:Hamza Mehmood:-

:Applied Physics:-

:SP-21-110:-

Sir:- Sajid Salem

:Assignment:-3:-

Question:-1

Given data:-

$f = 5.80 \times 10^{14}$ Hz

$R_i = 1.52$

To find:-

Wavelength of light in

(a) Vacuum

(b) Glass

Solution:-

Wavelength in vacuum:-

(a) $c = f\lambda \Rightarrow \lambda = \frac{c}{f}$

$$\Rightarrow \frac{3\times10^{8}\ m/s}{5.80\times10^{14}\ Hz}$$

$$\boxed{\lambda = 5.17\ nm}$$

(b) Wavelength of light in glass.

$$\lambda_n = \frac{\lambda}{n} \Rightarrow \frac{517\ nm}{1.52}$$

$$\boxed{\lambda = 340\ nm}$$

In glass the light travels slower than in vacuum and the wavelength is smaller.

Question 2:-

Given data:-

$$V = 1.94\times10^{5}\ m/s$$
$$\lambda_n = 355\ nm$$
$$= 355\times10^{-9}\ m$$

To find:-

(a) $n = ?$

(b) $\lambda_{air} = ?$

Solution:-

As from knowlge, the speed of light in a medium is given by:-

$$\therefore V = \frac{C}{n}$$

where $C = 3 \times 10^8$ m/s in the speed of light in a vacuum n is refraction index of material

The speed of light in quartz is $V = 1.94 \times 10^8$ m/s

So, we can re-arange the previous formula to find n the index of refraction of quartz:-

$$n = \frac{C}{V} \Rightarrow \frac{3 \times 10^8 \text{ m/s}}{1.94 \times 10^8 \text{ m/s}}$$

$$= 1.55$$

The relationship between the wavelength of light in air and in quartz is

$$\lambda = \frac{d}{n}$$

For light we have:-

$$\lambda = 355\,nm$$

$$n = 1.55$$

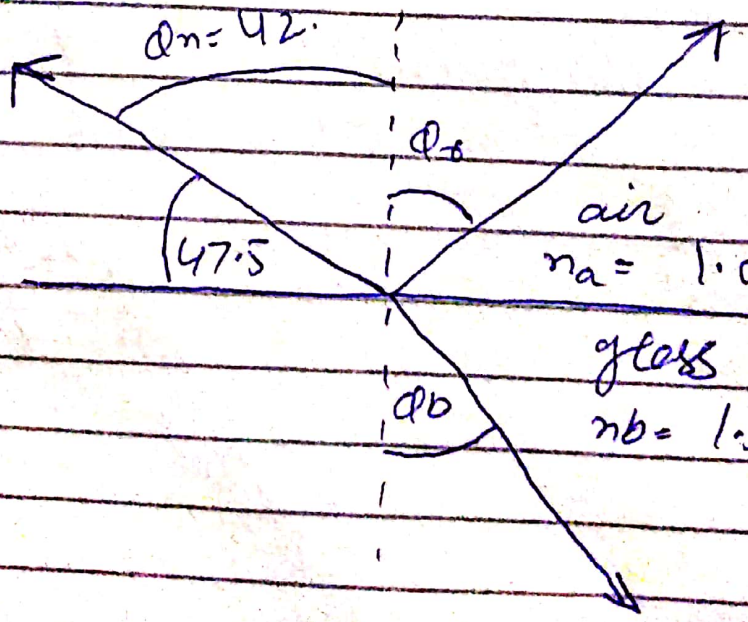
Therefore, we can find λ_0.

$$\lambda_0 = n\lambda = (1.55)(355)$$

$$\boxed{n\lambda = 550.3\,nm}$$

Question 3:-

Diagram:-



Given data:-

Angle of reflection = Angle of incidence

$\theta_r = \theta_a = 42.5$

Angle of reflection $= \theta_r = 90 - 42.5$

$= 47.5$

with glass refraction in either

$= n_b = 1.66$

(b) $n_a \sin\theta_a = n_b \sin\theta_b$

$$\sin 2_b = \frac{n_a \sin 2_a}{n_b}$$

$$\Rightarrow \frac{1 \times \sin 42.5}{1.66}$$

$\Rightarrow 0.407$

$A_b = \sin^{-1}(0.4070)$

The refractive ray makes an angle $90 - \theta_b = 66$ with surface of glass.