexico.	Pacific Ocean, Atlantic Ocean, Caribbean Sea, Southern Ocean.
6.	Major rivers	Mississippi River, Missouri River, Colorado River, Rio Grande, Yukon River	Amazon, Parana, Madeira, Tocantins, Orinoco
7.	Largest lake	Lake Superior	Portuguese, Spanish, Dutch, English, French
8.	Major deserts	Great Basin, Mojave, Sonoran and Chihuahuan deserts	Atacama deserts, Patagonian, deserts

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9.	Major animals	Brown bear, bald eagle, humming bird, bullfrog, beaver, red cockaded woodpecker, red fox, bison	Llama, anaconda, anteater, agouti, armadillo and chinchilla
10.	Major crops grown	Maize, wheat, soyabean	Wheat maize, rice, potato
11	Major language spoken	English, Spanish, French	Cerro Aconagua (Andes Mountains)

Wrap Up

- North America is the third largest continent next to Asia and Africa.It is divided into four physical divisions.
- The vast latitudinal extent from the tropics to the Polar Regions makes the climate of North America as varied as that of Asia.
- North America is endowed with a diverse and extensive forest cover. Approximately 30 percentage of the total land area is under forest cover.
- Wheat, Corn (Maize), Oats, Soybean, Barley and many other food crops are grown throughout the vast interior plains of North America.
- North America is the leading producer of Iron Ore, Petroleum, Natural Gas, Copper, Silver, Sulphur, Zinc, Bauxite and Manganese.
- United States of America is known as "Melting Pot" where hundreds of different cultures meet, blend and creating a new culture.
- Next to Asia, Africa and North America South America is the fourth largest country in the World. It is divided into three physical divisions.
- The climate of the continent of South America has been closely influenced by the latitudes, and the proximity of the Pacific and Atlantic Oceans.
- There are four main natural vegetation areas of South America and are the Amazon basin (the Selvas), the Eastern Highlands, the Gran Chaco and the slopes of the Andes.
- Wheat, Sugarcane, Maize, coffee, cocoa, sugarcane, banana, cotton etc., are grown in South American continent.
- South America has many valuable deposits of minerals particularly of iron ore, manganese, petroleum, copper and bauxite.
- Portuguese and Spanish are the primary languages of the South America.

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Glossary			
1.	Isthmus	A narrow stretch of land joining two large land masses	நிலச்சந்தி
2	Strait	A narrow stretch of water joining two large water bodies	நீர்ச்சந்தி
3.	Cellulose	Obtained from wood Pulp	மரக்கூழ்
4.	Prairies	A temperate grassland of North America	பிரெய்ரி புல்வெளி
5.	Igloos	The specially designed a house by ice	இக்லூ (எஸ்கிமோக்களின் வீடு)
6.	The Pacific Ring of Fire	These places are subject to great volcanic eruption and earthquake activities	பசிபிக் நெருப்பு வளையம்
7.	Selvas	A tract of land covered by dense equatorial forest in the Amazon basin.	மழைக் காடுகள்
8.	Pampas	A temperate grassland of South America	பாம்பாஸ்
9.	4'o Clock Rain	In equatorial regions, convectional rain occurs at 4pm	நான்கு மணி மழை
10.	Estancias	The Breeds raised on large pasture lands	செம்மறி ஆட்டுப் பண்ணை

Evaluation

I. Choose the correct answer

1. The ----------separates North America from Asia
   a) Bering Strait b) Palk Strait
   c) Malacca Strait d) Gibraltar straits
2. ---------- is known as the "sugar bowl of the world"
   a) Mexico b) USA
   c) Canada d) Cuba
3. ---------- are the longest rivers in North America
   a) The Mississippi and Missouri rivers
   b) The Mackenzieriver
   c) The St. Lawrence river
   d) The Colorado river
4. ----------is the longest mountain chain in the world.
   a) The Andes b) The Rockies
   c) The Himalayas d) The Alps
5. ---------- basin gets rainfall every day because of its equatorial location
   a) The Mackenzie b) The Orinoco
   c) The Amazon d) The Paraná

II. Fill in the blanks

1. ----------86m below the sea level is the lowest part of the continent of North America.
2. ---------- is one of the world's best fishing grounds.
3. The highest peak in the Andes is ---------- on the Chile - Argentina border.

4. ---------- of the equatorial regions are called the "lungs of the world".
5. ---------- is also known as the "coffee pot" of the world.

III. Match the following

1.	Mount McKinley	– Tropical forests
2.	Grand Canyon	– The flightless bird
3.	Ebony	– The Colorado River
4.	4'o Clock Rains	– 6194 m
5.	Rhea	– The equatorial regions

IV. Give Reasons

1. The eastern coast of North America particularly USA enjoys mild climate.
2. United States of America is known as "Melting Pot".
3. Though Quito and Amazon basin are in the same latitude Quito enjoys eternal Spring. Whereas Amazon basin is hot.
4. Peru is one of the world's largest producers of tropical fish.

V. Distinguish between

1. The Rocky mountain and the Appalachian mountain.
2. The Prairies and the Pampas grassland.
3. Tundra and Taiga.

VI. Put (√) for the correct option

1. **Assertion (A):** Cotton grows well in southern and western states of North America.

Reason (R): Warm summer with frequent rainfall and fertile soil which provide favourable condition.

a) Both A and R is correct.
b) A is correct and R is wrong.
c) A is wrong and R is correct.
d) Both A and R is wrong

2. **Assertion (A):** Industries in the South America has developed rapidly.

Reason (R): The continent lacks infrastructure (especially transport) need for industrialization.

a) Both A and R are correct.
b) A is correct and R is wrong.
c) A is wrong and R is correct.
d) Both A and R are wrong

VII. Answer the following

1. Name the boundaries of North America.
2. Write a note on Mackenzie River.
3. What type of fruits are cultivated in North America? Name some of them.
4. Give a short note about the lifestyle of an Eskimos.
5. Which are the densely populated areas of North America?
6. Name the physiographic divisions of South America.
7. What is called "4'o clock rains"?
8. Name the flora and fauna of equatorial forest in South America.
9. What is known as "Estancias"?
10. Name the major export of South America.

VIII. Answer the following in a paragraph

1. Give an account of the climate of North America.
2. Describe the Heavy Engineering Industries in North America.
3. Describe the drainage system in South America.
4. Write briefly about the major races in South America.

IX. Map skill

1. With the help of the map given in the text and an atlas, name the seas and bays in North America.
2. Mark the rivers Amazon, Orinoco, Negro, Paraguay, Uruguay on a map of South America.

X. Activity

1. Given below are some important cities with industries placed in brackets. Pick out the correct answer from them.
   a) Pittsburgh (Textile, Iron and steel, Shipping)
   b) Chicago (Meat Packing, Woolen textile, Heavy Engineering)
   c) Ontario (Automobile, Paper, Cement)
   d) Chile (Oil refinery, Sugar, Cotton textile)
   e) Uruguay (Leather processing, Copper smelting, Daily products)
2. Write down the answers to the question given in blocks:

   a) Name the highest peak in South America.

   b) An active volcano in South America.

   c) The combined Parana and Paraguay rives.

   d) The highest falls in the world.

   e) The largest river in the world.

3. Collect pictures of the animals and birds of North America and South America and make a scrap book.

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Unit -2

Map Reading

Learning Objectives

- To know about the maps and scale
- To identify the various types of maps
- To understand the elements of maps
- To learn the legend and signs and symbols

Introduction

Reading of maps will give clear understanding of geographical location, physiographic features like mountains, plateaus and plains, water features – river, lake, ocean etc., and cultural features, such as roads, settlement etc., The maps are meant to be the preserving records of the past which will helps us to understand the past and perceive the future. Maps portraits political boundaries of different countries and states. It helps the students to visually understand the size and shape of various countries, continents etc., Maps clearly refer to the properties that people own and the geographical boundaries.

Maps

A map is an essential tool of a geographer. Map is a representation of the earth as a whole or a part of the earth drawn on a flat surface according to a given scale. It can show continents, countries, cities and even a local area are drawn with specific details. It is easy to handle and carry as it can be rolled up (or) folded and stored in computers.

DO YOU KNOW?

In the early times, various materials such as animal skin, cloth, parchment, papyrus, wet earth and clay tablets were used to make maps.

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Types of Maps

As each map is unique in its design, content and construction. On the basis of certain common features maps can be classified into several types.

Maps

- On the basis of Scale
  - Large Scale
  - Small Scale
- On the basis of Content
  - Physical
  - Cultural

Maps on the basis of scale:

Large scale maps show small areas in greater details because they are drawn on a relatively large scale.

- **Cadastral maps** are village and town maps which show individual fields and house sites.
- **Topographical maps** shows smaller areas in much greater details about small area. These maps are prepared by Survey of India. These are also large scale maps which show both natural features like hills and valleys as well as man-made features like buildings, road and canals.

Small scale maps that show large areas like continent or countries. These maps are drawn on 1cm = 1000 kms. These are called small-scale maps.

- **Wall maps** are small-scale maps showing large areas. They are useful for students in classrooms and offices, small scale maps covers a larger area and depicts with limited information.
- **Atlas** is a collection of maps in a book. Atlas maps are small-scale maps covering large areas like continents and countries. Only prominent relief features, main roads and railways important towns are shown in Atlas maps. The study of geographic characteristics of a large area is possible at the time with the help of an atlas.

DO YOU KNOW?

The science of map-making is called cartography (carte means 'map' and graphic means 'drawing').One who draws maps is called a Cartographer.

Types of Atlas

- **School Atlas** contains the maps giving sufficient details of the home and country.
- **Advanced Atlas** contains detailed maps of even small regions of the continents and are used as reference atlases.
- **Regional Atlas** contains detailed maps of small areas, prepared with a view to help in regional planning.
- **National Atlas** contains detailed maps of a country. The maps of a national atlas are comparatively large-sized and they depict general and characteristic features of the geography of a country.

Maps on the basis of content

Physical maps show natural features such as relief, geology, soils, drainage, elements weather, and vegetation.

- **Relief maps** show general topography like mountains valleys, plains, plateaus and rivers.
- **Geological maps** are drawn to show geological structures, rocks and minerals.
- **Climatic maps** show the distribution of temperature, rainfall, clouds, relative humidity, direction and velocity of winds and other elements of weather.
- **Soil maps** which are drawn to show the distribution of different types of soil and their properties.

Cultural maps which shows the man-made features are called cultural maps.

- **Political maps** show the administrative divisions of a country, state or district. These maps facilitate the administration in planning and management of the concerned administrative units.
- **Population maps** show the distribution, density and growth of population, occupation structure and literacy.
- **Economic maps** depict the production and distribution of different types of crops and minerals, location of industries, trade routes and flow of commodities.
- **Transportation maps** show roads, railway lines and the location of railway station, airports and seaports, etc.,
- **Thematic maps** represent the distribution of a particular feature or theme and its spatial variation.

DO YOU KNOW?

Digital maps is a web-based service that provides detailed information about geographical regions and sites around the world.

Elements of maps

Maps provide us with a lot of information and one must know how to read and interpret them. Every map is provided with certain features that help us to study the information presented in it. The basic essential elements of a map are title, direction, scale and legend (or) key and signs and symbols.

Title

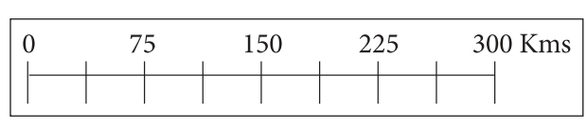
Every map has a title that describes the information given in the map. For example, a map with the title India Rivers shows Rivers of India.

Direction

In general maps are drawn with North orientation. It helps us to find other direction on the map like East, West and South. In addition to the North notation, latitudes and longitudes are depicted in the margins. The North is notified by letter 'N' with an arrow mark.

Scale

The scale of a map is the ratio between the distance on the map between two points and actual distance between the two places on the ground. For example the scales can be represented as 1cm = 10km. It means 1cm on the map is equal to 10 km on the ground. It helps to find the distance on the map between two points.



Legend (or) key

A legend or key of a map explains the symbols that are used on it to represent various physical and cultural features. The common signs and symbols which are internationally accepted and used in maps are called conventional signs and symbols. Every map has a legend or a key which explains the different colours and symbols used in it. On a map it is difficult to show the real shape such as settlements, bridges, post offices, railway lines and forests They are depicted by using certain colours, symbols or letters.

India Physical Features

Colours	Features
White	Snow
Yellow	Agriculture
Green	Forest
Blue	Water bodies (oceans, seas and rivers)
Brown	Mountain, Hill and Contour
Red	Settlements, Road
Black	Railway line

Conventional signs and symbols

A sign is a widely used symbol or a line pattern or a colour on a map. It represents a feature on the ground. The Survey of India (SOI) have standardized a set of convectional signs and symbols. Several colours are commonly used in the map.

- Major Road
- Minor Road
- Bridge
- RS — Railway Station
- Railway Broad Gauge
- Railway Metre Gauge
- River
- Canal
- Dam
- Lake
- Wetland
- Mountain
- Volcano
- Grass & Shrub
- Forest
- Country Capital
- Internal Administrative Capital
- Temple
- PO — Post Office
- TO — Telegraph Office
- PS — Police Station
- Fort

T3VD6

Uses of Maps

1. Maps enable us to know details of the landforms.
2. Maps help the military personnel to campaigns.
3. It is used in the aero planes and ships.
4. Maps are used for weather forecasting.

Comparison of Map and Globe

Map	Globe
1. A map is a two – dimensional form of the Earth.	1. A globe is three –dimensional model of the Earth.
2. A map shows a small or a large area.	2. A globe is a true model of the earth
3. A map can show a detailed information about an area .	3. A globe cannot show the detailed information for an area.
4. A map is very easy to carry	5. A globe is not easy to carry.

Wrap up

- ❖ Map is a representation of the Earth as a whole (or) a part of the earth drawn on a flat surface according to given scale.
- ❖ Maps classified into two types on the basis of scale and on the basis of content.
- ❖ The basis essential elements of a map are title, direction, scale and legend (or) key or symbol.
- ❖ The cardinal direction are North, South, East and West.
- ❖ The scale of a map is the ratio between the distance on the map between two points.
- ❖ A legend (or) key of a map explain the details in the map.
- ❖ The Survey of India (SOI) have standardized a set of conventional signs and symbols.

Glossary

1.	Map	Representation of Earth on a flat surface	நிலவரைபடம்
2.	Scale	Ratio between the Actual distance of two points on the earth and the distance on a map	அளவை
3.	Legend	It is a representation of different geographical features by using different colours and symbols	குறி விளக்கம்
4.	Relief maps	map that shows the physical appearance of hills, mountains, ridges, valleys, slopes	நிலத்தோற்ற வரைபடம்
5.	Atlas	Collection of several maps	வரைபடம்
6.	Cardinal direction	North, south, east and west are called cardinal direction	முதன்மையான திசைகள்
7.	Thematic map	Represent the distribution of a particular feature.	கருத்துப்படம்
8.	Graduated	Arranged in a series	பகுத்துக் குறியிட்ட அளவு

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Evaluation

I. Choose the correct Answer:

1. The science of map making is called _____.
   a) Geography
   b) Cartography
   c) Physiography
   d) Physical Geography

2. North, South, East and West are four directions are called as
   a) Cardinal b) Geographical
   c) Latitudinal d) Angels

3. Cultural maps are those which shows the _____ features
   a) Natural b) Man-made
   c) Artificial d) Environmental

II. Fill in the blanks:

1. _____ is an essential tool of a geographer.
2. The directions in between the cardinal directions are the inter mediate _____.
3. _____in a map which explains the different colours and symbols used in it.
4. Cadastral maps are known as _____.
5. Small scale maps are helpful to us to show large areas like _____ and _____.

III. Circle the odd one:

1. North East, Scale. North West and East.
2. White, Snow, High land, and Plains.
3. Relief map, Soil map, Physical map and Atlas.
4. Weather Forecasting, Climate, Rainfall and Temperature.

IV. Match the following:

1.	Upper right corner	– Density and growth
2.	Key (or) legend	– District (or) town
3.	Large Scale map	– Natural relief features
4.	Physical map	– Colours and Symbols
5.	Population map	– 'N' letter

V. Examine the Following Statements:

1. An Atlas is a bound volume of different types of maps
2. Atlas maps are drawn on smaller scale
3. Insignificant details are omitted
   a) 1 and 3 are correct
   b) 2 and 3 are correct
   c) 1 and 2 are correct
   d) 1, 2 and 3 are correct

2. **Statement I:** Globe is a three dimensional model of the Earth.
   Statement II: It is easy to handle and to carry. as it can be rolled up or folded.
   (a) Statement I is correct and II is wrong.
   (b) Statement I is wrong and II is correct.
   (c) Both the statements are correct.
   (d) Both the statements are wrong.

VI. Name the following:

1. Representing the earth on a flat surface.
2. Ratio between the distance on a map and distance on the ground.
3. Symbols which help to show road ways and railways.
4. A book which contains different kinds of maps.
5. A map which shows administration divisions.

VII. Answer the following:

1. What is a map?

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2. What is cartography?
3. What are cardinal directions?
4. What is an Atlas?
5. Name the types of Atlas?
6. What are the uses of maps?

VIII. Answer in Detail:

1. What are the elements of maps? Write about it?
2. What are the three ways of representation of maps?
3. Classify the maps based on functions
4. Write about comparison of map and Globe
5. Describe the types of maps based on the scale? Write about it?

IX. HOTs

1. Map is an essential tool for a traveller why?

X. Activity:

1. In an outline map of India mark the following features by using symbols and colours
   a) Mark any one of the District capitals
   b) Draw any one river path
   c) Mark any one of the mountains
2. Draw the convectional signs and symbols to given points
   a) Bridge
   b) Canal
   c) Dam
   d) Temple
   e) Forest
   f) Railway Station

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Unit -3

Natural Hazards – Understanding of Disaster Management in Practice

Learning Objectives

- To understand the meaning of natural hazards and disaster
- To get familiarise with natural and man made disasters.
- To know about the disaster management and disaster management cycle
- To know several survival techniques

Introduction

Everyday almost all the newspapers and television news channels carry reports on Natural hazards and disasters that occur in several parts of the world. Neither all the hazards nor all the disasters can be preventable but the destruction can be minimized.

For better understanding, we must know, what is a Natural Hazard? What is a Disaster? What is Disaster Management? Let us learn about some important terminologies along with disaster management techniques.

Hazard

Generally, a hazard is a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury, health impacts, property damage, livelihoods, services, social and economic disruption or environmental damage. Natural hazards are natural phenomenon that might have negative impact on human or the environment. Natural hazards are classified into two broad categories: Geophysical and biological.

Disaster

A disaster can be generally defined as "A serious disruption in the society causing widespread material, economic, social or environmental losses which exceed the ability of the affected society to cope using its own resources". Disaster impacts may include loss of life, injury, disease and other negative effects on human physical, mental and social well-being, together with damage to property, destruction

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of assets, loss of services, social and economic disruption and environmental degradation.

Hazards are termed as Disasters when they cause widespread destruction of property and human lives.

Example

Hurricane is a natural hazard. It develops at sea. When it reaches land and destroys buildings and kills people, it can be described as a disaster.

Types of Disasters

	Types of Disaster	Sources	Events
1.	Natural Disaster	Beneath the Earth Surface	Earthquakes, tsunamis and volcanic eruptions
		On the Earth Surface	Landslides and Avalanches
		Meteorological / Hydrological	Windstorms, Tornadoes, Hailstorms and Floods.
		Health	Epidemics
2.	Man-made Disaster	Socio - technical	Technological, Transportations disasters, Structural collapse and production failures.
		Warfare	National and International

Natural Disasters

Earthquake

A sudden movement (or) trembling of the earth crust is called as earthquake. The movement of the tectonic plates, mass wasting, landslides, surface fault, etc., causes earthquake.

Effects

Due to a strong earthquake, loss of lives, buildings, roads, bridges and dams are damaged. Earthquake cause floods, tsunamis, landslides, fires, break down of water supply and electrical lines. It may change the course of a river too.

Effect of Earth Quakes

Recent hazard in India and Tamilnadu

On 2nd to 3rd May 2018 a high velocity dust storms swept across the parts of North India and more than 125 people died and over 200 were injured. In Uttar Pradesh 43 died in the city of Agra and about 30 died other parts of the state. In neighbourhood of Rajasthan state 35 people died and over 200 were injured. The wind downed more than 8000 electricity posts and uprooted hundreds of trees.

After 2004 tsunami, cyclone Gaja is the worst natural disaster to hit Tamilnadu. It left

a trail of destruction in several coastal districts and took a toll on agriculture to a serious extent.

Destruction of Cyclone Gaja

Dust storms swept across the parts of North India

Tsunami

When earthquake jolts the ocean floor, the sudden dislocation of the sea bed occurs and the resulting displacement of water can produce one or more huge, destructive waves, known collectively as a Tsunami. The sea waves rise to several meters and may reach the coast within a few minutes.

Effects

It causes flooding and disrupts transportation, power communication and water supply.

DO YOU KNOW?

The word "Tsunami" is derived from the Japanese word. "Tsu" means harbour and "nami" means waves.

Flood

Sudden overflow of water in a large amount caused due to heavy rainfall, cyclone, melting of snow, Tsunami or a dam burst.

Effects

E8KQN

1. Loss of life and property
2. Displacement of people
3. Spread of contagious diseases such as Cholera and Malaria etc.,

Cyclone

A low-pressure area which is encircled by high pressure wind is called a cyclone.

Effects of cyclone

The main effects of tropical cyclone include heavy rain, strong wind, large storm surges near landfall and tornadoes.

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Effects of cyclone

"Severe cyclonic storm Gaja crossed the coasts of Tamilnadu and Puducherry around Vedaranyam and Nagapattinam in the early hours of November 10, 2018 Friday with wind speed gusting of around 120 (Kmph)" reported the Indian Meteorological Department.

Effects of Storm Gaja in Nagapattinam

Man-made Disasters

Stampede

The term stampede is a sudden rush of a crowd of people, usually resulting in injuries and death from suffocation and trampling. It is believed that most major crowd disasters can be prevented by simple crowd management strategies. Human stampedes can be prevented by organization and traffic control, such as barriers, following queues and by avoiding mass gathering.

Fire

Fire is a disaster caused due to electrical short circuit, accidents in chemical factory, match and crackers factory.

Fire involves 3 basic aspects

1. Prevention
2. Detection
3. Extinguishing

Forest fire in hilly regions

Fire accidents in Cracker Factories

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Public awareness of what to do before fire, during fire and after fire is of critical importance.

Industrial Disaster

Industry faces multiple risks involved with its production, transportation, storage, usage and disposal of the effluents containing residuals and hazardous materials from nuclear and chemical industries.

Example: Bhopal gas leakage

What is Disaster Management?

The systematic process of applying administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster is called Disaster Management.

Disaster Management is necessary or expedient for:

- Prevention
- Mitigation
- Preparedness
- Response
- Recovery
- Rehabilitation

Disaster Management Cycle or Disaster cycle

The six disaster management phases that have been used in the concept of disaster cycle are as follows

Pre – Disaster Phase

Prevention and Mitigation

Reducing the risk of disasters involves activities, which either reduce or modify the scale and intensity of the threat faced or by improving the conditions of elements at risk. The use of the term reduction to describe protective or preventive actions that lessen the scale of impact is therefore preferred. Mitigation embraces all measures taken to reduce both the effects of the hazard itself and the vulnerable conditions to it, in order to reduce the scale of a future disaster.

In addition to these physical measures, mitigation should also be aimed at reducing the physical, economic and social vulnerability to threats and the underlying causes for this vulnerability. Therefore, mitigation may incorporate addressing issues such as land ownership, tenancy rights, wealth distribution, implementation of earthquake resistant building codes etc.

Preparedness

The process includes various measures that enable governments, communities and individuals to respond rapidly to disaster situations to cope with them effectively. Preparedness includes for example, the formulation of viable emergency plans, the development of warning systems, the maintenance of inventories, public awareness and education and the training of personnel. It may also embrace search and rescue measures as well as evacuation plans for areas that may be "at risk" from a recurring disaster. All preparedness planning needs to be supported by appropriate rules and regulations with clear

allocation of responsibilities and budgetary provision.

Early Warning

This is the process of monitoring the situation in communities or areas known to be vulnerable to slow onset hazards, and passing the knowledge of the pending hazard to people harmless way. To be effective, warnings must be related to mass education and training of the population who know, what actions they must take, when warned.

The Disaster Impact

This refers to the "real-time event of a hazard occurrence and affecting elements at risk. The duration of the event will depend on the type of threat; ground shaking may only occur in a matter of seconds during an earthquake. Where as flooding may take place over a longer sustained period.

During Disaster Phase

Response

This refers to the first stage response to any calamity, which include setting up control rooms, putting the contingency plan in action, issue warning, action for evacuation, taking people to safer areas, rendering medical aid to the needy etc., simultaneously rendering relief to the homeless, food, drinking water, clothing etc. to the needy, restoration of communication, disbursement of assistance in cash or kind. The emergency relief activities undertaken during and immediately following a disaster, which includes immediate relief, rescue, and the damage needs assessment and debris clearance.

The Post- Disaster Phase

Recovery:

Recovery is used to describe the activities that encompass the three overlapping phases of emergency relief, rehabilitation and reconstruction.

Rehabilitation: Rehabilitation includes the provision of temporary public utilities and housing as interim measures to assist long-term recovery.

Reconstruction: Reconstruction attempts to return communities with improved pre-disaster functioning. It includes replacement of buildings; infrastructure and lifeline facilities so that long-term development prospects are enhanced rather than reproducing the same conditions, which made an area or population vulnerable.

Development: In an evolving economy, the development process is an ongoing activity. Long-term prevention/disaster reduction measures like construction of embankments against flooding, irrigation facilities as drought proofing measures, increasing plant cover to reduce the occurrences of landslides, land use planning, construction of houses, capable of withstanding the onslaught of heavy rain/wind speed and shocks of earthquakes are some of the activities that can be taken up as part of the development plan.

Let us see in detail about a few disaster management measures that are in practice in India.

Why mitigating the Hazards essential?

It is more cost-effective to mitigate the risks from natural disasters than to repair damage

after the disaster. Hazard mitigation refers to any action or project that reduces the effects of future disasters.

Warning System in India

Department of Science and Technology (DST) Department of Space (DOS) and CSIR Laboratories have set up early warning system for tsunami and storm surges in the Indian Ocean.

Disaster Management in India

National Disaster Management Authority, abbreviated as NDMA, is an agency of the Ministry of Home Affairs whose primary purpose is to coordinate response to natural or man-made disasters and for capacity-building in disaster resiliency and crisis response. NDMA was established through the Disaster Management Act enacted by the Government of India on 23rd December 2005.

The National Disaster Response Force (NDRF) is a specialized force constituted for the purpose of specialist response to a threatening disaster situation or disaster under the Disaster Management Act, 2005.

National Institute of Disaster Management (NIDM) is a premier institute for training and capacity development programs for managing natural disasters in India, on a national as well as regional basis.

Disaster Management in Tamilnadu

- Tamilnadu State Disaster Management Authority (TNSDMA)is responsible for all measures for mitigation, preparedness, response, and recovery are undertaken under the guidance and supervision of the Authority.
- Tamilnadu State Disaster Response Force (SDRF) has been constituted with a strength of 80 Police Personnel. They have been trained in disaster management and rescue operations in consultation with National Disaster Response Force (NDRF).
- District Disaster Management Authority (DDMA) is responsible for Disaster Management at district level

State Disaster Management plan – The perspective plan – 2018 -2030 prepared by the Revenue and Disaster Management Department.

Hot line between Indian Meteorological Department and the State Emergency Operation Centre is established and mitigation in the District is done through telephone, fax and IP phones also available which connect the State with District Head Quarters, Taluks and Blocks of the State. Wireless radio network with both high frequency and very high frequency are also available in the State.

General Survival Techniques

- During the earthquake be under the table, chair, kneel to the floor and protect yourself. Go near a sturdy wall, sit on the floor and hold the floor strongly and protect yourself.
- Use only torch lights.
- During flood forecast, store up necessary things like first aid. Listen to the local Radio / TV for instructions. Cut off all the electrical supplies during flood and earthquake.
- In case of fire accidents dial 101 for fire service.

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- If clothes are on fire, “Don’t Run; Stop, Drop and Roll".
- Road accidents can be avoided by permitting the persons only who have license are allowed to drive. Learn, preach and practice safety rules during walking and driving along the road.
- Rail Safety Tips: Stay alert. Trains can come from either directions at any time.
- Never sit on the edge of the Station Platform.
- Cross the tracks safely.
- While on boarding the Air craft, pay attention to the flight crew safety demonstration, and read the safety briefing card available in the seat pocket carefully.

Wrap up

- ❖ Both the hazard and the disaster cause enormous physical damage to property and even make huge loss of life.
- ❖ Disaster management refers to conservation of lives and property during a natural or man-made disaster.
- ❖ Preparation, Mitigation, Preparedness, Response, Recovery and Development are the six Disaster management cycles
- ❖ The state and the central government have various disaster management organisations.
- ❖ Earthquake, Tsunami, Flood Cyclone are some of the natural disaster.
- ❖ Fire and Industrial accidents are few man-made disasters.
- ❖ If any accidents occur dial 100 for Police, 101 for Fire service and 108 for the Ambulance
- ❖ If clothes are fire “Don’t Run, Stop, Drop and Roll”.

Glossary		
1.	Hazard	a dangerous event
2.	Disaster	an event which causes enormous damage to property and fife
3.	Vulnerability	severity
4.	Mitigate	reduce (or) make something less severe
5.	Meteorology	forecasting of weather
6.	Trembling	shaking or vibration
7.	Preventive	stop something before it happens
8.	Extinguish	to stop a fire or light
9.	Emergency	a serious, or dangerous situation
10.	Psychological	Mental or emotional state of a person

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Evaluation

I. Choose the correct Answer:

1. _____ is a event which causes enormous physical damage to property, loss of life and change in the environment.

   a) Hazard b) Disaster
   c) Recovery d) mitigation

2. Activities that reduce the effects of disaster

   a) Preparation b) Response
   c) Mitigation d) Recovery

3. A sudden movement (or) trembling of the earth's crust is called an _____

   a) Tsunami b) Earthquake
   c) Fire d) Cyclone

4. A sudden overflow of water in a large amount caused due to heavy rainfall is called _____

   a) Flood b) Cyclone
   c) Drought d) Seasons

5. Road accidents can be avoided by permitting the persons who have _____ is allowed to drive vehicle

   a) Ration card b) License
   c) permission d) Documents

II. Fill in the blanks:

1. A hazard is a _____ event that can causes harm or damage to human and his property
2. Activities taken during a disaster is called _____
3. Displacement of water can produce one or more huge destructive waves known as _____
4. In case of fire accidents call the nearby police station or the no _____ for the fire service
5. Disaster management refers to _____ of lives and property during a natural or man-made disaster

III. Match the following:

1.	Earthquake	– Gigantic waves
2.	Cyclone	– Creak / Fault
3.	Tsunami	– Uneven rainfall
4.	Industrial accident	– Eye of the storm
5.	Drought	– Carelessness

IV. Consider the following statement and tick the appropriate answer

1. **Assertion (A) :** In the modern world we can't live happing everyday.

   Reason (R) : Due to pollution and environmental degradation we are undergoing natural hazard and Disaster

   (a) A and R are correct and A explains R
   (b) A and R are correct but A does not explain R
   (c) A is not correct but R is correct
   (d) Both A and R are in correct

2. **Assertion (A)** Sudden movement (or) trembling of the earth's crust is called an Earthquake Reason (R): Movement of the tectonic plates, mass wasting, surface fault all leads to earthquake

   a) A and R are correct and A explains R

b) A and R are correct but A does not explain R

c) A is in correct but R is correct

d) Both A and R are in correct

V. Answer the following briefly

1. Define Hazard
2. What is disaster ?
3. What are the six concepts of Disaster management cycle
4. Name any two agency which involves in warring system in Tamilnadu
5. Write about any three effects of flood
6. Give any four Rail safety tips
7. Name any four different industry which goes under industrial disaster frequently.

VI. Distinguish between

1. Earthquake and Tsunami
2. Flood and cyclone
3. Hazard and disaster

VII. Answer the following questions in detail

1. Write about disaster management cycle
2. Write about flood its effects and the mitigation
3. Write about any five general survival techniques
4. Write about earthquake, its effects, and mitigation steps

VIII. HOTs

1. Why should we know about the natural disasters?
2. Name four places in India which undergoes land slide .

ICT CORNER

Natural Hazards

To know about Natural disaster in detail through this activity.

PROCEDURE :

Step 1: Open the Browser and type the URL (or) Scan the QR Code.

Step 2: Seismic monitor page will appear on the screen.

Step 3: On the right side of the screen select the place or area.

Step 4 : Click the marked positions to view the detailed explanation about the disaster

Step 1

Step 2

Step 3

Natural Hazard URL: http://ds.iris.edu/seismon/

*Pictures are indicative only

*If browser requires, allow Flash Player or Java Script to load the page.

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CIVICS

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Unit -1

Women Empowerment

Learning Objectives

- To know the sociological perspectives of gender.
- To understand about various role played by women in society.
- To know the importance of woman's education.
- To understand the role played by women in economic development.
- To understand the idea of women's rights.

8Q2S6

Introduction

"Feminism is not about making women stronger. Women are already strong. It's about changing the way the world perceives that strength".

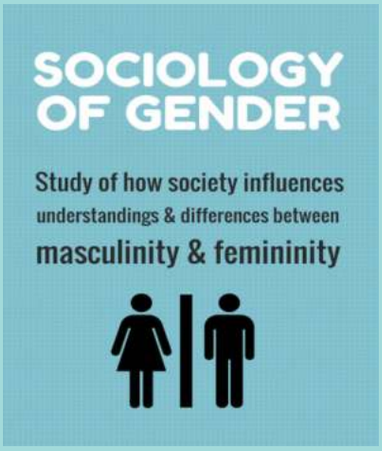
"The story of women's struggle for equality belongs to no single feminist nor to any one organisation but to the collective efforts of all who care about human rights".

"You educate a man; you educate a man. You educate a woman; you educate a generation".

To call woman the weaker sex is a libel; it is man's injustice to woman –Mahatma Gandhi.

The empowerment and autonomy of women and the improvement of their political, social, economic and health status is a highly important end in itself. In addition, it is essential for the achievement of sustainable development. Women's empowerment and achieving gender equality is essential for our society to ensure the sustainable development of the country.

Social Aspects of Gender



In sociology, we make a distinction between sex and gender. Sex is the biological trait that societies use to assign people into the category of either male or female. When people

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talk about the differences between men and women they are often drawing on sex – on rigid ideas of biology – rather than gender, which is an understanding of how society shapes our understanding of those biological categories.

Gender is more fluid – it may or may not depend upon biological traits. More specifically, it is a concept that describes how societies determine and manage sex categories; the cultural meanings attached to men's and women's roles; and how individuals understand their identities including, but not limited to, being a man, woman, transgender, and other gender positions. Gender involves social norms, attitudes and activities that society views as more appropriate for one sex over another. Gender is also determined by what an individual feels and does.

The sociology of gender examines how society influences our understandings and perception of differences between masculinity (what society views appropriate behaviour for a "man") and femininity (what society views appropriate behaviour for a "woman"). We examine how this, in turn, influences identity and social practices.

The essential factors for empowerment are :

1. **Education:** Education gives one the ability to think wisely and take thoughtful decisions.
2. **Gender Discrimination:** A Society which discriminates between the two genders can never be empowered.
3. Discrimination based on caste, creed, religion etc.

Woman's Education

Education is one of the most important means of empowering women with the knowledge, skills and self-confidence necessary to participate fully in the development process. More than 40 years ago, the Universal Declaration of Human Rights asserted that "everyone has the right to education".

Educating the girl child produces mothers who are educated and who will, in turn, educate their children care for their families and provide their children care and support. The girl child needs to be educated to acquire knowledge and skills needed to advance her status for social interactions and self-improvement.

The sustainability and progress of all regions depend on the success of women across the globe. As the former President Barrack Obama said while addressing the United Nations General Assembly in 2012, "the future must not belong to those who bully women. It must be shaped by girls who go to school and those who stand for a world where our daughters can live their dreams just like our sons."

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The Unmatched Importance of Female Education

1. **Increased Literacy:** Of the illiterate youth across the globe, nearly 63 percent are female. Offering all children education will prop up literacy rates, pushing forward development in struggling regions.

2. **Human Trafficking:** Women are most vulnerable to trafficking when they are undereducated and poor, according to the United Nations Inter-Agency Project on Human Trafficking. Through providing young girls with opportunities and fundamental skills, Human Trafficking can be significantly undermined.

3. **Political Representation:** Across the globe, women are under represented as voters and restricted from political involvement. The United Nations Women's Programmes on Leadership and Participation suggest that civic education, training and all around empowerment will reduce this gap.

4. **Thriving Babies:** According to the United Nations Girls' Education Initiative, children of educated mothers are twice as likely to survive past the age of five.

5. **Later Marriage:** As suggested by the United Nations Population Fund, in underdeveloped countries, one in every three girls is married before reaching the age of 18. In a region where a girl receives seven or more years of education, the wedding date is delayed by four years.

6. **Income Potential:** Education also increases a woman's earning capabilities. According to the United Nations Educational, Scientific and Cultural Organisation, (UNESCO) a single year of primary education has shown to increase a girl's wages later in life by 20 percent.

7. **Prospering GDP:** Gross Domestic Product also rises when both girls and boys are being offered educational opportunities. When 10 percent more women attend school, GDP increases by three percent on average.

8. **Poverty Reduction:** When women are provided with equal rights and equal access to education, they go on to participate in economic activity. Increased earning power leads to reduction in poverty level.

Savitribai Phule as a tradition breaker, the first female teacher at the first girls' school. when we talk about the girls' education only Jyotirao Phule is remembered as the champion of women's education in India. He, along with his wife Savitribai Phule, opened the first school for girls in 1848.

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First in the World – Woman

First woman	Name	Country
Prime Minister	Sirimavo Bandaranaike	Sri Lanka
In space	Valentina Tereshkova	USSR
To scale Mt Everest	Junko Tabei	Japan
To win the Olympic gold	Charlotte Cooper	England

First in India - Woman
First Women's University Maharshi Karve starts SNDT University in Pune with five students in 1916.
First Women to hold a Union Cabinet post Vijaya Lakshmi Pandit
First Women to hold a Union Foreign Minister's post Sushma Swaraj (2014)
First Women youngest minister of a state Sushma Swaraj (She became the cabinet minister of Haryana when she was only 25 yrs old)
First Women governor of Independent India Sarojini Naidu, in charge of United Provinces
First Women president of UN General AssemblyVijaya Lakshmi Pandit (1953)
First Women Prime Minister of India Indira Gandhi (1966)
First Women IPS Officer of India Kiran Bedi (1972)
First Women to win Nobel Peace Prize Mother Teresa (1979)
First Indian Women to climb Mount Everest Bachendri Pal (1984)
First Indian Women to win Booker Prize Arundhati Roy (1997)
First Women President Pratibha Patil (2007)
First Women Speaker of LokSabha Meira Kumar (2009)
First Women judge in Supreme Court Meera Sahib Fatima Bibi
First Women President of the Indian National Congress Annie Besant
First Women Chief Minister of an Indian State Sucheta Kripalani
First Women Director General of Police (DGP) Kanchan Chaudhary Bhattacharya
First women defencse Minister of India Nirmala Sitharaman
First woman Finance Minister of India Nirmala Sitharaman

Factors Responsible for Poor Female Literacy Rate

1. Gender based inequality.
2. Social discrimination and economic exploitation.
3. Occupation of girl child in domestic chores.
4. Low enrolment of girls in schools.
5. Low retention rate and high dropout rate.

Male Female literacy rate in India: 1951-2011

Census year	Persons	Males	Females	Male-Female gap in literacy rate
1	2	3	4	5
1951	18.33	27.16	8.86	18.30
1961	28.3	40.4	15.35	25.05
1971	34.45	45.96	21.97	23.98
1981	43.57	56.38	29.76	26.62
1991	52.21	64.13	39.29	24.84
2001	64.83	75.26	53.67	21.59
2011	74.04	82.14	65.46	16.68

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Role of woman in the economic development

Importance of women's economic empowerment in society is inevitable. Empowerment is one of the main procedural concerns when addressing human rights and development. Women's empowerment and achieving gender equality is essential for our society to ensure the sustainable development of the country.

Benefits of Economic Empowerment of Woman

1. Women's economic empowerment is central to realising women's rights and gender equality.
2. Empowering women in the economy and bridging gender gaps in the world of work are key to achieving the agenda for Sustainable Development
3. When more women work, economies grow.
4. Increasing women's and girls' educational attainment contributes to women's economic empowerment and more inclusive economic growth.
5. It is estimated that companies with three or more women in senior management functions score higher in all dimensions of organisational performance.

The need for Economic Empowerment of Woman.

1. Gender differences in laws affect both developing and developed economies, and women in all regions.
2. Women remain less likely to participate in the labour market than men around the world.
3. Women are more likely to be unemployed than men.
4. Women are over-represented in informal and vulnerable employment.
5. Globally, women are paid less than men.
6. Women bear disproportionate responsibility for unpaid care and domestic work.
7. Unpaid care work is essential to the functioning of the economy, but often goes uncounted and unrecognised
8. Women are less likely to be entrepreneurs and face more disadvantages starting businesses.
9. Women are less likely than men to have access to financial institutions or have a bank account.
10. Women are still less likely to have access to social protection.
11. Violence and harassment in the world of work affects women regardless of age, location, income or social status.

Indian society is known for its unity in diversity. Social inequality also prevails in this society which has given birth of weaker section of society which is as diverse as Indian society itself, women, Scheduled caste, scheduled tribes, children, poor, landless farmers are considered as weaker sections. They have faced socio-economic and political discrimination in hands of dominating section since ancient time and their fight for rights and access to justice is almost as old as the discrimination against these marginalised and weaker group.

Summary

Women empowerment and issues related, nowadays gained its importance worldwide. Personal rights, Social equality, Political power, and Economic opportunity are the important aspects of woman empowerment. World governments, both developed and developing countries are sincerely working towards achieving the goal of Women empowerment. Almost the women population shared 50% of the total population of the world; we can't imagine world peace and prosperity without empowering each and every woman on this planet. It is everyone's responsibility to make each woman into an independent and empowered woman.

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Glossary			
1.	bully	to hurt or frighten someone, terrorise	பலவீனனைக் கொடுமைப்படுத்துபவர், கொடுமைக்காரர்
2.	trafficking	the act of buying or selling people	மனித கடத்தல், ஆள் கடத்தல்
3.	thriving	very lively and profitable, successful	வெற்றிகரமான
4.	chores	task, duty	வேலை, பணி
5.	retention	the act of retaining something, with holding	தேக்கி வைத்தல், வைத்திருத்தல்
6.	entrepreneur	a person who sets up a business or businesses	தொழிலதிபர்
7.	harassment	aggressive pressure, irritation	துன்புறுத்தல், தொல்லை கொடுத்தல்

Evaluation

I. Choose the correct answer:

1. Which of the following is NOT a consequence of gender inequality?
   a) Poor maternal health
   b) Greater insecurity for men
   c) The spread of HIV/AIDS
   d) Lower literacy rates for women

2. Gender equality is an issue that is relevant to
   a) Girls and women; it's a women's issue
   b) All societies, women and men alike
   c) Third world countries only
   d) Developed Countries only

3. Which of the following strategies will help women become more socially and economically empowered?
   a) Women working together to challenge discrimination
   b) More income sources for women
   c) Improved access to education
   d) All of the above

4. Why are girls more likely than boys to miss out on secondary education in the developing world?
   a) Because of high school fees, only boys are sent to school
   b) Girls are expected to help out at home
   c) Child Marriage restricts girls mobility and freedom
   d) All of the above

II. Fill in the blanks:

1. Jyotirao Phule is remembered as the champion of women's education in India. He, along with his wife_____, opened the first school for girls in 1848.
2. _____is the first Woman to hold a Union Foreign Minister's post.
3. _____is the first Woman Director General of Police (DGP)
4. _____is the first Indian Woman to win Booker

III. Match the following:

1.	Sirimavo Bandaranaike	England
2.	Valentina Tereshkova	Japan
3.	Junko Tabei	Sri Lanka
4.	Charlotte Cooper	USSR

IV. Consider the following statements:

1. **Tick the appropriate answer:**

   Assertion : Now women are being integrated at all steps of humanitarian operations.

   Reason: Women and girls suffer the most from any kind of conflict in the society.

   a) Both, A and R, are true and R is the correct explanation of A

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b) Both, A and R, are true but R is not the correct explanation of A
c) If A is true but R is false
d) If A is false but R is true

2. **Assertion :** Violence against women cuts across caste, class, religion, age and even education.

Reason: Domestic violence is manifested in the form of foeticide, infanticide, dowry murder, marital cruelty, battering, child abuse etc.

a) Both, A and R, are true and R is the correct explanation of A
b) Both, A and R, are true but R is not the correct explanation of A
c) If A is true but R is false
d) If A is false but R is true

V. Answer the following questions:

1. Discuss about various roles played by woman in Society
2. What is gender equality?
3. Explain woman's right.
4. List out the essential factors of woman empowerment
5. Write an essay on importance of woman's education

VI. Activity:

1. Prepare an album about top ten Women achievers of different fields of Tamilnadu?

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Unit - 2

Market and Consumer Protection

Learning Objectives

- To identify four different types of market structures.
- To know the differences between each type of market structure.
- To understand why consumers need protection.
- To understand the rights of consumers.

Introduction

When we talk about a market we generally visualise a crowded place with a lot of shops and consumers. People are buying different types of goods like groceries, clothing, electronics, etc in the market.

And the shops are also selling a variety of products and services as well. So in a traditional sense, a market is where buyers and sellers meet to exchange their goods and services.

But what is a market in economics? In economics, we do not refer to a market as a physical place. Economists described a market as coming together of the buyers and sellers, i.e. an arrangement where buyers and sellers come in direct or indirect contact to sell/buy goods and services. For example, the market for books will constitute all the sellers and buyers of books in an economy. It does not necessarily refer to a geographic location.

A set up where two or more parties engaged in exchange of goods, services and information is called a market. Ideally a market is a place where two or more parties are involved in buying and selling. The two parties involved in a transaction are called seller and buyer. The seller sells goods and services to the buyer in exchange of money. There has to be more than one buyer and seller for the market to be competitive.

Features of a Market

In economics, the term market refers to the shops for one commodity or a set of commodities. For example a market for rice, a market for cloth, a market for electronics goods, etc.

1. A market is also not restricted to one physical or geographical location. It covers

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a general wide area and the demand and supply forces of the region.

2. There must be a group of buyers and sellers of the commodity to constitute a market. And the relations between these sellers and buyers must be business relations.
3. Both the sellers and buyers must have access to knowledge about the market. There should be an awareness of the demand for products, consumer choices, and preferences, fashion trends, etc.
4. At any given time only one price can be prevalent in the market for the goods and services. This is only possible in the existence of perfect competition.

Classification of Markets

Broadly there are two classifications of markets – the product market and the factor market. The factor market refers to the market for the buying and selling of factors of production like land, capital, labour, etc. The other classification of markets are as follows,

I. On the Basis of Geographic Location

Local Markets: In such a market the buyers and sellers are limited to the local region or area. They usually sell perishable goods of daily use since the transportation of such goods can be expensive.

Regional Markets: These markets cover a wider are than local markets like a district, or a cluster of few smaller states

National Market: This is when the demand for the goods is limited to one specific country. Or the government may not allow the trade of such goods outside national boundaries.

International Market: When the demand for the product is international and the goods are also traded internationally in bulk quantities, we call it as an international market.

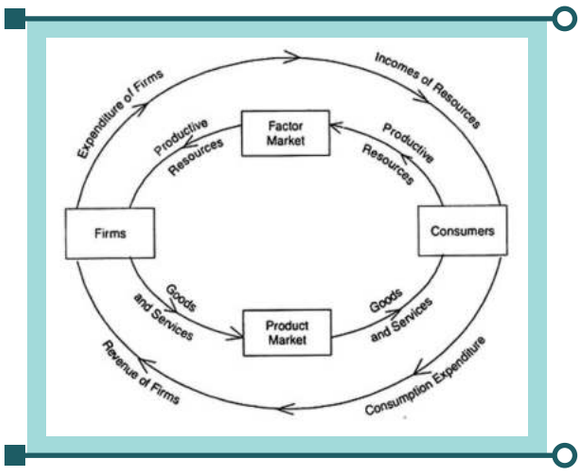
II. On the Basis of Time

Very Short Period Market: This is when the supply of the goods is fixed, and so it cannot be changed instantaneously. Say for example the market for flowers, vegetables. Fruits etc. The price of goods will depend on demand.

Short Period Market: The market is slightly longer than the previous one. Here the supply can be slightly adjusted. Example:

Long Period Market: Here the supply can be changed easily by scaling production. So it can change according to the demand of the market. So the market will determine its equilibrium price in time. Example:

III. On the Basis of Nature of Transaction



Spot Market: This is where spot transactions occur, that is the money is paid immediately. There is no system of credit.

Future Market: This is where the transactions are credit transactions. There is a promise to pay the consideration sometime in the future.

IV. On the Basis of Regulation

Regulated Market: In such a market there is some oversight by appropriate government authorities. This is to ensure there are no unfair trade practices in the market. Such markets may refer to a product or even a group of products. For example, the stock market is a highly regulated market.

Unregulated Market: This is an absolutely free market. There is no oversight or regulation, the market forces decide everything. Example:

V. On the basis of nature of competition

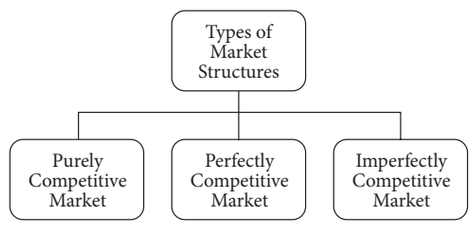


Figure-1: Types of Market Structures

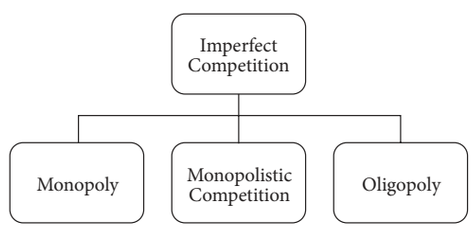


Figure-2: Types of Imperfect Competition

Monopoly:

Monopoly refers to a market structure in which there is a single producer or seller that has a control on the entire market. This single seller deals in the products that have no close substitutes.

Monopolistic Competition:

The term monopolistic competition was given by Prof Edward H. Chamberlin of Harvard University in 1933 in his book Theory of Monopolistic Competition. The term monopolistic competition represents the combination of monopoly and perfect competition. Monopolistic competition refers to a market situation in which there are a large number of buyers and sellers of products. However, the product of each seller is different in one aspect or the other.

Oligopoly:

The term oligopoly has been derived from two Greek words, Oligoi means few and poly means control. Therefore, oligopoly refers to a market form in which there are few sellers dealing either in homogenous or differentiated products.

1. Who is a Consumer?

A Consumer is a person who purchases a product or avails a service for a consideration, either for his personal use or to earn his livelihood by means of self employment.

The consideration may be:

- ✓ Paid
- ✓ Promised
- ✓ Partly paid and partly promised.

It also includes a beneficiary of such goods/services when such use is made with the approval of such person.

2. Who is not a Consumer ?

A person is not a consumer if he/she:

- ✓ Purchases any goods or avails any service free of charge;
- ✓ Purchases a good or hires a service for commercial purpose;
- ✓ Avails any service under contract of service.

What is Unfair Trade Practice?

An "unfair trade practice" means a trade practice, which, for the purpose of promoting any sale, use or supply of any goods or services, adopts unfair method, or unfair or deceptive practice. Some of these practices include:

- False representation
- When goods and services are not of stated standard, quality or grade;
- When second hand, renovated goods are sold as new ones;
- When goods and services do not have the claimed use, usefulness or benefit;
- When products / services do not have the claimed warranty / guarantee;
- When the price of product or service is misleading.
- False and misleading advertisement of selling at bargain price.
- Offering gifts, prizes, etc. to lure customers with no intention of providing them.
- Selling goods which do not fall within the safety standards set up by competent authority.
- Hoardings or destroying goods with the intention of raising the cost of these or similar goods manufactured in greater number so as to manipulate higher prices.
- Manufacturing or offering spurious goods or adopting deceptive practices in the provision of services.

DO YOU KNOW?

"Goods once sold will not be taken back"
or
"No exchange",
or
"No refund under any circumstances"

It amounts to Unfair Trade Practice and does not carry any legal weight.

Consumer protection

Consumer protection is a group of laws enacted to protect the rights of consumers, fair trade, competition and accurate information in the market place. The laws are designed to prevent the businesses that engage in unfair practices from gaining an advantage over competitors. They may also provide additional protection for those most vulnerable in society. Consumer protection laws are a form of government regulations that aim to protect the rights of consumers. For example, a government may require businesses to disclose detailed information about products—particularly in areas where safety or public health is an issue, such as food.

Consumer protection is linked to the ideas of consumer rights and to the formation of consumer organisations, which helps consumers make better choices in the marketplace and get help with consumer complaints. Other organisations that promote consumer protection include government organisations and self-regulating business organisations.

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Example:
Telecom Regulatory Authority of India – **TRAI.**
Insurance Regulatory and Development Authority of India – **IRDAI.**

The Eight Basic Consumer Rights

1. The Right to Basic Needs.
2. The Right to Safety.
3. The Right to Information.
4. The Right to Choose.
5. The Right to Representation.
6. The Right to Redress.
7. The Right to Consumer Education.
8. The Right to a Healthy Environment.

The Consumer Protection Act, 1986 (COPRA)

This Act enacted in 1986 in the Parliament of India to protect the interests of consumers. It makes for the establishment of consumer councils and other authorities for the settlement of consumer's grievances and for matters connected there with it. The act was passed in Assembly in October 1986 and came into force on December 24, 1986.

COPRA is regarded as the 'Magna Carta' in the field of consumer protection for checking unfair trade practices, 'defects in goods' and 'deficiencies in services' as far as India is concerned. It has led to the establishment of a widespread network of consumer forums and appellate courts all over India. It has significantly impacted how businesses approach consumer complaints and has empowered consumers to a great extent.

Consumer Protection Councils are established at the national, state and district level to increase consumer awareness. To increase the awareness of consumers, there are many consumer organisations and NGOs that have been established.

Consumer Disputes Redressal Agencies

National Consumer Disputes Redressal Commission (NCDRC): Established by the Central Government. It deals with matters of more than 10 million.

State Consumer Disputes Redressal Commission (SCDRC): Also known as the "State Commission" established by the State Government in the State. It is a state level court that takes up cases valuing less than ₹10 million.

District Consumer Disputes Redressal Forum (DCDRF): Also known as the "District Forum" established by the State Government in each district of the State. The State Governments may establish more than one District Forum in a district. It is a district level court that deals with cases valuing up to ₹2 million.

Consumer protection Act of 2019

Indian Parliament, in August 2019, passed the landmark Consumer Protection Bill, 2019 which aims to provide the timely and effective administration and settlement of consumer disputes in this Digital Age. The New Act will come into force on such date as the Central Government may so notify. The New Act seeks to replace more than 3 (three) decades old Consumer Protection Act, 1986 (Act).

Highlights of the New Act:

1. **E-Commerce Transactions:** The New Act has widened the definition of 'consumer'. The definition now includes any person who buys any goods, whether through offline or online transactions, electronic means, teleshopping, direct selling or multi-level marketing.

2. **Enhancement of Pecuniary Jurisdiction:** Revised pecuniary limits have been fixed under the New Act. Accordingly, the district forum can now entertain consumer complaints where the value of goods or services paid does not exceed INR 10,000,000 (Indian Rupees Ten Million). The State Commission can entertain disputes where such value exceeds INR 10,000,000 (Indian Rupees Ten Million) but does not exceed INR 100,000,000 (Indian Rupees One Hundred Million), and the National Commission can exercise jurisdiction where such value exceeds INR 100,000,000 (INR One Hundred Million).

3. **E-Filing of complaints:** The New Act contains enabling provisions for consumers to file complaints electronically and for hearing and/or examining parties through video-conferencing.

4. **Establishment of Central Consumer Protection Authority:** The New Act proposes the establishment of a regulatory authority known as the Central Consumer Protection Authority (CCPA), with wide powers of enforcement. The CCPA will have an investigation wing, headed by a Director-General, which may conduct inquiry or investigation into consumer law violations.

5. **Unfair Trade Practices:** The New Act introduces a specific broad definition of Unfair Trade Practices, which also includes sharing of personal information given by the consumer in confidence, unless such disclosure is made in accordance with the provisions of any other law.

6. **Penalties for Misleading Advertisement:** The CCPA may impose a penalty of up to INR 1,000,000 on a manufacturer or an endorser, for a false or misleading advertisement. The CCPA may also sentence them to imprisonment for up to two years for the same. In case of a subsequent offence, the fine may extend to INR 5,000,000 and imprisonment of up to five years. The CCPA can also prohibit the endorser of a misleading advertisement from endorsing that particular product or service for a period of up to one year. For every subsequent offence, the period of prohibition may extend to three years.

Consumer courts in India

National Consumer Disputes Redressal Commission (NCDRC): A national level court works for the whole country and deals compensation claimed exceeds rupees one core. The National Commission is the Apex body of Consumer Courts; it is also the highest appellate court in the hierarchy. The National Consumer Disputes redressal Commission (NCDRC), is a quasi-judicial commission in India which was set up in 1988 under the Consumer Protection Act of 1986. Its head office is in New Delhi. The commission is headed by a sitting or retired judge of the Supreme Court of India.

State Consumer Disputes Redressal Commission (SCDRC): A state level court works at the state level with cases where compensation claimed is above 20 lakhs but up to one core. The State Commission also has the appellate jurisdiction over the District Forum.

District Consumer Disputes Redressal Forum (DCDRF): A district level court works at the district level with cases where the compensation claimed is up to 20 lakhs.

Important Acts

- ✓ The Consumer Protection Act, 1986
- ✓ The Legal Metrology Act, 2009
- ✓ The Bureau of Indian Standards Act, 1986
- ✓ The Essential Commodities Act, 1955
- ✓ The prevention of Black Marketing and maintenance of supplies of essential
- ✓ Commodities Act, 1980

Website of the Department: http://consumeraffairs.nic.in

Website of the NDRC :http://ncdrc.nic.in/

State Commission :http://ncdrc.nic.in/statelist.html

District Forums :http://ncdrc.nic.in/districtlist.html

Summary

❖ Nowadays, consumers are needed to be treated like a King as they bring business to the seller. Previously, consumers needed to be cautious before buying any product, but these days sellers needed to be more cautious before selling any product as due to policies introduced, government laws, consumer protection, NGO and the increased competition in the market. Though the consumers are protected by policies and laws, lack of awareness prevails among the consumers; the need of the hours is consumers are empowered towards their rights and protection.

Glossary

1.	Commodities	trade goods, supplies	வியாபாரப் பொருள்கள்
2.	Prevalent	very common, frequent	எங்குமிருக்கும், வழக்கமான
3.	Cluster	a grouping of a number of similar things, bunch	தொகுப்புக் குழு, திரள்
4.	Instantaneously	immediately, without hesitation	உடனடியாக, கணப்பொழுதில்
5.	Spurious	invalid, fake	போலியான, பொய்யான
6.	Vulnerable	attacked either physically or emotionally, helpless	பாதிக்கப்படக்கூடிய ஆபத்தான
7.	Redress	compensate, remedy, rectify	குறை நிவர்த்தி குறை தீர்க்கும்
8.	Pecuniary	relating to money, financial	பொருள் சார்ந்த பணவகையான

Evaluation

I. Choose the correct answer:

6MUQP

1. In which case a consumer cannot complain against the manufacturer for a defective product?
   a) Date of expiry unspecified
   b) Price of the commodity
   c) Batch number of the commodity
   d) Address of the manufacturer

2. Consumer's face various problems from the producer's end due to
   a) Unfair trade practices
   b) Wide range of goods
   c) Standard quality goods
   d) Volume of production

3. Consumers must be provided with adequate information about a product to make
   a) Investment in production
   b) Decision in sale of goods

c) Credit purchase of goods
d) Decision in purchase of goods

4. The system of consumer courts at the national, state, and district levels, looking into consumers grievances against unfair trade practices of businessmen and providing necessary compensation, is called
   a) Three tier system b) One tier system
   c) Two tier system d) Four tier system

5. Mixing other extraneous material of inferior quality with a superior quality material is called
   a) Purification b) Adulteration
   c) Refinement d) Alteration

II. Fill in the blanks:

1. A set up where two or more parties engage in _____ of goods, services and information is called a market.
2. In regulated Markets, there is some oversight by appropriate_____ authorities.
3. _____refers to a market structure in which there is a single producer or seller that has a control on the entire market.
4. _____statue is regarded as the 'Magna Carta' in the field of consumer protection for checking unfair trade practices.

III. Match the following:

1.	The Consumer Protection Act	1955
2.	The Legal Metrology Act	1986
3.	The Bureau of Indian Standards Act	2009
4.	The Essential Commodities Act	1986

IV. Consider the following statements:

1. **Tick the appropriate answer:**
   Assertion : In local Markets the buyers and sellers are limited to the local region or area.
   Reason: A market is not restricted to one physical or geographical location.
   a) Both, A and R, are true and R is the correct explanation of A
   b) Both, A and R, are true but R is not the correct explanation of A
   c) If A is true but R is false
   d) If A is false but R is true

V. Answer the following questions

1. What is market?
2. Describe consumer protection.
3. List out the rights of consumers
4. Discuss about the role of consumer courts.
5. Write about the types of market and its functions.

VI. Activity

1. List out the name and price of ten essential commodities that used in our day today's life.

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Unit -3

Road Safety

Learning Objectives

- Understand the need for road safety
- Analyze the causes for road accidents
- List out the safety measures
- Recognize the roles and responsibilities of government and individuals
- Know about safety week and traffic signals

Safe driving, Saves lives, Drive fine, Avoid fine

Introduction

The revolutionary invention of the wheel has given rise to modern technologies from transport to machinery. It is one of the most fundamental inventions we use in our daily life. Invention of wheel may be a mystery but the history of vehicles prove the intelligence of man. Can you imagine a world without two wheelers, three wheelers and four wheelers?

Road safety

We have to travel via roads almost every day to go to school, college, office, shops, visit relatives and friends. We need to be safe on the roads. Road safety refers to the methods and measures used to prevent road users. from being killed or seriously injured.

Need for safety on Roads

It is a saddening fact that India is the world's largest contributor to road accidents.

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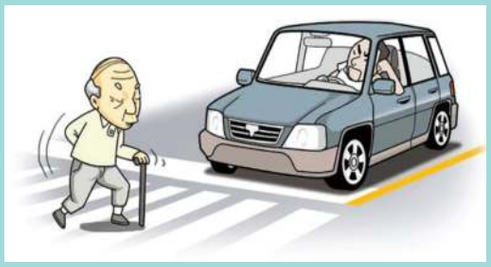
India accounts for about 10% of road accident fatalities at worldwide. Road crashes have a threatening impact on Indian lives, growth and economy.

Causes for Road Accidents

Distracted driving

This is a larger threat and the leading cause for road accidents. It is the distraction of the driver, engaging in any other activity while driving. It may be talking over the mobile phone or texting message or engaging in any activities with attention diverted from driving.

Reckless driving



It is a major traffic violation of rules. It is defined as the mental state in which the driver purposely disregard the rules of the road.

Night driving

An extra alertness is needed while driving at night. The uncontrolled sleep, tiredness due to long drive, poor lighting on the road can cause fatal accidents.

Tailgating

Tailgating refers to a condition where a driver drives behind another vehicle without leaving sufficient distance between them. In this condition, if the vehicle in front of him, stops suddenly, his own vehicle will crash with it.

Heavy Traffic

Increase of vehicles on the road create heavy traffic jam and cause more pollution.

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Road conditions

Road expansion is very slow when compared to the expansion of vehicles.

Avoidance of safety gears

Avoiding the use of helmets for two wheelers and seat belts for four wheelers lead to unwanted happenings.

Impatience of Pedestrians

Impatience of Pedestrians and violation of traffic rules result in accidents.

Other causes

Drunken driving, jumping red light over speeding and unmanned railway crossings cause great damage to valuable lives. Due to this, many families lose their breadwinners.

Road Safety Rules

Every country has its own road safety rules and regulations for the best interests of its citizens. India also has designed road safety rules for protecting the road users from meeting with accidents and injury.

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As per the Indian law, one should be eligible to get a driving license at the age of 18. While driving use of mobile phone is prohibited. Sound horn is prohibited near a hospital or a school zone.

10 GOLDEN RULES FOR ROAD SAFETY

STOP OR SLOW DOWN

Allow Pedestrians to cross first at uncontrolled zebra crossing. They have the Right of Way (Rule 11)[1]

BUCKLE UP

So that your family and you are sate in the car (Section 138 (3)[2]. Seat Belts reduce changes of death of a car occupant in accident by over 60%.

OBEY TRAFFIC RULES AND SIGNS

To prevent road accidents (Section 119)[3].

OBEY SPEED LIMITS

For your own safety and that others (Section 112)[3]. In residential area and market places, that ideal speed is 20 kmph and the limit is 30 kmph.

KEEP VEHICLE FIT

To prevent frequent breakdowns and difficulty in controlling vehicle which may lead to accidents on road (Section 190)[2]

NEVER USE MOBILE WHILE DRIVING

To avoid distraction that lead to accidents (Section 184)[3].

WEAR HELMET

To protect your head while riding a two wheeler (Section 129)2. A good quality helmet reduces the chances of severe head injury by over 70%.

NEVER DRIVE DANGEROUSLY

To ensure your own safety and that of other road user (Section 184)[3].

BE COURTEOUS

Share the road with all and be considerate. Never range on the road. It is dangerous for your and other road users.

NEVER MIX DRINKING AND DRIVING

Be Responsible... Don't drink and Drive (Section 185)[3].

1. Rules of Road Regulations 1989 2. The Central Motor Vehicle Rules. 1989 3. The Motor Vehicle Act 1968.

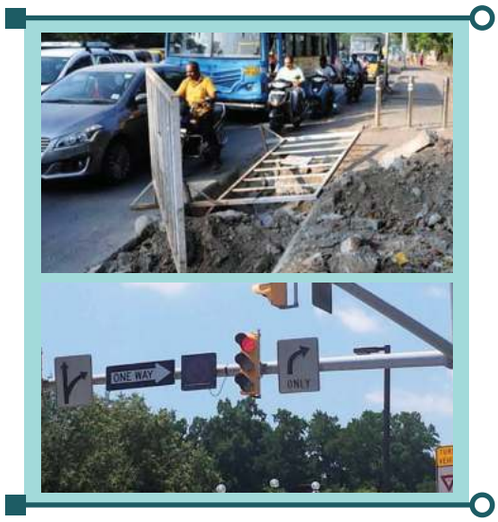
Use standard helmets while driving two wheeler vehicle and strap it before mounting the vehicle. Fasten the seat belts while driving a car for both the driver and co-passenger. Avoid carrying heavy load while riding a two wheeler. Two wheeler can carry one adult pillion rider and not the whole family. Keep a safe distance from the vehicle ahead of yours. Slow down on bends and turns, especially in hill stations. The Motor Vehicle Act, 1988 passed by the Parliament came into force in 1989 and it is applicable to across the country.

Preventive Measures

Government

Through the Ministry of Road Transport and Highways, Government of India has taken earnest steps for reducing the number of road accidents.

i) Taking steps for the rectification of accident black spots and improvement of road engineering.



ii) Ensuring the good functioning of the traffic signals and road signs at busy crossing roads.

iii) Constructing proper roads both in urban and rural areas.

iv) Installation of CCTV cameras to record high speed offences which can detect the offenders.

v) Prohibiting the act of digging or hoarding soil from roads.

vi) Remove encroachments and maintain proper pedestrian ways for ensuring road safety. If the public are violating the traffic rules, it is the duty of government to correct the public and maintain order. Stringent actions are to be taken for the violation of any road safety rules.

Individuals

One who drives a vehicle should have undergone the training and tests to obtain a driving license. It is compulsory to have the following documents – driving license, registration certificate of the vehicle, Insurance certificate, Taxation certificate, fitness certificate and permit.

Brake failure can result in crucial collisions. So the vehicle should be in good condition and serviced at regular intervals.

To avoid accidents because of potholes and road humps, users can opt to use the Raksha safe drive device. It is attached with velcro to the car and alerts the driver about road humps, bad roads and on crossing the speed limits.

Carpooling is the sharing of car journeys so that more than one person travels in car, and prevents the need for more cars to the same location.

Raksha safe drive. It is a device capable of automatic crash detection, two – way call connectivity, GPS tracking, engine health monitoring and smart panic button.

Carpooling will reduce the number of vehicles on the road. Many people use one vehicle and so fuel, money and time are saved. It will pave way for a cordial relationship and better understanding among the fellowmen.

Parents and Teachers

Parents and Teachers play a vital role in imparting road safety Education to young ones. If a child's parent violates the traffic rules, the child too will initiate the same in future. So the elders have to set an example for them in adhering to the safety rules and regulations. Video and computer games that simulate driving should be banned by the government or discouraged by parents as it will develop racing habit in children.

Help your children learn about the traffic signals and rules. Instruct them to wait for

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the right signal and to use the zebra crossing while crossing the road. Warn them not to run across or along the road. Teach them to use the footpath, while walking on the road.

Provide Road Safety education since childhood. It has to be made a part of school curriculum, syllabus, text book and included in competition on road safety. Activities like writing of slogans, essays and paintings on this theme should be conducted for reinforcement.

Media

Media like radio, TV, films and advertisement could take up this responsibility of creating awareness of road safety.

On Sachin Tendulkar's 45th birthday, Mumbai police has released his video to create awareness among the motorists. "The little master set great records wearing a helmet! How about simply following his footsteps".

Traffic Signs

Traffic signs act as silent conductors of the traffic on the road. Some traffic signs are mandatory like stop, speed limit, turn right, no left turn etc. Some signs are cautionary, which warn the driver about the danger ahead like steep ascent or descent, narrow bend. Some signs are informatory providing information about hospital, petrol pump, resting place, parking or no parking area.

Road Safety Week

This is a national event which aims at promoting public awareness about traffic rules and to reduce causalities due to road accidents. It is observed annually. It is celebrated with great joy and enthusiasm. A variety of programmes related to road safety is conducted. Educational banners, safety posters, leaflets, and pocket guides related to road safety are distributed to the public.

The Government of India observes 'Road Safety Week' awareness during January, every year.

Suggestions

- Walking is a good alternative and cycling is a good exercise for a distance of 1 to 2 kms.
- Use eco-friendly vehicles.
- Implement the idea of installing bollards near unmanned railway crossings. A separate unhindered passage for cyclists would yield many benefits and also reducing road crashes.
- Cycling is a healthy habit and reduces pollution.
- Motorcycle manufacturers should be asked to design two wheelers with a designed maximum speed of 50 km ph.
- An awareness programme can be used by narrating live examples and also projecting videos.

Recap

- Road safety refers to the methods and measures used to prevent road users and vechicle users from fatal accidents and injuries.
- Violation of road rules and regulations cause road crashes and a threatening impact on a country's growth and economy.
- Traffic signs act as silent conductors of the traffic on the road.
- Mandatory signs, Cautionary signs and informatory signs are the three types of traffic signs.
- Every country celebrates road safety week.
- We should strictly follow the rules and regulations road safety and save our nation.

Glossary

1.	Pedestrians	persons walking on the road	பாதசாரிகள்
2.	Fatalities	deaths due to accident	விபத்தால் ஏற்படும் இழப்பு
5.	Breadwinner	one who earns money to support the family	குடும்பத்திற்காக சம்பாதிப்பவர்
6.	Stringent	severe	மிகவும் கடுமையான
7.	Collision	crash	மோதல்
8.	Rectification	correction	திருத்தம்
9.	Potholes	holes in a road surface	பாதையில் உள்ள குழிகள்
12.	Mandatory	compulsory	கட்டாயம்
13.	Bollards	short concrete posts used to prevent vehicles on the road	கட்டை தூண்கள்
14.	Pillion	seat behind in a two wheeler	இருசக்கர வாகன பின்இருக்கை

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Evaluation

I. Choose the correct answer:

1. Road safety is meant for
   a) Passersby
   b) drivers
   c) public
   d) all who use roads

2. Road accidents affect a country's
   a) improvement b) life
   c) finance d) all the above

2. Permit refers to
   a) permission for driving
   b) permission for carrying goods
   c) certificate for drivers
   d) registration of vehicles

4. Raksha safe drive is a device useful for
   a) pedestrians b) motorists
   c) car drivers d) passengers

5. Road safety week celebration was first imitated in India in the year
   a) 1947 b) 1989
   c) 1990 d) 2019

II. Fill in the blanks:

1. The most useful invention of man for transport is _____.
2. Using _____ is inevitable in our journey of life.
3. Too many vehicles on the road cause _____and_____ pollution.
4. _____ is the monetary supporter of a family.
5. In case of emergency for medical assistance call _____ for help.

III. Match the following:

1.	Informatory sign	Traffic lights
2.	Zebra crossing	Narrow bend sign
3.	Mandatory sign	Petrol pump sign
4.	Cautionary sign	License
5.	Right to drive a vehicle	Walkers

IV. Consider the following statements:

1. **Tick the appropriate answer:**
   Assertion : Car pooling is the use of vehicles by turns.
   Result: It saves fuel, time and money and also
   a) A is correct and R is not correct
   b) A is correct and R is also correct
   c) A is wrong and R is correct
   d) Both are wrong

2. **Find the odd one**
   a) car b) trucks
   c) tempos d) aero planes

3. **Find the following statements are true or false**
   a) Road safety education in the school curriculum is an additional burden for the students.
   b) An ounce of practice is worth more than tons of preaching.
   c) Hoarding on roads has to be banned.
   d) Following road safety rules from childhood will become a habit in future.

V. Answer in one or two sentences:

1. What are the distracters while driving?
2. Mention the 2 safety gears for safe driving.
3. Why is not safe to drive in nights?
4. When can a person obtain the right to drive a vehicle?
5. How can media promote road safety among the public?

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VI. Answer the following in detail:

1. List out the documents necessary for an Indian while driving.
2. What is the need for including road safety education in the school curriculum?
3. How can parents teach their children road safety rules?

VII. HOTs

1. Knowing the road safety rules, how will you influence your parents and relatives?
2. If wheel had not been invented, what might have been our mode of transport?

Activity

1. Prepare an album of all traffic signals.
2. Organise a procession promoting road safety with catchy slogans for public awareness.
3. Conduct competitions on road safety.

ICT CORNER

ROAD SAFETY

To know and learn about the safety rules through this activity.

PROCEDURE :

Step 1: Open the Browser and type the URL (or) Scan the QR Code.

Step 2: Game page will appear on the screen.

Step 3: Click on PLAY button on the screen and Choose the Characters.

Step 4: Select the area URBAN or RURAL. Read the instructions by clicking next then start the game.

Step 5: Choose the correct path A or B to reach the goal safely

Step 1

Step 2

Step 3

ROAD SAFETY Web URL:

https://www.think.gov.uk/games/take_the_lead/take_the_lead.html

*Pictures are indicative only

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ECONOMICS

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Unit -1

Tax and its Importance

Learning Objectives

- To know the Taxation, Principles of Taxation and its types.
- To know the importance of Tax and its types.
- To gain knowledge of the need for Tax and People's Welfare.

3Q6JN

இயற்றலும் ஈட்டலுங் காத்தலும் காத்த
வகுத்தலும் வல்ல தரசு.

– திருவள்ளுவர்

"It was only for the good of his subjects that he collected taxes from them, just as the Sun draws moisture from the Earth to give it back a thousand fold"

– **Kalidas**

Introduction

For the welfare of the society, the government has to perform various functions so it requires revenue. Modern governments have a wider variety of sources of revenue. The principal sources of the revenue are taxes, fees, prices, special assessment and Raffle Scheme. Like any other country, taxes form the most important part of revenue of India.

Taxation

Taxation is a term for when a taxing authority, usually a government, levies or imposes a tax. The term **'taxation'** applies to all types of involuntary levies, from income to capital gains to estate taxes. Though taxation can be a noun or verb, it is usually referred to as an act; the resulting revenue is usually called 'taxes'.

Taxes

Taxes are compulsory payments to the government without expectations of direct or return or benefit to the taxpayers. According to Prof. Seligman, taxes are defined as a compulsory contribution from a person to the government to defray the expenses incurred in the common interest of all without reference to special benefits conferred.

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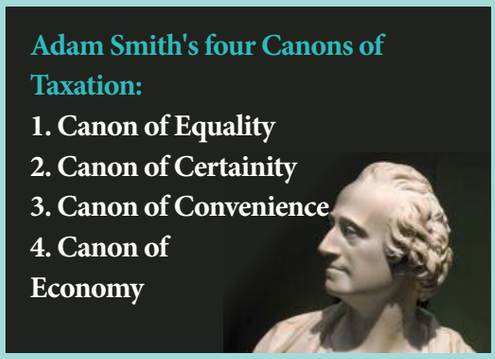
Why are Taxes Imposed?

Everybody is obliged by law to pay taxes. Total Tax money goes to government exchequer. The government decides how are taxes to be spent and how the budget is to be organized. Tax payment is not optional. An individual has to pay tax if any income comes under the income tax slab. It is a duty of every citizen to pay taxes. More collection of tax allows the government to implement more and more welfare schemes.

Principle of taxation

Adam Smith's principles or cannons of taxation still form the basis of the tax structure of a modern state:



1. Canon of Equality: the government should impose taxes in such a way that people have to pay according to their ability. It does not mean equal amount of tax but it means that the burden of a tax must be fair and just.

2. Canon of Certainty: Certainty creates confidence in the taxpayers cost of collection of taxes and increases economic welfare because it tends to avoid all economic waste.

3. Canon of Convenience: Taxes should be levied and collected in such a manner that it provides a maximum of convenience to the taxpayers. It should always be kept in view that the taxpayers suffer the least inconvenience in payment of the tax.

4. Canon of Economy : Minimum possible money should be spent in the collection of taxes. Collected amount should be deposited in the Government treasury.

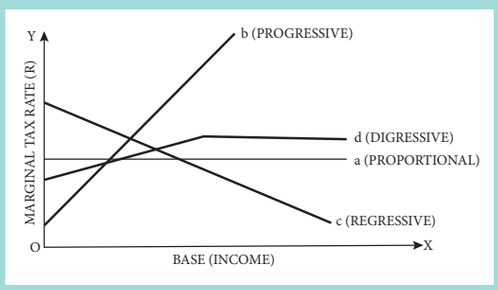
Taxation Types

There are three types of Taxation:

1. Proportional Tax

2. Progressive Tax

3. Regressive Tax and



Taxation Types

Proportional Taxation is a method, where the rate of tax is same regardless the size of the income. The tax amount realized will vary in the same proportion as that of income.

If tax rate is 5% on income and Mr. X gets an income of Rs.1,000, he will pay Rs.50, Mr. B gets an income Rs.5,000, he will pay tax of Rs.250. In short, proportional tax leaves the relative financial status of taxed persons unchanged.

Progressive Taxation is a method by which the rate of tax will also increase with the increase of income of the person. If a person with Rs.1000 income per annum pays a tax of 10% (i.e) Rs.100, a person with an income of Rs.10,000 per annum pays a tax of 25% (i.e) Rs.2,500 and a person with income of 1 lakh per annum pays the tax of 50% that is Rs.50,000.

Regressive Taxation

A regressive tax is a tax applied uniformly, taking a larger percentage of income from low income earners than from high income earners. It is in opposition to a progressive tax.

Importance of Tax

Without taxes, governments would be unable to meet the demands of their societies. Taxes are crucial because governments collect this money and use it to finance under the following social projects.

1. Health

Without taxes, government contributions to the health sector would be impossible. Taxes go to funding health services such as social healthcare, medical research, social security, etc.

Health

2. Education

Education could be one of the most deserving recipients of tax money. Governments put a lot of importance in the development of human capital and education is central in this development.

Education

3. Governance

Governance is a crucial component in the smooth running of country affairs. Poor governance would have far reaching ramifications on the entire country with a heavy toll on its economic growth. Good governance ensures that the money collected is utilized in a manner that benefits citizens of the country.

Digital India

4. Other important sectors are infrastructure development, transport, housing, etc.

Apart from social projects, governments also use money collected from taxes to fund sectors that are crucial for the wellbeing of their citizens such as security, scientific research, environmental protection, etc.

Some of the money is also channeled to fund projects such as pensions, unemployment benefits, childcare, etc. Taxes can affect the state of economic growth of a country. Taxes generally

contribute to the gross domestic product (GDP) of a country.

Scientific Research

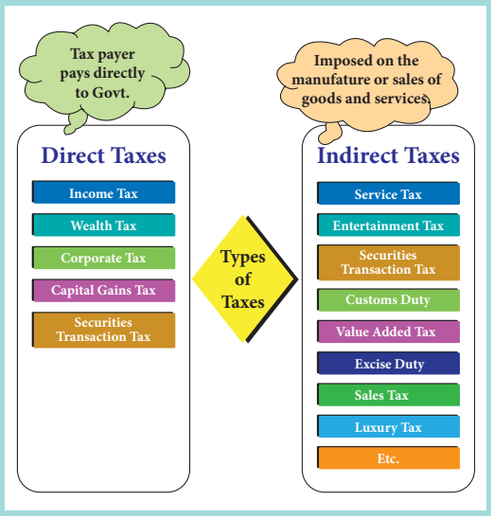
Environmental Protection

Types of tax

In modern times taxes are classified into two types. There are:

1. Direct Tax;

2. Indirect Tax



Direct Tax

A **Direct tax** is paid directly by an individual or organisation to imposing entity.

A tax payer, for example, pays direct taxes to the Government for different purposes, including real property tax, personal property tax, income tax or taxes or on asserts.

Income Tax

DO YOU KNOW?

Central Board of Revenue bifurcated and a separate Board for Direct Taxes known as Central Board of Direct Taxes (CBDT) constituted under the Central Board of Revenue Act, 1963.

Other examples of direct tax are

Corporation Tax

Corporation Tax

It is levied on profit of corporations and companies. It is charged on royalties, interest, gains from sale of capital assets located in India, fees for technical services and dividends.

Wealth Tax

It is imposed on property of individuals depending upon the value of property. The same property will be taxed every year on its current market value.

Gift Tax

It is paid to the Government by the recipient of gift depending on value of gift.

Estate Duty

Estate Duty

It is charged from successor of inherited property. It is not desirable to avoid payment of taxes .They are levied directly on income and property of persons, who pay directly to the government.

Indirect Tax

On the other hand when liability to pay a tax is on one person and the burden of that tax shifts on some other person, this type of tax is called an indirect tax. Indirect Tax is a tax whose burden can be shifted to others. For example.

Service Tax

It is raised on provision of Service. This tax is collected from the service recipients and paid to the Central Government.

Sales Tax

It is an indirect tax on sale of goods because liability to collect tax is that of shopkeeper but the burden of that tax falls on the customer. The shopkeeper realizes the tax amount from the customer by including it in the price of the commodity that he sells.

Excise Duty

Excise Duty

It is paid by the producer of goods, who recovers it from wholesalers and retailers. This tax in India is levied by the Central Government.

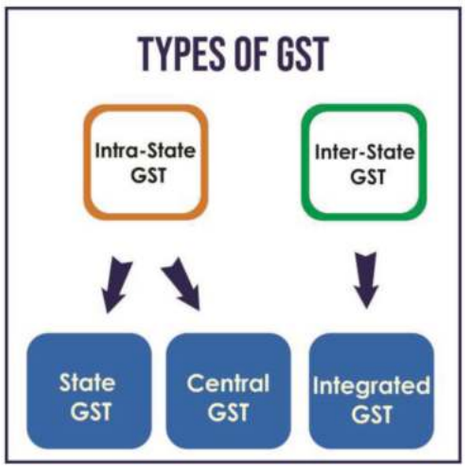
Entertainment Tax

The state governments charge such tax on every transaction related to entertainment.

Some examples are movie tickets, video game arcades, stage shows, exhibitions, amusement parks, and sports-related activities.

Goods and Services Tax (GST)

Goods and Services Tax is a kinds of tax imposed on sale, manufacturing and usage of goods and services. This tax is applied on services and goods at a national level with a purpose of achieving overall economic growth. GST is particularly designed to replace the indirect taxes imposed on goods and services by the Central and State.



Introduction to GST

Previous Indirect Tax Structure and its difficulties

The history of Indian taxation goes back to ancient period. According to Arthshastra, the book written by Kautilya, in ancient time taxes were levied and collected in both cash and kind. The modern history of Indirect taxes starts from the early 20th century when Central Excise Duty was imposed on Salt, Sugar, Motor Spirit, etc. Gradually the base of Excise duties was widened. At the time of independence, the system of Central Excise Duty at the national level and the Sales Tax at the State level was prevailing. After prolonged efforts and amendments, VAT was introduced first in Indian State of Haryana in 2003 and thereafter in 24 States/UTs including Punjab, Chandigarh, HP, J&K and Delhi in 2005. If the VAT was a major improvement over the pre-existing Sales Tax regime , then the Goods and Services Tax (GST) is indeed an remarkable improvement and the next logical step towards realising perfection in taxation system in the country.

Initially, it was proposed that there would be a single and national level GST. However, the GST tax regime has been finally implemented from 1st July, 2017 across India. With thus there is a economic union of the country with ONE TAX, ONE MARKET AND ONE NATION.

Goods and Services Tax (GST) is a tax on all the goods and services that we buy. It has two parts, the Central Goods and Services Tax (CGST) and State Goods and Services Tax (SGST). It is a transparent tax. If you get a bill for the products you buy, you will find the following information:

Value of the Product	=	Rs.100	SGST 9%	=	Rs.9
CGST 9 %	=	Rs.9	Total	=	Rs.118

In the bill, the GST is 18%, and it is divided equally as 9% for the Central and State Governments. Therefore, Rs 9 will go to Tamil Nadu Government and another Rs 9 will go to Central government.

If a seller in Tamil Nadu sells a commodity to a buyer in other state (for example Karnataka), it is called inter-state trade. In the case of inter-state trade, the bill will be as given below:

Value of the Product	=	Rs.100
IGST 18 %	=	Rs.18
Total	=	Rs.118

Rs 18 will go to Central government. Central government will take Rs 9 and send another Rs 9 to Karnataka government.

The tax is divided into five slabs - 0 per cent, 5 per cent, 12 per cent, 18 per cent, and 28 per cent. Although GST is collected by the central government, taxes on petroleum products, alcoholic drinks, electricity are separately collected by the state government and almost all the necessities of life like vegetables and food grains are exempted from this tax.

Toll Tax & Road Tax

Toll tax is a tax you often pay to use any form of infrastructure developed by the government, example roads and bridges. The tax amount levied is rather negligible which is used for maintenance and basic upkeep of a particular project.

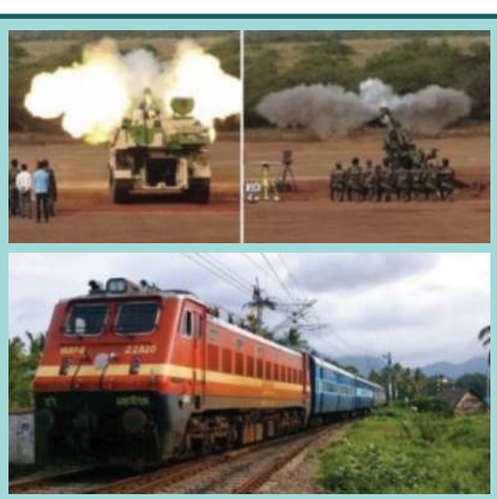
Swachh Bharat Cess

This is a cess imposed by the government of India and was started from 15 November 2015. This tax is applicable on all taxable services and the cess currently stands at 0.5%. Swachh Bharat cess is levied over and above the 14% service tax that is prevalent in the present times.

Distinction between Direct and Indirect tax

Direct Tax	Indirect Tax
Burden cannot be shifted by taxpayers	Easily be shifted to another person
Tax is imposed on personal income and corporate income	Taxes imposed on various goods and services
Direct tax has no inflation pressure	This tax has inflation pressure
The impact and incidence are the same in case of direct tax	The impact and incidence are different in case of indirect tax
Direct tax is less elastic	Indirect tax is more elastic

Need for Tax and Peoples Welfare



The levying of taxes aims to raise revenue to fund governing. It helps alter prices in order to balance the affect of demand. States and their functional equivalents throughout history have used money provided by taxation to carry out many functions.

Some of these include expenditures on economic infrastructure like, transportation, sanitation, public safety, education, health-care systems, military, scientific research, culture and the arts, public works, public insurance, etc. A government's ability to raise taxes is called its fiscal capacity.

When expenditures exceed tax revenue, a government accumulates debt. A portion of taxes may be used to serve past debts. Governments also use taxes to fund welfare and public services. These services can include education systems, pensions for the elderly, unemployment benefits, and public transportation. Energy, water and waste management systems are also common public utilities.

According to the proponents of the list theory of money creation, taxes are not needed for government revenue, as long as the government in question is able to issue flat money. The purpose of taxation is to maintain the stability of the currency, express public policy regarding the distribution of wealth, subsidizing certain industries or population groups or isolating the costs of certain benefits, such as highways or social security.

Summary

- Taxation is a term used for when a government taxing authority levies or imposes a tax. The term 'taxation' applies to all types of involuntary levies, from income to capital gains to estate taxes.
- Taxes are compulsory payments to the government without expectations of direct or return or benefit to the taxpayers.
- Proportional Taxation is a method, where the rate of tax is same regardless size of the income.
- Governance is a crucial component in the smooth running of country affairs.
- A Direct tax is the tax whose burden is directly borne by the person on whom it is imposed, i.e., its burden cannot be shifted to others.
- Estate is charged from successor of inherited property. It is not desirable to avoid payment of taxes .
- Indirect Tax is a tax whose burden can be shifted to others.
- Excise duty in India is levied by the Central Government.
- Goods and Services Tax is a kinds of tax imposed on sale, manufacturing and usage of goods and services.
- The levying of taxes aims to raise revenue to fund governing or to alter prices in order to affect demand. States and their functional equivalents throughout history have used money provided by taxation to carry out many functions.

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2. *Public Finance,* H.L. Bhatia.
3. *Direct Taxes,* V.K. Singhania.
4. htt:\\www.GST.in.

Glossary

1.	Equality	equal opportunities	சமத்துவம்
2.	Convenience	the state of being able to proceed with something without difficulty	வசதி
3.	Proportional	equivalent	விகிதாசார
4.	Regressive	taking a proportionally greater amount from those on lower incomes	பிற்போக்கு வரி
5.	Inherited	received as an heir at the death of the previous holder	மரபுரிமை
6.	Accumulate	gather	குவிக்க
7.	Subsidize	contribute to	மானியம்
8.	Persecution	unfair treatment of a person or a group, especially because of their religious or political beliefs	துன்புறுத்தல், அடக்குமுறை

Evaluation

I. Choose the correct answer:

1. Taxes are_____ payment.
   a) Voluntary
   b) Compulsory
   c) a & b
   d) None of the above

2. Minimum possible amount should be spent in the collection of taxes is
   a) canon of equality
   b) canon of certainity
   c) canon of economy
   d) canon of convenience

3. This taxation is a very opposite of progressive taxation.
   a) degressive b) proportional
   c) regressive d) none

4. Income tax is a
   a) direct tax b) indirect tax
   c) a & b d) degressive tax

5. Which tax is raised on provision of service.
   a) wealth b) corporate
   c) wealth d) service

II. Fill in the blanks:

1. _____is a term for when a taxing authority usually a government levies or imposes a tax.
2. _____is the method, where the rate of tax is same regardless size of the income.
3. _____is paid to the Government by the recipient of gift depending on value of gift.
4. _____tax burden cannot be shifted by tax payers.
5. Indirect tax is_____ elastic.

III. Match the following:

1. Principle of taxation	–	Direct Tax
2. Estate tax	–	Goods and Service Tax
3. Excise Tax	–	Adam Smith
4. 01.07.2017	–	Less elastic
5. Direct Tax	–	Indirect Tax

IV. Odd one out:

1. Which one of the following is not a indirect tax?
2. a) Service tax b) Value Added Tax (VAT)
   c) Estate duty d) Excise duty

V. Correct one out :

1. Which one of the following tax is a direct tax?
   a) Service tax b) Wealth tax
   c) Sales tax d) Progressive tax

VI. Give short answer:

1. Define tax.
2. Why taxes are imposed?.
3. Write name of taxation types and draw its diagram.
4. Write any three importance of tax.
5. What are the types of tax? and explain its.
6. Write short note on Gift Tax and Service Tax.
7. What is Goods and Service Tax?.
8. Distinguish between the direct and indirect tax.

VII. Give brief answer:

1. Write briefly about the principles of taxation.
2. Explain the taxation types.
3. Explain the importance of tax.
4. Explain the direct and indirect tax with examples.
5. Why need for tax on people welfare? And explain it.

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VIII. Activity and Project

1. Students are asked to go to the nearest departmental store and know about the Goods and Service tax (GST). Teacher and students are discussed about the GST.
2. Teacher asks the student to write an essay on what is tax? why we pay tax? And how does the Government use this tax for the welfare of the people.

IX. Life Skills :

1. Teacher and Students together discuss about the tax and their importance of development of country.

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