HW

Pg - 228 -

(Q12) The speed of light in vaccum and in two different glasses is given in the table below
(a) Calculate the absolute refractive indexes of flint glass and crown glass.
(b) calculate the relative refractive index for light going from crown glass to flint glass.

ans: (a) $n_{flint} = \frac{\text{speed of light in vaccum}}{\text{speed of light in flint glass}} = \frac{3\times10^8}{1.86\times10^8} = 1.61$

$n_{crown} = \frac{\text{speed of light in vaccum}}{\text{speed of light in crown glass}} = \frac{3\times10^8}{1.97\times10^8} = 1.52$

(b) $_{crown}n_{flint} = \frac{\text{speed of light in crown glass}}{\text{speed of light in flint glass}}$

$= \frac{1.97\times10^8}{1.86\times10^8} = 1.059$

(13) The speed of light in air is 3×10^8 m/s. In medium x its speed is 2×10^8 m/s and in medium y the speed of light is 2.5×10^8 m/s. calculat
(a) air ^{n}x (b) air ^{n}y (c) x ^{n}y

ans speed of light in air = 3.0×10^8 m/s
speed of light in medium x = 2.0×10^8 m/s
speed of light in medium y = 2.50×10^8 m/s

(a) air n_x = $\frac{\text{speed of light in air}}{\text{speed of light in medium x}}$

= $\frac{3.0 \times 10^8 \text{ m/s}}{2.0 \times 10^8 \text{ m/s}}$ = 1.5

(b) air n_y = $\frac{\text{speed of light in air}}{\text{speed of light in medium y}}$

= $\frac{3.0 \times 10^8 \text{ m/s}}{2.50 \times 10^8 \text{ m/s}}$ = 1.2

(c) $_x n_y$ = $\frac{\text{speed of light in medium x}}{\text{speed of light in medium y}}$

= $\frac{2.0 \times 10^8 \text{ m/s}}{2.50 \times 10^8 \text{ m/s}}$ = 0.8

(14) What is the speed of light in a medium of refractive index 6/5 if its speed in air is 3,00,000 km/s ?

ans- Refractive index = $\frac{6}{5}$

Speed of light in air = 3,00000 km/s

so, refractive index =

$$n_{medium} = \frac{\text{speed of light in air}}{\text{speed of light in medium}}$$

$$\Rightarrow \frac{6}{5} = \frac{3,00,000 \text{ km/s}}{\text{speed of light in medium}}$$

$\Rightarrow$ speed of light in medium =

$$\frac{5}{6} \times 3,00,000 = 5,00,000$$

$\Rightarrow$ $5 \times 50,000$

$= 2,50,000$

(15) Refractive index of glass = 1.5

speed of light in air = 3×10^8 m/s

so speed of light in glass = $\frac{\text{speed of light in air}}{\text{Refractive index of glass}}$

$$= \frac{2.0}{1.5} \times 10^8 \text{ m/s}$$

$= 2.0 \times 10^8$ m/s

hence the speed of light in air is 2.0×10^8

(16) speed of light in water = 2.25×10^8 m/s

speed of light in vaccum = 3×10^8 m/s

So refractive index of water = $\frac{\text{speed of light in vaccum}}{\text{speed of light in water}}$

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

(17) Refractive index of diamond = 2.42

speed of light in air = 3.0×10^8 m/s

So Refraltive index of dimond = $\frac{\text{speed of light in air}}{\text{speed of light in diamond}}$

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

$\Rightarrow$ speed of light in diamond = 1.239×10^8 m/s

MCQs

(19) $\mu = \frac{\text{speed of light in air}}{\text{speed of light in a medium}}$

So speed of light will be maximum in a substance whose refractive index is minimum. hence (d) s is the correct option.

(20) (c) material c

the ratio $\frac{\sin i}{\sin r}$ is maximum for material c

hence, it produce max refraction

(21) (c) 4/6

$_a\mu_g = \frac{3}{2}$

so $_g\mu_a = \frac{1}{_a\mu_g} = \frac{1}{3/2} = \frac{2}{3}$ or $\frac{4}{6}$

(22) (e) medium C

as the angle of refraction is minimum with more refractive index.

(23) (a) 2.4

(24) (d) substance S

(26) (a) 1.33.

(26) $a\mu_w = \frac{4}{3}$

$$\text{so } {}_w\mu_a = \frac{1}{{}_a\mu_w} = \frac{1}{\frac{4}{3}} = \frac{3}{4} = 0.75$$

so option c is correct.

(27) (d) carbon disulphide.

(28) (b) 1.125