

ANUSHKA KUNDU  
10DB

## HOME ASSIGNMENTS

12. The speed of light in vacuum and in two different glasses is given in the table below.

Medium	speed of light
Vacuum	$3 \times 10^8$ m/s
Flint glass	$1.86 \times 10^8$ m/s
Crown glass	$1.97 \times 10^8$ m/s

- a) calculate the absolute refractive indexes of flint glass and crown glass.

$$\text{Refractive index} = \frac{\text{speed of light in vacuum}}{\text{speed of light in medium}}$$

$$\rightarrow n_g = \frac{3 \times 10^8}{1.97 \times 10^8} = \frac{3}{1.97} = 1.52$$

Flint glass

$$n_g = \frac{3 \times 10^8}{1.86 \times 10^8} = \frac{3}{1.86} = 1.61$$

- b) Refractive index of crown glass to flint glass

$$\frac{1.97 \times 10^8}{1.86 \times 10^8} = \frac{1.97}{1.86} = 1.059$$

13. Speed of light in air =  $3 \times 10^8$  m/s

ii Medium X =  $2 \times 10^8$  m/s

iii Medium Y =  $2.5 \times 10^8$  m/s

$$(a) \text{ air } n_x = \frac{3 \times 10^8}{2 \times 10^8} = \frac{3}{2} = 1.5$$

$$(b) \text{ air } n_y = \frac{3 \times 10^8}{2.5 \times 10^8} = \frac{3}{2.5} = 1.2$$

e

$$(c) x n_y = \frac{2 \times 10^8}{2.5 \times 10^8} = \frac{2}{2.5} = 0.8$$

13. ~~Refractive index =  $\frac{6}{5}$~~

14. Refractive index =  $\frac{6}{6}$

Speed of light = 3,00,000 km/s

= 3,000,000,000 m/s =  $3 \times 10^8$  m/s

$$\Rightarrow \frac{6}{5} = \frac{\text{Refractive index of air}}{\text{Refractive index of medium}}$$

$$\Rightarrow \frac{6}{5} = \frac{3 \times 10^8}{\text{Refractive index of medium}}$$

$$\begin{aligned} \Rightarrow \text{Refractive index of medium} &= \frac{3 \times 10^8 \times \frac{5}{6}}{1} \\ &= 2.5 \times 10^8 \text{ m/s} \\ &= 250000 \text{ km/s} \end{aligned}$$

15. Refractive index of glass = 1.5  
 speed of light in air is  $3.0 \times 10^8 \text{ m/s}$

$$\Rightarrow 1.5 = \frac{3 \times 10^8}{\text{Refractive index speed of light in glass}}$$

$$\Rightarrow \text{Speed of light in glass} = \frac{3 \times 10^8}{1.5} = 2 \times 10^8 \text{ m/s}$$

16. speed of light in water =  $2.25 \times 10^8 \text{ m/s}$   
 speed of light in glass =  $3 \times 10^8 \text{ m/s}$   
 Refractive index<sub>vacuum</sub> = ?

$$\Rightarrow n_w = \frac{3 \times 10^8}{2.25 \times 10^8} = \frac{3}{2.25} \approx 1.33$$

17. a) Refractive index = 2.42  
 Speed of light in air =  $3 \times 10^8$   
 Speed of light in diamond = ?

$$\Rightarrow 2.42 = \frac{3 \times 10^8}{\text{speed of light in diamond}}$$

$$\Rightarrow \text{Speed of light in diamond} = \frac{3 \times 10^8}{2.42}$$

$$= 1.23 \times 10^8$$

MCQs

19. Refractive index  $\propto \frac{1}{\text{speed of light}}$

19. The ~~refractive substance~~ <sup>substance</sup> having ~~refractive index~~ <sup>lowest refractive index</sup> is

The substance having lowest refractive index has maximum speed of light.

$\therefore$  Ans is (d) S

20.  $\Rightarrow$  Material C

21. Refractive Index of glass for light going from air to glass =  $\frac{3}{2}$

Refractive Index of glass for light going from glass to air =  $\frac{2}{3}$  i.e.  $\frac{4}{6}$

∴ Ans is (c)  $\frac{4}{6}$ .

22 (c) In medium AC

$$23. \frac{4.25 \times 10^8}{3 \times 10^8} = \frac{3 \times 10^8}{1.25 \times 10^8} = \frac{3}{1.25} = 2.4$$

∴ Ans. (a) 2.4

24. (a) In medium S

25. (a) 1.33

26. The refractive index of water with respect to air =  $\frac{4}{3}$

The refractive index of air with respect to water =  $\frac{3}{4} = 0.75$

∴ Ans is (c) 0.75

27. Light travels the slowest in carbon disulphide.

Refractive Index  $\propto \frac{1}{\text{speed of light}}$

$\therefore$  Ans is (d)

28. [?] 1.125.