



# Grade 11



# SCIENCE



## Unit-: Practice principles and laws of optics for daily needs and scientific purposes

### Learning outcomes

- 1) Do activities to convince the nature of images formed by curved mirrors.
- 2) Identify the pole, center of curvature and focus of a curved mirror.
- 3) Draw ray diagrams to create the images formed by concave and convex mirrors.
- 4) Use curved mirrors when necessary.
- 5) Image in different activities to demonstrate refraction.

### Activity

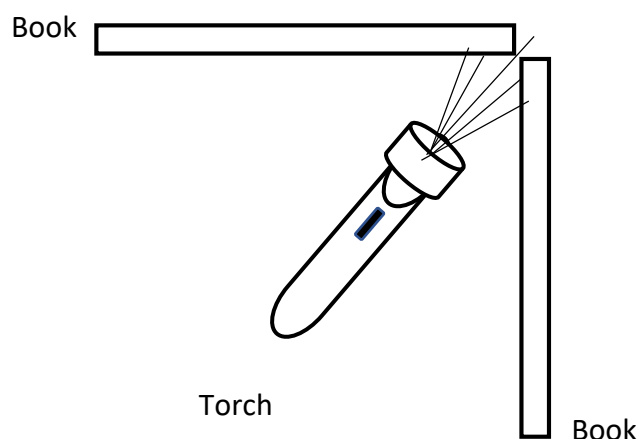
Do the following activities, using replaced materials at home. If you are possible to use desired instruments, do the activities by using such instruments. Follow different trial sessions to experience the activities.

### 11.5.1 Create a small light beam

Follow the instruction given below and try to create a small light beam

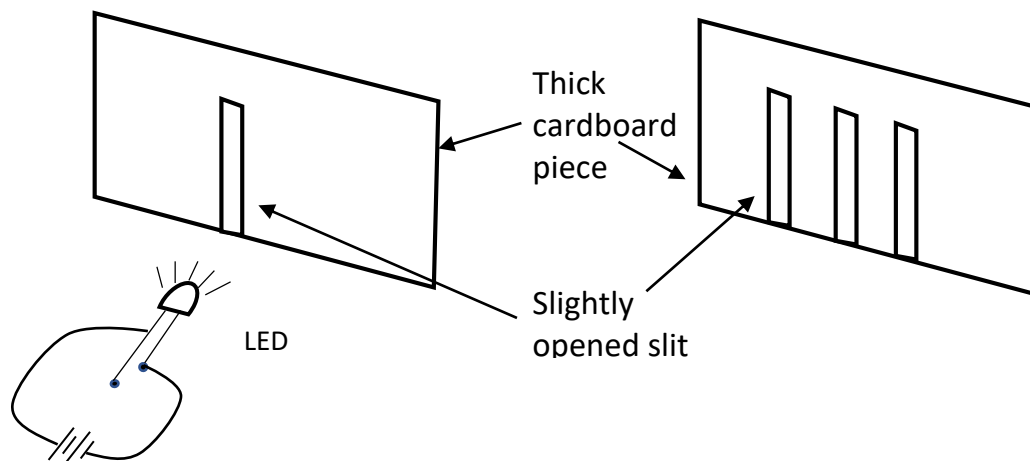
#### Method 1 :-

Keep two books angular according to the diagram depicted. Observe the light focus through the angle by the electric torch.





### Method 2 :-



Check whether you can obtain a small light beam by fixing the appliances due to the above manner. **Answer the following questions, using the observations obtained in the activity.**

- 1) Write a strategy to minimize the size of the light beam obtained in the activity in Method 1
- 2) To obtain a short light beam in that activity does the torch makes closer to the angle of books or makes further?
- 3) How a shap light beam is obtained in the activity 2? If the LED bulb is closer to the cardboard or further to the cardboard?

### For your knowledge

- Light beam is too thin when the vertically drawn hole is narrow.
- Parallel light beam is obtained because of the concave (parabolic mirror) mirror in the electric torch. Near the surface of electric torch, the light is dispersed. (diverged light)
- Front portion of the LED bulb is convex. Because of that it gives a parallel beam of light.



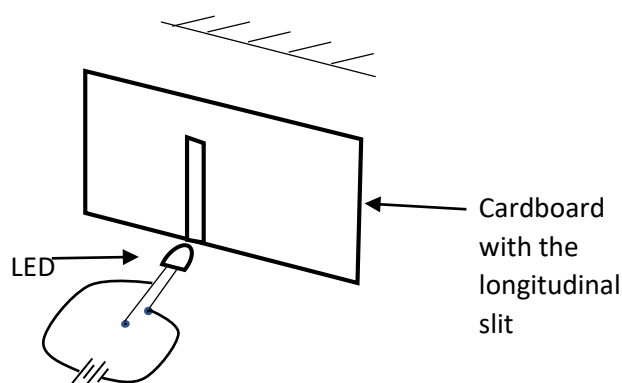
## 11.5.2 Identify the reflection of plane mirrors and curved mirrors

### Materials needed:-

- Piece of plane mirror
- Curved Mirrors (Convex and Concave)
- Materials that can be used as concave and convex mirrors

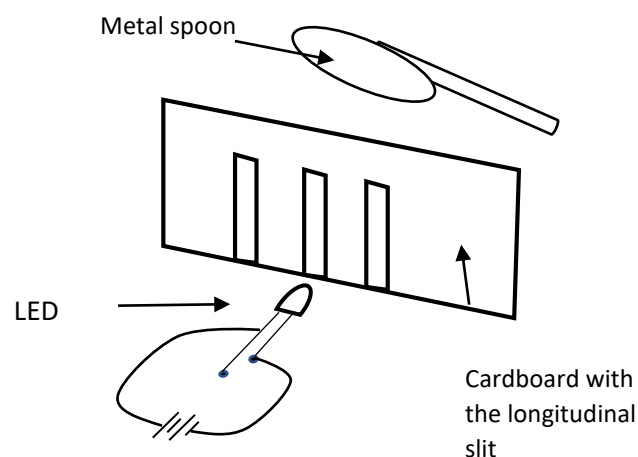
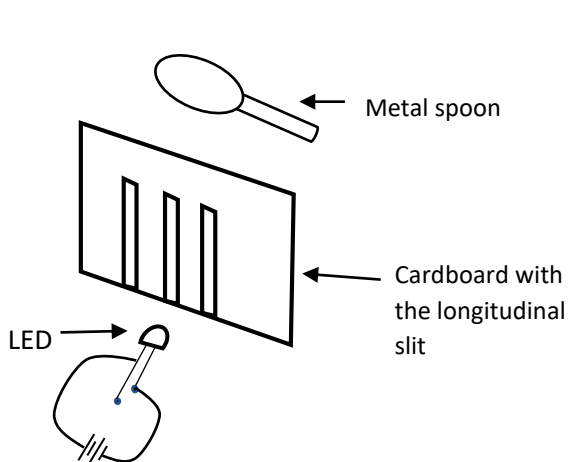
**Method -:** Test the reflection of light rays by doing the following activity

**Instructions -:** Choose LED which emit red light. Activity should be done in a slightly dark area.



- Light beam is perpendicular.
- Light beam is angular to the mirror.
- Direct the light beam as above and test.

When the following activity is done, the cardboard with longitudinal slits and the curved portion of the spoon, drill a bit in a regiform sheet.

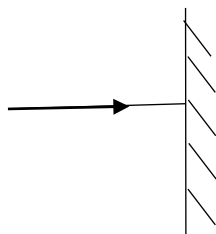




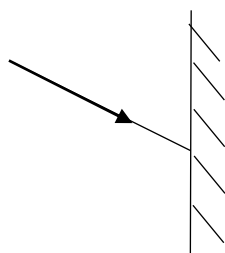
Examine the reflection of light rays of the above given instances, how the beam of light falls on the spoon.

**Answer the following questions by the observations you obtained through the activities above**

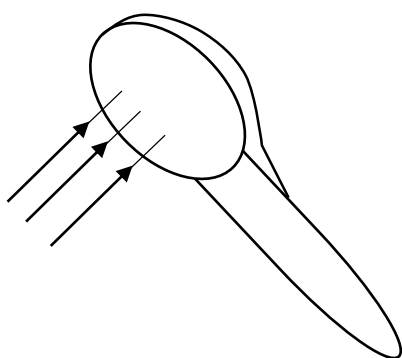
- 1) Draw the ray diagram for the reflection of the following instance, when the beam of light is perpendicular to the mirror.



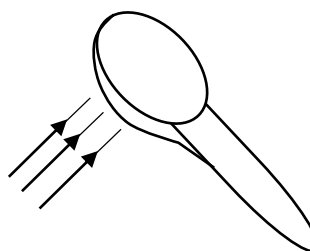
- 2) When the light beam is angular to the mirror.



- 3) Draw the reflection of the light beams depicted in the diagrams given below.



Spoon is acted as  
a ..... mirror in  
this instance

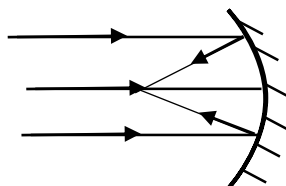


Spoon is acted as  
a ..... mirror in  
this instance

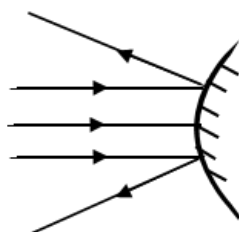


### For your knowledge:-

- ❖ When a beam of light falls perpendicular on a plane mirror, reflects through that perpendicular line.
- ❖ When a beam of light reflect angular, it follows laws of reflection.
- ❖ When light rays fall on a concave mirror, parallels to the principal axis, those converge to a point.



- ❖ When light rays falls perpendicular to a convex mirror, those diverge.



### **11.5.3 Do a piece of paper burn by the reflection of light rays (solar rays)**

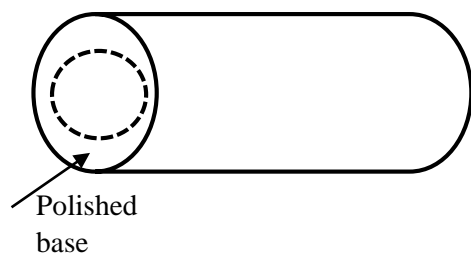
Needed materials :-

- Aluminum can of soft drinks which the base is polished.
- Concave mirror (if possible)

Instructions :-

- Do this practical in a sunny day
- Polish the can of soft drink by braze

**Method :-**



- ❖ Direct the polished base of the can to sunlight
- ❖ Obtain the light patch collected, on the floor
- ❖ Observe by keeping a piece of paper at the thick light patch, whether the paper burns.
- ❖ If you are capable of finding a concave mirror, practice the above practical, directing the mirror to sunlight.

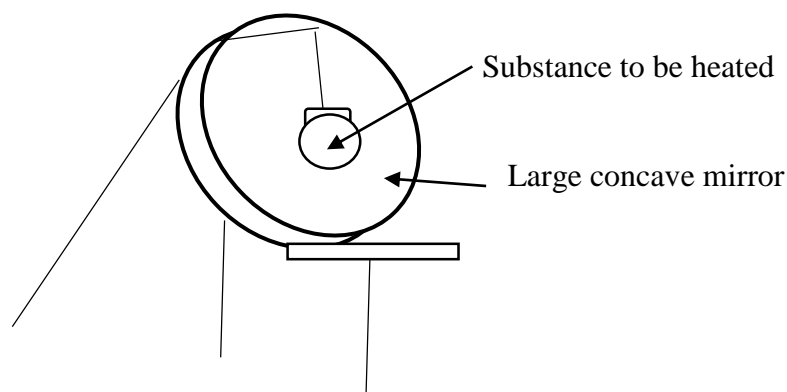


**Answer the following questions by the experience you gained from above activity**

- 1) By which type of mirror does the base of the aluminum can behave.
- 2) Name another energy form which has reflected, except light energy.
- 3)

**For your knowledge :-**

- When a parallel beam of light falls on the concave mirror, parallel to the principal axis, light rays converge to the focal point.
- Heat rays reflect, other than light rays
- Solar hearth is created through this phenomenon. The Substance to be heated is kept at the focal point of the mirror.



#### **11.5.4 Observe the images formed by curved mirrors.**

**Materials needed:-**

- Lighted candle
- Well-polished metal spoon (slightly big)
- Use concave and convex mirrors if possible.

**Method:-**

Light the candle and keep in front of the spoon.

Observe the image form, when the lighted candle is kept in front of the concave side.

Observe the changes of the images form when changing the distance between the lighted candle and the concave surface of the spoon (Keep the candle stationary).

Repeat the activity by changing the distance in between the convex surface of the spoon and the lighted candle (Keep the candle stationary).





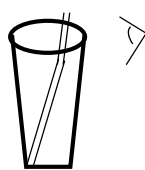

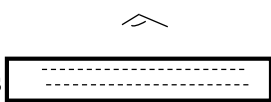
Study well the pages (10-115) of your science text book to obtain a better knowledge on the observations you gained by doing the above activity.

**For your knowledge :-**

Nature of image formed by a concave mirror differs according to the place where the mirror keeps in front of the object

No	Location of the object	Features of the images
1	Less than the focal length	Upright, magnification
2	On the focus	No clear image
3	In between the focus and the center of curvature	Inverted , magnified
4	Twice of the focal length	Inverted , same as the object
5	Less than the two times of the focal length	Inverted -diminished

**11.5.5 why this happens?**

Activity	Observation	
1) Observe by a side when keep a pencil inside a water filled transparent glass. 		
2) Observe at the top when keep a coin inside a water filled glass. 		
3) Transparent glass slab is kept on a book with letters written and observe the letters over the glass. 		





Do the following activity and record the observations. Explain shortly the reasons for your observations.

### 11.5.6 Prepare a telescope

#### Materials needed:-

- Two convex lenses (in equal focal lengths)
- A piece of bristol board.

#### Method :-

Create a simple telescope by using the piece of bristol board as shown in the diagram .Use the bristol board to hold the lenses.



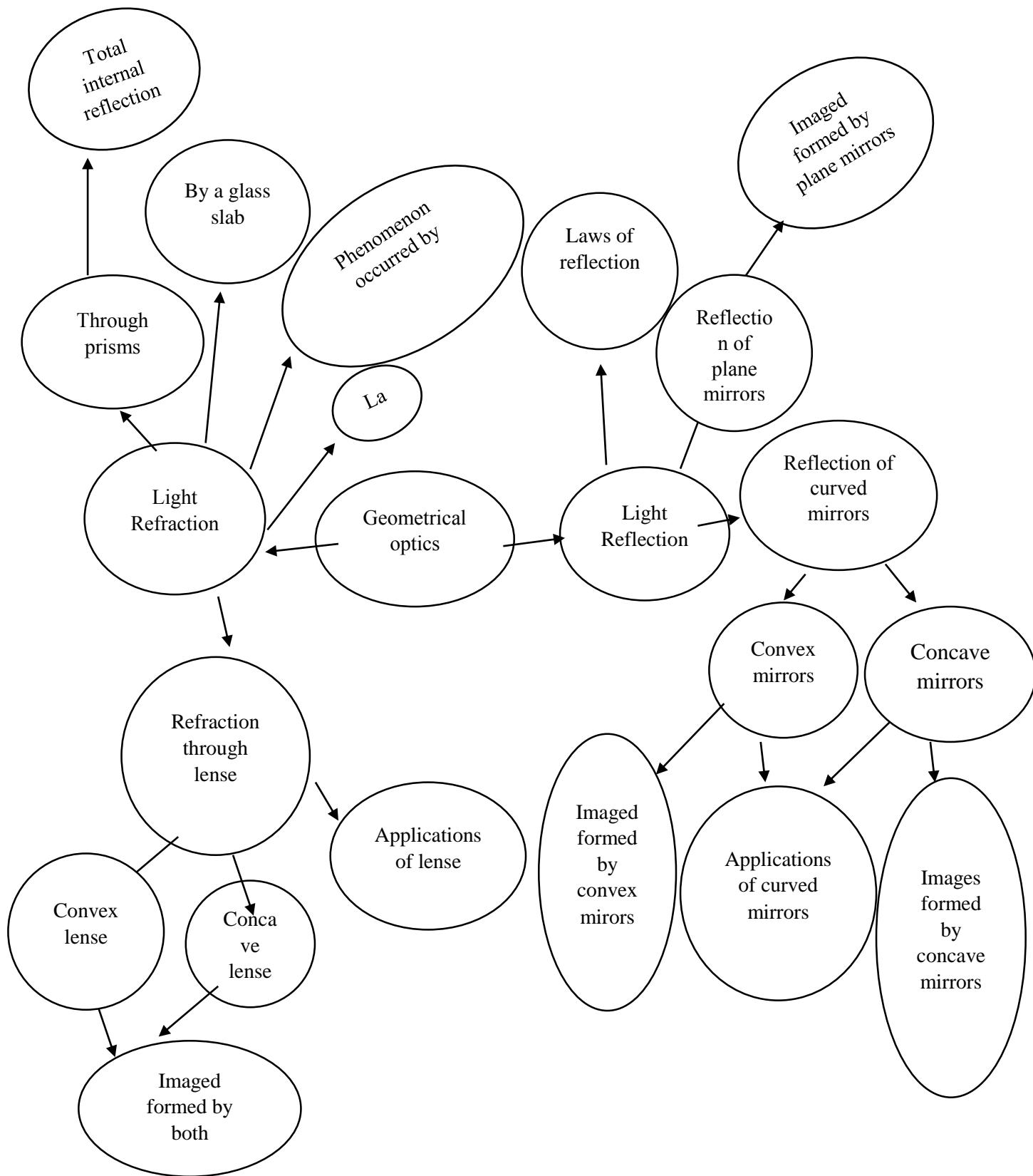
**Answer the following questions using the experience you got when preparing the telescope and when you study.**

- 1) Which name is given to the lense closer to the eye
- 2) Name the lense which is far from the eye
- 3) When you receive two lenses with different focal lengths, how do you use those two as the lenses of the telescope
  - Lens with higher focal length
  - Lens with lower focal length

#### For your knowledge :-

Following are few instruments prepared by using convex lenses

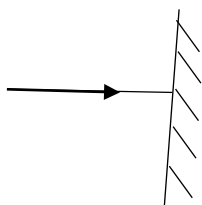
- ❖ Telescope
- ❖ Microscope
- ❖ Camera
- ❖ Telescope is used to classer the object which are far
- ❖ Lens near the eye is eyepiece and the lens far from the eye is objective lens.
- ❖ Eyepiece is the Lens with lower focal length and the objective lens is the lens with higher focal length.



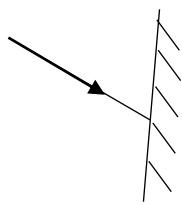


**Evaluation**

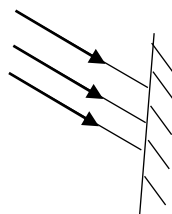
1) Draw how reflection occurs in following instances



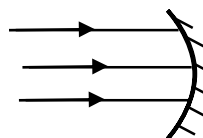
(1)



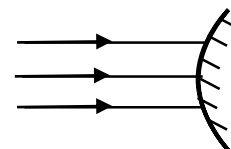
(2)



(3)



(4)



(5)

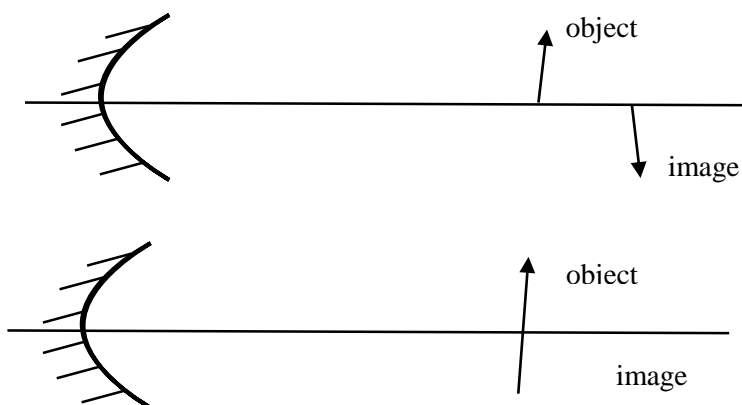
2) Paper on the road consists with a word



Using the knowledge you gained, by studying mirrors, identify the word clearly

3) The image formed when an object is kept in front of a concave mirror, differ by the distance in between the mirror and the object

Mention the place where object should keep in front of the mirror, to obtain an image, with the features given below in the diagrams





4) A small exploration to experience, the knowledge you gather in your school vacation, regarding geometrical optics

Water filled bottles are kept around houses to chase away dogs.

Create an experiment to find a strategy to chase away dogs who urinate around home by

- keeping water-filled & bottles.
- Does the shape of the bottle affect for the fact.
- Does the colour of the water inside the bottle affect .

Report your details in a suitable manner

