



**SUBJECT:-PHYSICS**

**CHAPTER:- LIGHT – REFLECTION & REFRACTION**

**GUIDELINES:**

Dear Students,

- There are total **2 Assignments** whose details are as follows:
  - ❖ Assignment 1: Based on Reflection of Light.
  - ❖ Assignment 2: Based on Spherical mirrors
- Complete the Assignments in Physics Notebook.
- **A video link** has been provided for better understanding of the concept through visuals. Watch the videos carefully as these will help you in doing the assignments.
- To promote 'Learning by doing', an activity has been given at the end for you. **Perform the activity** at home and involve yourself in this beautiful journey of learning.
- Read the lesson from **NCERT textbook** also.
- Link for lesson :- <http://ncert.nic.in/textbook/pdf/jesc110.pdf>

**SUB TOPICS:**

**1. Reflection of light.**

- (i) Basic concept of Reflection
- (ii) Laws of Reflection
- (iii) Characteristics of the image formed by plane mirror.

**2. Spherical mirrors**

- (i) Basic Concept about Spherical Mirrors & terms associated with Spherical mirrors.
- (ii) Principal Focus of spherical mirrors.
- (iii) Rules for image formation in Concave and Convex Mirror.

**3. Activities** (Learning by Doing)

**INTRODUCTION**

*The word 'Light' usually refers to the 'Visible light'* enabling us to see different objects. In the absence of light, we will not be able to see anything. We are able to see this beautiful and colourful world around us because of light. In other words '**NO LIGHT - NO SIGHT**'.

When light falls on a surface, the following may occur:

- A portion of incident light is reflected back into the first medium (**reflection of light**).
- A part of incident light travels through the second medium with a change in its path (**refraction of light**).
- The remaining third part of the light may be absorbed by the second medium (**absorption of light**)

**Let's Begin the journey of learning:**

**1. REFLECTION OF LIGHT**

**(i) BASIC CONCEPT OF REFLECTION**

When light falls on a highly polished surface such as mirror, some of it bounces back in the same medium. This is called **Reflection**. The surface which reflects the light is called the **reflecting surface**.

Kindly go through the video links given below:

<https://youtu.be/skGmQC87Bvg> : to understand the basic concept of Reflection of Light.

[https://youtu.be/UWUP8o\\_XTio](https://youtu.be/UWUP8o_XTio) : to understand Types of Reflection.

(ii) **LAWS OF REFLECTION**

Rays of Light when incident on reflecting surfaces obey certain **laws of reflection**. To understand these laws, let's watch this video:

<https://youtu.be/OrobTDEys2M>

(iii) **CHARACTERISTICS OF IMAGE FORMED BY PLANE MIRROR**

In the junior classes, you were made familiar with the concept of formation of image by a plane mirror. Let's quickly recapitulate the **characteristics of the image formed by a plane mirror** by watching this video:

[https://youtu.be/g\\_5\\_4Ktamf8](https://youtu.be/g_5_4Ktamf8)

I hope you enjoyed learning through these videos. Now it's time for **SELF ASSESSMENT**. Please attempt the questions given below in your Physics note book to see how much fruitful learning has taken place.

**ASSIGNMENT 1 (REFLECTION OF LIGHT)**

**Q.1** The angle between Mirror and the incident ray is  $30^\circ$ . (a) What is the angle of reflection? (b) What is the total angle through which the ray of light turns?

**Q.2** What is the angle of incidence and the angle of reflection when a ray of light falls normally on the surface of Mirror? Also trace the path of the ray of light.

**Q.3** Calculate the angle of incidence if the reflected ray makes an angle of  $90^\circ$  with the incident ray.

**Q.4** Two mirrors A and B are placed perpendicular to each other. If an incident ray on mirror A makes an angle of  $30^\circ$  with the normal at the point of incidence, trace its path as it is reflected from both the mirrors.

Also write the measure of the angle of reflection made by the ray as it is reflected from mirror B.

**Q.5** Define the term 'Lateral Inversion'.

**Q.6** Enlist four characteristics of the image formed by plane mirror.

**Q.7** Hari is standing in front of a plane mirror. The distance between his image and the mirror is 3 m. If he moves 1 m towards the mirror, the distance between Hari and his image will be:

**Choose the correct option:**

- (a) 1 m                      (b) 2 m                      (c) 4 m                      (d) no change.

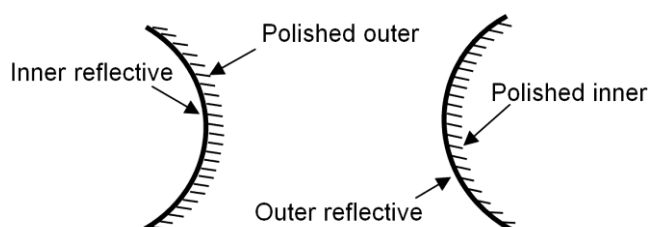
**Q.8** The terms 'Laterally Inverted Images' and 'Inverted Images' are the same. (True or false) \_\_\_\_\_

**2. SPHERICAL MIRRORS**

(i) **BASIC CONCEPT ABOUT SPHERICAL MIRRORS AND TERMS ASSOCIATED WITH THEM.**

Spherical mirrors are of two types:

**Concave mirror:** A spherical mirror in which the outer surface is polished and the reflecting surface is



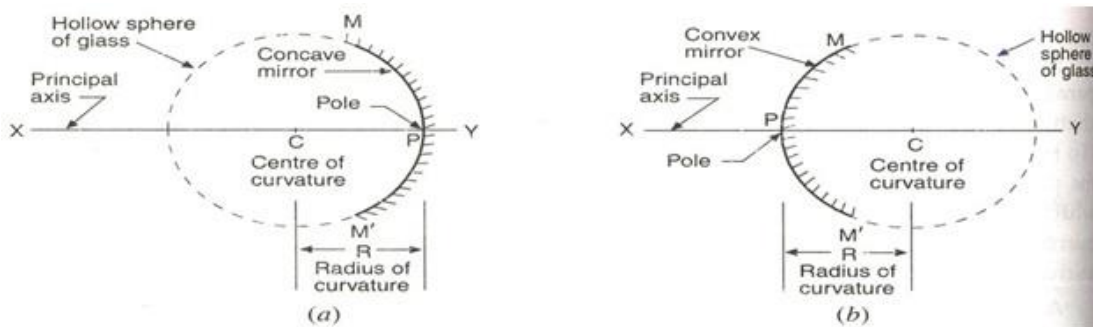
(a) A concave mirror

(b) A convex mirror

towards the center of the sphere of which the mirror is a part.

**Convex Mirror:** A spherical mirror in which the inner surface is polished and the reflecting surface is away from the center of the sphere of which the mirror is a part.

There are **certain terms associated with Spherical mirrors.**



For better understanding kindly go through the video link given below:

<https://youtu.be/8-nR7bWY75I>

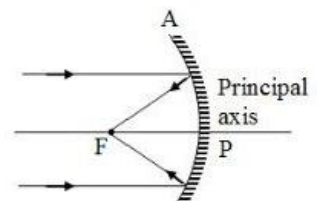
**(ii) PRINCIPAL FOCUS AND FOCAL LENGTH OF THE MIRROR:**

**Principal Focus:** The rays of light parallel to the principal axis after reflection from the spherical mirror either actually converge to or appear to diverge from a point F on the principal axis. This point is called the Principal Focus of the mirror. It is denoted by F.

**Concave mirror** has **REAL FOCUS** because the rays of light parallel to the principal axis after reflection from the concave mirror actually converge to point F on the principal axis.

Therefore, **Concave mirror is also known as CONVERGING MIRROR.**

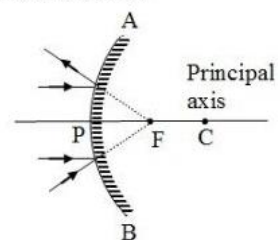
1. Concave mirror :



**Convex mirror** has **Virtual FOCUS** because the rays of light parallel to the principal axis after reflection from the convex mirror appear to diverge from a point F on the principal axis.

Therefore **Convex mirror is also known as DIVERGING MIRROR.**

2. Convex mirror :



For Better understanding of the above concept, kindly go through the video links given below:

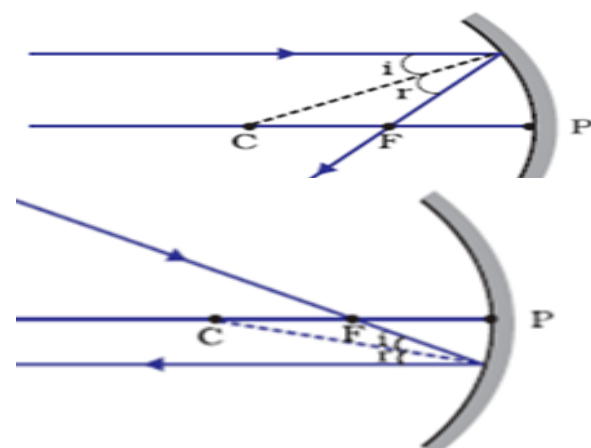
<https://youtu.be/gR67E2vuX2g> :for Principal Focus of spherical mirror.

[https://youtu.be/oKwLnIZQg\\_w](https://youtu.be/oKwLnIZQg_w) : for Converging and Diverging mirrors

**(iii) RULES FOR IMAGE FORMATION IN CONCAVE AND CONVEX MIRROR**

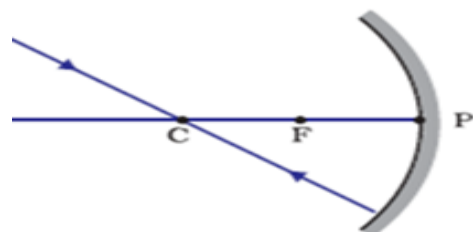
**For Concave Mirror**

**(a) A ray of light parallel to Principal axis after reflection from the concave mirror passes through its Principal Focus (F).**

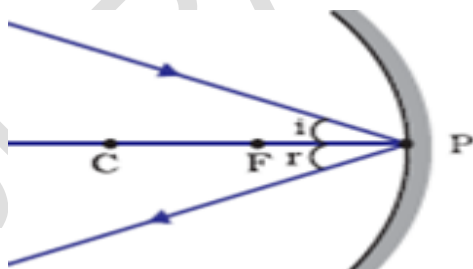


(b) A ray of light passing through the Principal focus (F) of the concave mirror after reflection from it goes parallel to the principal axis.

(c) A ray of light passing through Centre of Curvature (C) after reflection from the concave mirror retraces its path i.e. gets reflected along the same path. This is because **the line joining any point of the spherical mirror to its centre of curvature will be normal to the mirror at that point.**

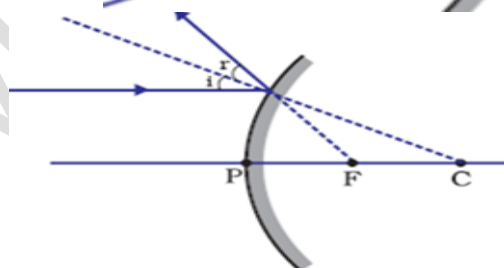


(d) A ray of light falling at the pole of the concave mirror by making a certain angle with the principal axis gets reflected along the direction which makes the same certain angle with the principal axis.

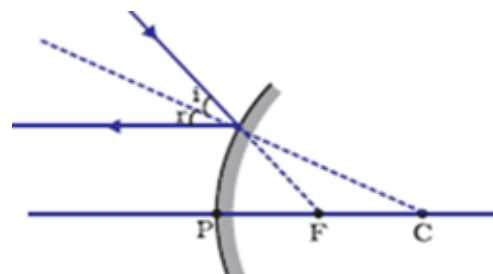


#### For Convex Mirror

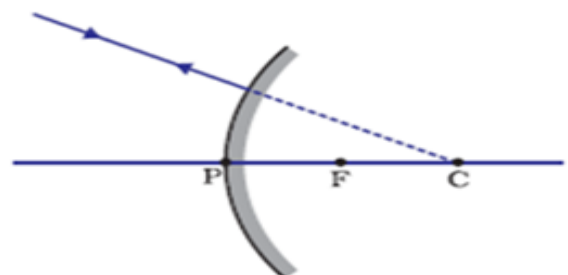
(a) A ray of light parallel to the Principal axis after reflection from the mirror appears to diverge from the Principal Focus (F).



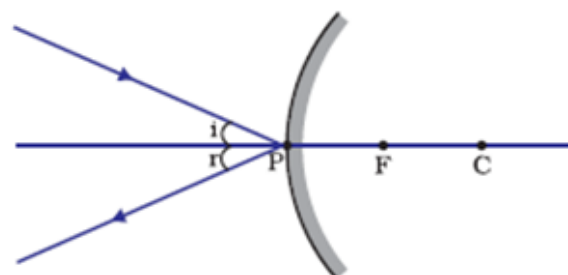
(b) A ray of light directed towards the Principal focus (F) of the convex mirror after reflection from it goes parallel to the principal axis.



(c) A ray of light directed in the direction of Centre of Curvature (C) after reflection from the mirror retraces its path i.e. gets reflected along the same path. This is because **the line joining any point of the spherical mirror to its centre of curvature will be normal to the mirror at that point.**



(d) A ray of light falling at the pole of the mirror by making a certain angle with the principal axis gets reflected along the direction which makes the same certain angle with the principal axis.



For Better understanding of the above concept, kindly go through the video link given below:

<https://youtu.be/b-9qgQyirvk>

I hope you enjoyed learning through these videos. Now it's time for **SELF ASSESSMENT**. Please attempt the questions given below in your Physics note book to see how much fruitful learning has taken place.

### ASSIGNMENT 2 (SPHERICAL MIRRORS)

**Q.1** A person is holding a mirror in his hand to burn a piece of paper as shown in figure.

- Identify the mirror.
- The paper begins to burn producing smoke. Where should he place the paper in front of the mirror for this to happen?



**Q.2** Draw a ray diagram showing the converging nature of Concave mirror.

**Q.3** Draw a ray diagram to show the diverging nature of Convex mirror.

**Q.4** The outer surface of a hollow sphere of aluminium of radius 40 cm is to be used as a mirror.

- What will be the focal length of this mirror?
- Which type of spherical mirror will it provide?

**Q.5** Match the columns:

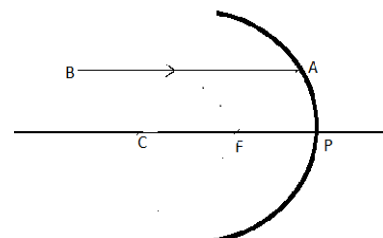
#### Column A

- Centre of the reflecting surface of a spherical mirror
- Radius of the sphere of which the spherical mirror forms a part
- Line joining the pole and the Centre of Curvature
- Diameter of the reflecting surface of the spherical mirror

#### Column B

- Radius of curvature.
- Principal axis
- Aperture.
- Pole

**Q.6** An incident ray AB falls on a concave mirror as shown. Which two points will you join to show the path of the reflected ray?



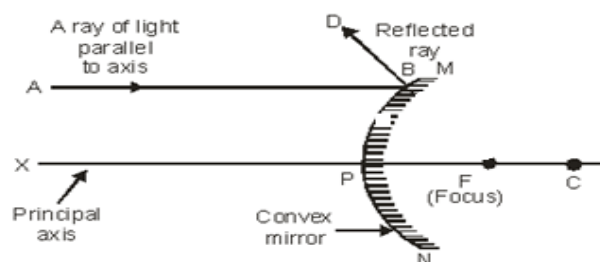
**Q.7** Consider the figure of **Q.6**. Which points will you join to mark the angle of reflection?

**Q.8** Explain why, after reflection, a ray of light passing through the centre of curvature of a concave mirror retraces its path?

(Hint: In this case the angle of incidence is  $0^\circ$ . The ray passing through the centre of curvature is normal to the mirror.)

**Q.9** An incident ray AB falls on a convex mirror as shown.

Which two points will you join to mark the angle of incidence?



**Q.10** Redraw the figure given in **Q.9** and mark the angle of incidence and the angle of reflection.

### 3. ACTIVITY

➤ **Activity 1:** To compare the characteristics of the images formed by shining curved surfaces.

**Things required:** A stainless steel spoon.

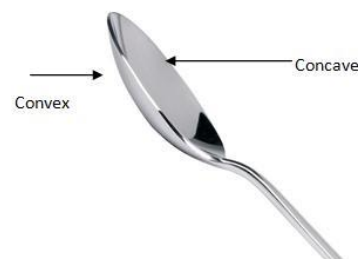
**Method and observation:**

- Take a large stainless-steel spoon and bring your face near to its inner side i.e. the front side of the spoon. An enlarged and erect image of the face is observed.
- Now move the spoon slowly away from your face. Now you observe the inverted and enlarged image of your face.
- On moving the spoon further away from your face, you will observe an inverted but diminished image of your face.
- Reverse the spoon and now bring your face near to the outer side. Repeat the activity. You will observe that the image of your face is always erect and inverted. On moving the spoon further away, the image of the face goes on decreasing in size.



**Conclusion:** When curved surfaces are used as reflecting surfaces for the formation of image, the position, size and nature of the image change with the change in the position of the object.

The curved surfaces of a shining spoon could be considered as curved mirrors or spherical mirrors.



Now you have understood how the inner and the outer curved surface of the spoon act as Concave and Convex mirrors respectively.

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S. NO.	CONTENT	VIDEO LINK
1	Basic concept about Reflection of Light	<a href="https://youtu.be/skGmQC87Bvg">https://youtu.be/skGmQC87Bvg</a>
2.	Types of Reflection: Regular and Diffused reflection	<a href="https://youtu.be/UWUP8o_XTio">https://youtu.be/UWUP8o_XTio</a>
3.	Laws of Reflection	<a href="https://youtu.be/OrobTDEYs2M">https://youtu.be/OrobTDEYs2M</a>
4.	Characteristics of the image formed by Plane Mirror	<a href="https://youtu.be/g_5_4Ktamf8">https://youtu.be/g_5_4Ktamf8</a>
5.	Terms associated with Spherical mirrors.	<a href="https://youtu.be/8-nR7bWY75l">https://youtu.be/8-nR7bWY75l</a>
6.	Principal Focus of spherical mirrors	<a href="https://youtu.be/gR67E2vuX2g">https://youtu.be/gR67E2vuX2g</a>
7.	Converging and Diverging Mirror	<a href="https://youtu.be/oKwLnIzQg_w">https://youtu.be/oKwLnIzQg_w</a>
8.	Basic Understanding of Real and Virtual images	<a href="https://youtu.be/FYr8IAJ4xfQ">https://youtu.be/FYr8IAJ4xfQ</a> <a href="https://youtu.be/B50S8JcBMk">https://youtu.be/B50S8JcBMk</a>
9.	Rules for image formation in Concave and Convex Mirror	<a href="https://youtu.be/b-9qgQyirvk">https://youtu.be/b-9qgQyirvk</a>