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WAVE THEORY

(1) $\mu_{w_{Red}} = 1.325$

$\mu_{w_{violet}} = 1.334$

$v_{Red} - v_{violet} = ?$

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

Solution:

$\mu_w = \frac{v_a}{v_w} = \frac{3 \times 10^8}{v_w}$

$\therefore \mu_{w_{Red}} = \frac{3 \times 10^8}{v_{w\,Red}}$

$\therefore v_{w\,Red} = \frac{3 \times 10^8}{1.325}$ -(i)

& $v_{w\,violet} = \frac{3 \times 10^8}{1.334}$ -(ii)

$\therefore v_{w\,Red} - v_{w\,violet}$

$= \frac{3 \times 10^8}{1.325} - \frac{3 \times 10^8}{1.334}$.

$= 1.53 \times 10^6$ m/s

(2) **Data:**

~~λ_{Red}~~

$\lambda_{a\,Red} = 6400$ Å

$\lambda_{g\,Red} = 4000$ Å

$\lambda_{a\,violet} = 4400$ Å

$\lambda_{g\,violet} = ?$

Solution:

$a\lambda_{g_{Red}} = a\lambda_{g\,violet}$

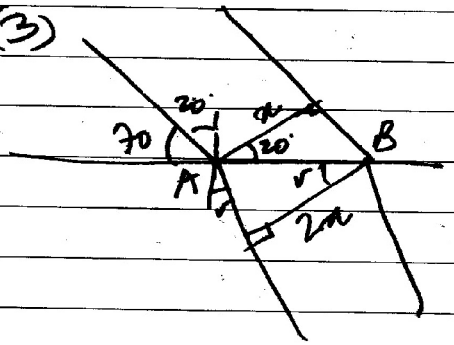
$\left(\frac{\lambda_a}{\lambda_g}\right)_{Red} = \left(\frac{\lambda_a}{\lambda_g}\right)_{violet}$

$\frac{6400}{4000} = \frac{4400}{\lambda_{g\,violet}}$

$\therefore \lambda_{g\,violet} = \frac{4400 \times 4000}{6400}$

$= 2750$ Å

(3)



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Solution :

$\cos 20° = \frac{x}{AB}$

$\cos r = \frac{2x}{AB}$

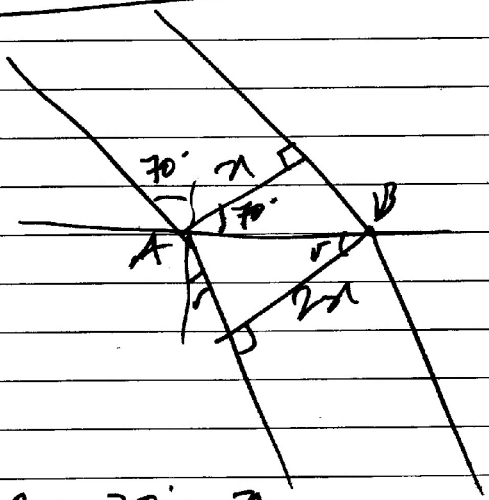
$\therefore \frac{x}{\cos 20} = \frac{2x}{\cos r}$

$\therefore \cos r = 2\cos 20$

$\cos r = 1.879$

WRONG QUESTION

Changing question to angle of incidence 70°



$\cos 70° = \frac{x}{AB}$

$\cos r = 2x/AB$

$\therefore \frac{x}{\cos 70} = \frac{2x}{\cos r}$

$\therefore \cos r = 2\cos 70$

$= 0.6840$

$\therefore r = 46°51'$

$\mu = \frac{\sin i}{\sin r}$

$= \frac{\sin 70}{\sin 46°51'}$

$= 1.288$

(4) Data

$v_g - v_w = 0.25 \times 10^8$ m/s

$v_a = ?$

$\mu_g = 1.5$

$\mu_w = 4/3$

Solution

$|v_g - v_w| = 0.25 \times 10^8$

$\left|\frac{v_a}{a\mu_g} - \frac{v_a}{a\mu_w}\right| = 0.25 \times 10^8$

$\left|v_a\left(\frac{1}{1.5} - \frac{1}{4/3}\right)\right| = 0.25 \times 10^8$

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$$\left| Va\left(\frac{2}{3} - \frac{3}{4}\right) \right| = \frac{1}{4} \times 10^8$$

$$Va\left[\frac{8-9}{4\times 3}\right] = \frac{1}{4} \times 10^8$$

$$\therefore \frac{Va}{3} = 10^8$$

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

$$\therefore \mu = \frac{5}{3}$$

$$\therefore \tan i_p = 5/3$$

$$\therefore i_p = \tan^{-1}(5/3)$$

$$i_p = 59^\circ 2'$$

(5) $$\mu = \frac{\sin i}{\sin r} = \frac{Va}{Vg}$$

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

$$= 1.5$$

$$\tan i_p = 1.5$$

$$\therefore i_p = \tan^{-1}(1.5)$$

$$= 56^\circ 19'$$

(6) $$i_c = \sin^{-1}(3/5)$$

$$\sin i_c = 3/5$$

$$\frac{1}{\sin i_c} = \frac{5}{3}$$

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