Q a) Calculate the absolute refractive indices of flint glass & crown glass.

b) Calculate the relative refractive index for light going from crown glass to flint glass.

a) Refractive index of flint glass = $\dfrac{\text{speed of light in air}}{\text{speed of light in medium}}$

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

b) Refractive index of crown glass = $\dfrac{\text{speed of light in air}}{\text{speed of light in medium}}$

$$= \dfrac{3 \times 10^8}{1.97 \times 10^8} = 1.52$$

Q 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 ?

Refractive index = $\dfrac{\text{speed of light in air}}{\text{speed of light in medium}}$

$$\dfrac{6}{5} = \dfrac{3 \times 10^5}{x} \quad \rightarrow \quad x = \dfrac{3 \times 10^5 \times 5}{6} = 25 \times 10^4$$

Hence, speed of light in medium is 250000 km/s

Q. The refractive index of glass is 1.5. Calculate the speed of light in glass.

A. Refractive index of glass = 1.5

speed of light in glass = 3×10^8 air = 3×10^8

speed of light in glass = $\dfrac{3 \times 10^8}{1.5}$ = 2×10^8 m/s

Hence, speed of light in glass is 2×10^8 m/s.

Q. The speed of light in water is 2.25×10^8 m/s. Calculate the refractive index of water.

$$n_w = \frac{\text{speed of light in air}}{\text{speed of light in medium}} = \frac{3 \times 10^8}{2.25 \times 10^8}$$

$$= \frac{\cancel{3}}{\cancel{225}} \times \cancel{100} = 1.33$$

Hence, refractive index of water is 1.33.

Q. Light enters from air into diamond which has a refractive index of 2.42. Calculate the speed in diamond.

Refractive index of diamond = 2.42
speed of light in air = 3×10^8

speed of light in diamond = $\dfrac{3 \times 10^8}{2.42}$ = 1.24×10^8

Hence, the speed of light in diamond is 1.24×10^8 m/s

Q The refractive indices of four substances P, Q, R & S are 1.50, 1.36, 1.77 & 1.31 respectively. The speed of light is maximum in :-

A substance S
Because the higher will be the speed of light in a medium, the lesser will be the refractive index

Q The refractive indices of four materials A, B, C & D are 1.33, 1.43, 1.71 & 1.52 respectively. When the light rays pass from air into these materials, they refract the max. in -

A Material A
Because the higher will be the speed of light in a medium, the lesser will be the refractive index.

Q The refractive index of glass for light going from air to glass is 3/2. The refractive index for light going from glass to air will be

$$_g\mu_a = \frac{3}{2}$$

$$_a\mu_g = \frac{1}{_g\mu_a} = \frac{1}{3/2} = \frac{2}{3}$$

Hence, the correct option is (c) $\frac{4}{6}$ i.e., $\frac{2}{3}$

Q The refractive indices of four media A, B, C & D are 1.44, 1.52, 1.65 & 1.36 respectively. When light travelling in air is incident in these media at equal angles, the angle of refraction will be min. -

A. in medium C
the angle of refraction is directly proportional to the speed of light in medium. & inversely proportional to the refractive index.

Hence, when speed of light is minimum the angle of refraction will also be min. but the refractive index will be max.

Q The speed of light in substance X is 1.25×10^8 m/s & that in air is 3×10^8 m/s. The refractive index of this substance will be :-

A Refractive index of substance X $= \dfrac{3 \times 10^8}{1.25 \times 10^8}$

$$= \dfrac{3}{125} \times \cancel{100}^{\,\,4} = 2.4$$

Hence, refractive index $= 2.4$ (ans)

Q the refractive indices of four substances P, Q, R & S are 1.77, 1.50, 2.42 & 1.31 respectively. The angle of refraction will be max. in :-

A In substance S

Q the refractive index of water is 1.33

Q The refractive index of water with respect to air is 4/3. The refractive index of air with respect to water will be.

$$_a\mu_w = \frac{4}{3}$$

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

Hence refractive index of air with respect to water is 0.75 (ans)

Q Refractive of water, sulphuric acid, glass & carbon dioxide are 1.33, 1.43, 1.53 & 1.63. the light travels slowest in :-

A Carbon disulphide

Q The refractive index of glass with respect to air is $\frac{3}{2}$ & refractive index of water with respect to air is $\frac{4}{3}$. The refractive index of glass with respect to water will be :-

A $$_a\mu_g = \frac{3}{2} \qquad\qquad _a\mu_w = \frac{4}{3}$$

$$_w\mu_g = \frac{_a\mu_g}{_a\mu_w} = \frac{3/2}{4/3} = \frac{3}{2} \times \frac{3}{4} = \frac{9}{8}$$

$$= 1.125$$

Hence, the refractive index will be 1.125.