**INDIAN SCHOOL MUSCAT**
**DEPARTMENT OF PHYSICS**
**REVISION WORKSHEET 1**
**CLASS 10**

## LIGHT REFLECTION AND REFRACTION

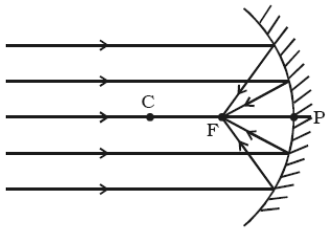
1. State the two laws of reflection of light.

    1. The angle of incidence is equal to the angle of reflection.
    2. The incident ray, the normal to the reflecting surface at the point of incidence and reflected ray from that point, all lies in the same plane.

2. Define the following terms relating to a concave mirror:
(i) Aperture
(ii) Radius of curvature
(i) The diameter of the reflecting surface of the mirror is called aperture.
(ii) The radius of the sphere of which the reflecting surface of the spherical mirror forms a part is called the radius of curvature of the mirror.

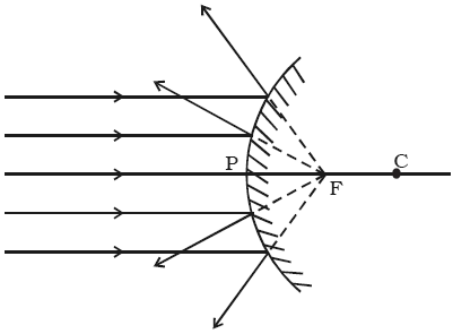
3. Define principal focus for concave mirror and draw the formation of focus using a ray diagram.

    The point on the principal axis where all the rays parallel to it meet after reflection is called focus.



Principal F

4. Define principal focus for convex mirror and draw the formation of focus using a ray diagram.




5. If the radius of curvature of a concave mirror is 30 cm, what would be its focal length? Also write the mirror formula and magnification formula for spherical mirrors.

    R = - 30 cm and f=R/2 we have, f=-15 cm

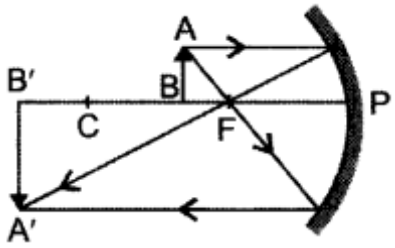
    Mirror formula :

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u},$$

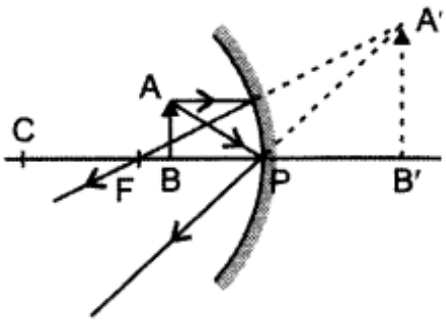
    Magnification:

$$m = - v/u$$

6. Draw the ray diagram for the formation of the image by a concave mirror when the object is placed between focus and Centre of curvature.




7. Draw a ray diagram when a concave mirror produces virtual erect image.




8. An object 2 cm in size is placed 30 cm in front of a concave mirror of focal length 15 cm. At what distance from the mirror should a screen be placed in order to obtain a sharp image? What will be the nature and the size of the image formed?

$f = -15$ cm, $h_o = 2$ cm, $u = -30$ cm.

Using, $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$, we get

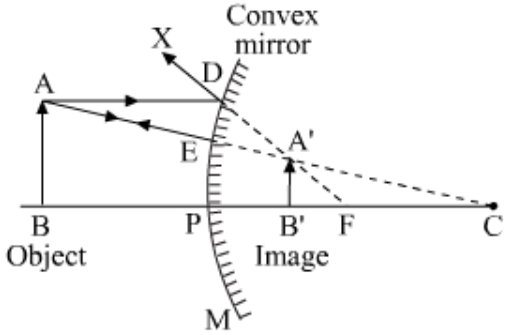
$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{-15} - \frac{1}{-30}$$

$$= \frac{2-1}{-30} = \frac{1}{-30}$$

$\Rightarrow$ $v = -30$ cm

$h_i/h_0 = -v/u = -1$ , real inverted image, same size as that of object

9. Draw ray diagram for image formation of convex mirror when object is between pole and infinity.




Formation of image by a convex mirror when the object is placed anywhere between the pole of mirror and infinity.

10. 4.5 cm needle is placed 12 cm away from a convex mirror of focal length 15 cm. Give the location of image and magnification.

F = 15 cm  $h_i$ = 4.5 cm
u = -12 cm

1/v+1/u = 1/f
1/v+ 1/-12 = 1/15

v= +6.6 cm.
m= -v/u, m= +6.6 cm/ -12= 0.55
Image is diminished.

11. State the type of mirror preferred as (i) rear view mirror in vehicles, (i0 shaving mirror. Justify your answer giving two reasons in each case ?
Answer. (i) Convex mirror (ii) Concave mirror
(i) Convex mirror is used as a rear view mirror because:
(a) it gives a wider field of view as it is curved outwards and
(b) it produces erect and diminished image of the traffic behind the driver of the vehicle.
(ii) Concave mirror is used as a shaving mirror to see a large size image of the face. When the object lies in between pole and principal focus of a concave mirror, it forms a virtual, erect and enlarged image behind it.

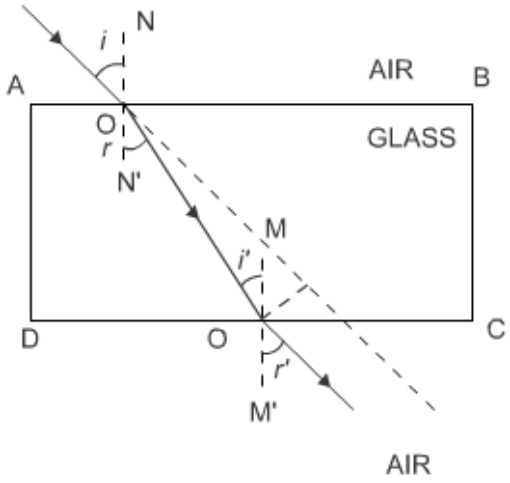
12. State laws of refraction of light

(i) The incident ray, the refracted ray, and the normal at the point of incidence all lie in the same plane.
(ii) Snell's law: The ratio of the sine of angle of incidence to the sine of the angle of refraction is a constant and this constant is called the index of refraction or refractive index.
Mathematically, Sin i/Sin r = $n_{21}$

13. "The refractive index of diamond is 2.42". What is the meaning of this statement in relation to speed of light?

The ratio of speed of light in vacuum to speed of light in diamond is 2.42.

14. Draw the ray diagram showing the refraction of light through glass slab.




15. Define lateral displacement. State factors on which the lateral displacement of the emergent ray depends.

The perpendicular distance between the emergent ray and the direction of incident ray is called lateral displacement.

(ii) angle of incidence

(iii)thickness of slab, and

(iv)refractive index of the material.

16. A convex lens has a focal length of 10 cm. At what distance from the lens should the object be placed so that it forms a real and inverted image 20 cm away from the lens? What would be the size of the image formed if the object is 2 cm high?

$f$ = + 10 cm, $v$ = + 20 cm as image is real and inverted. Height of the object = 2 cm. (Say +ve)

Using, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$, we get

$$\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$$

$$= \frac{1}{+20} - \frac{1}{10} = \frac{+1-2}{20} = -\frac{1}{20}$$

$\therefore$ $u = -20$ cm $(= 2f)$

$h_i / h_o = v/u$ = 20/-20 = -1 , real inverted same sized

17. A concave lens has focal length of 20 cm. At what distance from the lens a 5 cm tall object be placed so that it forms an image at 15 cm from the lens? Also calculate the size of the image formed.

$f = -20$ cm, $h_o = 5$ cm, $v = -15$ cm.

Using, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$, we get

$$\frac{1}{u} = \frac{1}{v} - \frac{1}{f} = \frac{1}{-15} - \frac{1}{(-20)}$$

$$\frac{1}{u} = \frac{-20+15}{300} = -\frac{5}{300}$$

$$u = -60 \text{ cm.}$$

Since, $m = \frac{h_I}{h_o} = \frac{v}{u}$, we get

$$h_I = \frac{v}{u} . h_o = \frac{(-15)}{(-60)} \times 5$$

$$= \frac{5}{4} = 1.25 \text{ cm.}$$

Image is diminished and virtual.