HOME ASSIGNMENT

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Medium	Speed of light
Vacuum	3×10^8 m/s
Flint Glass	1.86×10^8 m/s
Crown Glass	1.97×10^8 m/s.

(a) Absolute refractive index = $\frac{\text{Speed of light in vacuum}}{\text{Speed of light in medium.}}$

So, μ of medium =

(i) Flint Glass (μ_1) $= \frac{C}{V_1} = \frac{3\times10^8 \text{ m/s}}{1.86\times10^8 \text{ m/s}} = 1.61$

(ii) Crown Glass (μ_2) $= \frac{C}{V_2} = \frac{3\times10^8 \text{ m/s}}{1.97\times10^8 \text{ m/s}}$

$= 1.52$

(b) Relative refractive index $= \mu_{12} = \frac{\mu_1}{\mu_2} = \frac{C/V_1}{C/V_2}$

$= \frac{V_2}{V_1} = \frac{1.61}{1.52} = 1.059$

So, * $\mu_{crown\,glass/flint\,glass}$

$$= \frac{\mu_{crown\,glass}}{\mu_{flint\,glass}} = \frac{V_{flint\,glass}}{V_{crown\,glass}}$$

$$= \frac{1.86 \times 10^8 \text{ m/s}}{1.97 \times 10^8 \text{ m/s}} = 0.94$$

13) $c = 3 \times 10^8$ m/s

$V_x \longrightarrow$ velo of light in medium X $= 2 \times 10^8$ m/s

$V_y \longrightarrow$ velo of light in medium Y $= 2.5 \times 10^8$ m/s

(a) $$_{air}n_x = \frac{n_{air}}{n_x} = \frac{V_x}{V_{air}} = \frac{2 \times 10^8 \text{ m/s}}{3 \times 10^8 \text{ m/s}}$$

$$= \boxed{\frac{2}{3}}$$

(b) $$_{air}n_y = \frac{n_{air}}{n_y} = \frac{V_y}{V_{air}} = \frac{2.5 \times 10^8 \text{ m/s}}{3 \times 10^8 \text{ m/s}}$$

$$= \frac{25}{30} = \boxed{\frac{5}{6}}$$

(c) $_xn_y = \frac{n_x}{n_y} = \frac{V_y}{V_x} = \frac{2.5\times10^8 m/s}{2\times10^8 m/s}$

$= \frac{25}{20} = \boxed{\frac{5}{4}}$

14) $\mu_{medium} = \frac{6}{5}$

$V_{air} = 3\times10^8 m/s = c$

So, $\mu = \frac{c}{V_{medium}}$

$\Rightarrow V_{medium} = \frac{c}{\mu} = \frac{3\times10^8}{6/5} = \frac{3\times10^8\times5}{6_2}$

$= \boxed{2.5\times10^8 m/s}$ (Ans)

15) $\mu_{glass} = 1.5$

$c = 3\times10^8 m/s$

$V_{glass} = \frac{c}{\mu_{glass}} = \frac{3\times10^8 m/s}{1.5} = \frac{30\times10^7 m/s}{15}$

$= \boxed{2\times10^7 m/s}$

16) $V_{water} = 2.25 \times 10^8 \text{ m/s}$

$c = 3 \times 10^8 \text{ m/s}$

$\mu_{water} = \frac{c}{V_{water}} = \frac{3 \times 10^8 \text{ m/s}}{2.25 \times 10^8 \text{ m/s}}$

$= 1.33$

17) $\mu = 2.42.$

$c = 3 \times 10^8 \text{ m/s}.$

$\mu = \frac{c}{V_{diamond}} \Rightarrow V_{diamond} = \frac{3 \times 10^8}{2.42}$

$= 1.23 \times 10^8 \text{ m/s}$

MCQS

19) The $\mu_P = 1.5$

$\mu_Q = 1.36$

$\mu_R = 1.77$

$\mu_S = 1.31$

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

So, as $\mu_R > \mu_P > \mu_Q > \mu_S$

So, $v_R < v_P < v_Q < v_S$

- The speed of light is max in medium S.

(d) S.

20) $\mu_A = 1.33$
$\mu_B = 1.43$
$\mu_C = 1.71$
$\mu_D = 1.52$

μ = Refractive Index of medium

So, μ_C → Greatest. So, refraction is max in C.

(c)

21) $\mu_{g/a} = \frac{3}{2}$ → As light passes from air to glass

$\mu_{a/g} = \frac{2}{3}$ → As light passes from glass to air

So, $\mu_{a/g} = \frac{2 \times 2}{3 \times 2} = \frac{4}{6}$ (c)

22) $\mu_{min} \longrightarrow \mu_D = 1.36$ (d)

23) $V_x = 1.25 \times 10^8 \text{ m/s}$.

$V_{air} = 3 \times 10^8 \text{ m/s}$.

$\mu_{substance/air} = \dfrac{V_{air}}{V_x} = \dfrac{3 \times 10^8}{1.25 \times 10^8} = 2.4$ (a)

24) Denser the medium, lesser will be angle of refraction for light travelling into the medium.

And, Optical density of medium depends on refractive index.

So, $\mu \propto \dfrac{1}{\text{angle of refraction for light travelling into the medium}}$

$\mu_S < \mu_Q < \mu_P < \mu_R$.

As $\mu_S \rightarrow$ Lowest; angle of refraction will be greatest.

25) $\mu_{w/g} = \dfrac{C}{V \text{ of light in water}}$

$= \dfrac{3 \times 10^8 \text{ m/s}}{2.25 \times 10^8 \text{ m/s}} = 1.33$ (a)

26) $\mu_{water/air} = \frac{4}{3}$

$\mu_{air/water} = \frac{1}{\mu_{water/air}} = \frac{3}{4} = 0.75$

(c)

27) velo of light depends upon the refractive index medium in which light travels.

velo of light $\propto \frac{1}{\text{Refractive index of medium.}}$

$\mu_{water} < \mu_{H_2SO_4} < \mu_{glass} < \mu_{CS_2}$

So, $V_{water} > V_{H_2SO_4} > V_{glass} > V_{CS_2}$

So, light travels slowest in CS_2

(d)

28) $\mu_{g/a} = \frac{3}{2}$

$\mu_{w/a} = \frac{4}{3}$

$\mu_{g/w} = \frac{\mu_g}{\mu_a} \times \frac{\mu_a}{\mu_w}$

$= \frac{3}{2} \times \frac{3}{4} = \frac{9}{8}$

$= 1.125$ (d)