Home Assignment

12. The speed of light in vaccuum and in two different glasses is given in below.

Medium	Speed of Light
Vaccuum	3.00×10^8 m/s
Flint glass	1.86×10^8 m/s
Crown glass	1.97×10^8 m/s

(a) Calculate the absolute refractive indexes of flint glass and crown glass?

Absolute refractive index of flint glass =

$$\frac{\text{Velocity of light in vaccuum}}{\text{Velocity of light in the flint glass}} =$$

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

Absolute refractive index of crown glass

$$\frac{\text{Velocity of light in vaccuum}}{\text{velocity of light in the crown gl}}$$

$$= \frac{3.00 \times 10^8}{1.97 \times 10^8} = 1.52$$

(b) Relative refractive index for light going from crown glass to flint glass is given by

$$\frac{\text{Speed of light in crown glass}}{\text{Speed of light in flint glass}}$$

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

13. The speed of light in air 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 Calculate:

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

$$= \frac{3 \times 10^8}{2 \times 10^8} = 1.5$$

(b) $a^n y = \frac{\text{Speed of light in air}}{\text{Speed of light in medium y}}$

$$= \frac{3 \times 10^8}{2.5 \times 10^8} = 1.5$$

(c) $x^n y = \frac{\text{Speed of light in medium x}}{\text{Speed of light in medium y}}$

$$= \frac{2 \times 10^8}{2.5 \times 10^8} = 0.8$$

14. What is the speed of light in a medium of refractive index $6/5$ if its speed in air is 300000 km/s ?

Speed of light in air = 300000 km/s

refractive index of medium = $6/5$

refractive index of a medium =

$$\frac{\text{Speed of light in air}}{\text{Speed of light in medium}}$$

Speed of light in medium = $\frac{\text{Speed of light in air}}{\text{Refractive index of medium}}$

$$= \frac{300000}{6/5} = \frac{300000 \times 5}{6} = 250000 \text{ km/s}$$

15. Speed of light in water is 2.25×10^8 m/s. If the speed of light in vaccum be 3×10^8 m/s, Calculate the refractive index of watere ?

Speed of light in water = 2.25×10^8 m/s

Speed of light in vaccum = 3×10^8 m/s

Speed of light in vacuum / speed of light in water.

$= \frac{3 \times 10^8}{1.[illegible] \times 10^8}$

= [illegible] 2 [illegible]

16. The speed of light in water is 2.25×10^8 m/s. If the speed of light in vacuum be 3×10^8 m/s, calculate the refractive index of water.

Speed of light in water = 2.25×10^8 m/s

Speed of light in vaccum = 3×10^8 m/s

Refractive index = $\frac{\text{Speed of light in vaccum}}{\text{Speed of light in water}}$

$= \frac{3 \times 10^8 \text{ m/s}}{2.25 \times 10^8 \text{ m/s}} = 1.33$

Light enters from air into diamond which has a refractive index of 2.42. Calculate the speed of light in diamond. The speed of light in air is 3.0×10^8 m/s.

A refractive index: 2.42

Speed of light in air: 3×10^8 m/s.

Speed of light in medium = $\frac{\text{Speed of light in vaccum}}{\text{Refractive index}}$

$= \frac{3 \times 10^8}{2.42}$

$= \frac{3 \times 10^8 \times 50}{121}$

$= 1.24 \times 10^8$ m/s

MCQs

19. The refractive ~~medium~~ indices of four substances P, Q, R and S are 1.5, 1.36, 1.97, 1.91. The speed of light is the maximum in the substance:

Ans- S

20. The refractive indices of four materials A, B, C, D are 1.33, 1.43, 1.71 and 1.92. When the light pass ~~from~~ air into these materials, they refract maximum in

ns- Material C

1. The refractive index of glass for light going from air to glass is the refractive index for light going from glass to air will be

$\frac{4}{6}$

2. The refractive indices of four media A, B, C and D are 1.44, 1.52, 1.65, 1.36. When light travelling in air is incident in these media at equal angles, the angle of refraction will be the minimum:

1.65

23. The speed of light in substance X is 1.2×10^8 m/s and that in air is 3×10^8 m/s. The refractive index of this substance will be:

2.4

24. The refractive indexes of four substances P, Q, R and S are 1.77, 1.5, 2.42 and 1.31 respectively. When light travelling in air is incident on these substances at equal angles, the angle of refraction will be the maximum in:

Substance S

25. The refractive index of water is

1.33

26. The refractive index of water with respect to air is $\frac{4}{3}$. The refractive index of air with respect to water will be:

0.75

27. Refractive indices of water, Sulphuric acid, glass and carbon ~~dioxide~~ disulphide are 1.33, 1.43, 1.53 and 1.63 respectively. The light travels slowest in:

Carbon disulphide.