

1. A concave mirror produces three times magnified real image of an object placed at 7cm in front of it. Where is the image located?

Ans: Magnification  $m=3$   
 Object distance  $u=-7\text{cm}$   
 Magnification  $m = \frac{-v}{u}$  (real image)  
 $3 = \frac{-v}{u}$   
 $3u = -v$   
 $v = -3u$   
 $v = -3 \times -7\text{cm}$   
 $= 21\text{cm}$

The concave mirror is 21cm in front of its pole.

2. Light enters from air into a glass plate having refractive index 1.5. What is the speed of light in glass?

Ans: Refractive index of a glass  $\mu=1.5$   
 Speed of light in vacuum is  $C=3 \times 10^8 \text{ms}^{-1}$   
 Speed of light in glass  $V=?$   
 $\mu = \frac{C}{V} = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in medium}}$   
 $1.5 = \frac{3 \times 10^8 \text{ms}^{-1}}{V}$   
 $V = \frac{3 \times 10^8 \text{ms}^{-1}}{1.5} = \frac{30}{15} \times 10^8 \text{ms}^{-1}$   
 $= 2 \times 10^8 \text{ms}^{-1}$

The speed of light in glass is  $2 \times 10^8 \text{ms}^{-1}$

3. The speed of light in water is  $2.25 \times 10^8 \text{ms}^{-1}$ . If the speed of light in vacuum is  $3 \times 10^8 \text{ms}^{-1}$ . Calculate the refractive index of water.

Ans: Speed of light in water  $V=2.25 \times 10^8 \text{ms}^{-1}$   
 Speed of light in Vacuum  $C = 3 \times 10^8 \text{ms}^{-1}$   
 Refractive index of water  $\mu=?$

$$\mu = \frac{C}{V}$$

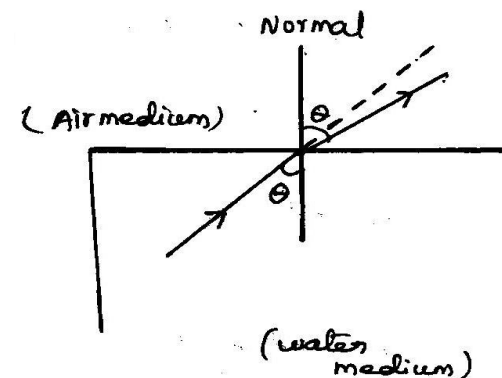
$$\mu = \frac{3 \times 10^8 \text{ms}^{-1}}{2.25 \times 10^8 \text{ms}^{-1}}$$

$$\mu = 1.33$$

II. Higher order thinking skills: (HOTS)

1. Light ray emerges from water into air. Draw a ray diagram indicating the change in its path in water.

Ans:



2. When a ray of light passes from air into glass, the angle of refraction is greater than or less than the angle of incidence.

Ans: When a ray of light travels from optically rarer medium (air) to denser medium (glass) it bends towards the normal  
 $\therefore$  Angle of refraction is less than the angle of incidence  
 $(\angle r < \angle i)$

3. What do you conclude about the speed of light in diamond, if the refractive index of diamond is 2.41?

Ans: Refractive index of diamond  $\mu=2.41$

$$\mu = \frac{C}{V}$$

$$2.41 = \frac{3 \times 10^8 \text{ms}^{-1}}{V}$$

$$V = \frac{3 \times 10^8 \text{ms}^{-1}}{2.41}$$

$$V = 1.24 \times 10^8 \text{ms}^{-1}$$

Speed of light in diamond is lesser than in air. Speed of light in air is 2.42 times the speed of light in diamond.