DPP
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 6

Topic :- RAY OPTICS AND OPTICAL INSTRUMENTS

1 **(a)**

For the objective, $\frac{1}{v_o} - \frac{1}{-1/3.8} = \frac{1}{1/4}$

Or $\frac{1}{v_o} + 3.8 = 4$ or $\frac{1}{v_o} = 0.2 = \frac{1}{5}$

or $v_0 = 5$ cm

Now, $M_0 = \frac{5}{-\frac{1}{3.8}} = -19$

Again, $M = M_O \times M_e$

$-95 = -19 \times M_e$ or $M_e = \frac{95}{19} = 5$

2 **(b)**

Frequency does not change with medium but wavelength and velocity decrease with the increase in refractive index

3 **(b)**

$$f = \frac{R}{\mu - 1} = \frac{10}{(1.5-1)} = 20\ cm$$

$$\frac{1}{f} = \frac{2}{f_1} + \frac{1}{f_m}, f_m = \infty \Rightarrow f = \frac{f_1}{2} = \frac{20}{2} = 10\ cm$$

4 **(b)**

$$f = \frac{f_1 f_2}{f_1 + f_2} = \frac{10(-10)}{10 + (-10)} = \frac{-100}{10 - 10} = \infty$$

5 **(c)**

$$\frac{1}{f} = (\mu - 1)\left(\frac{2}{R}\right) \text{ or } f = \frac{R}{2(\mu - 1)}$$

Now, $f > R$

$$\therefore \frac{R}{2(\mu - 1)} > R$$

Or $\frac{1}{2(\mu-1)} > 1$ or $2(\mu - 1) < 1$

Or $\mu - 1 < \frac{1}{2}$ or $\mu < \left(1 + \frac{1}{2}\right)$

Or $\mu < 1.5$

6 **(c)**

$$n=\frac{f}{f+u}$$

$$f+u=\frac{f}{n}$$

Or $u=\frac{f}{n}-f=\left(\frac{1-n}{n}\right)f$

Or $u=-\left(\frac{n-1}{n}\right)f, |u|=\frac{n-1}{n}f$

7 **(a)**

According to mirror formula

$$\frac{1}{f}=\frac{1}{v}+\frac{1}{u}$$

Here $u=-9$ m and $f=-1$ m

$$\frac{1}{(-1)}-\frac{1}{(-9)}=\frac{1}{v}$$

$$\Rightarrow v=-\frac{9}{8}\text{m}$$

As the object moves at a constant speed of 5 m/s after 1 s the new position of image is

$$u'=-9\text{ m}+5\text{ m}=-4\text{ m}$$

$$\therefore \frac{1}{(-1)}-\frac{1}{(-4)}=\frac{1}{v'}$$

$$\Rightarrow v'=-\frac{4}{3}\text{m}$$

The shift in the position of image in 1 s is

$$v-v'=-\frac{9}{8}+\frac{4}{3}=\frac{1}{5}$$

$\therefore$ Average speed of image $=\frac{1}{5}$m/s

8 **(d)**

The image of object at infinity should be formed at 100 cm from the eye

$$\frac{1}{f}=\frac{1}{\infty}-\frac{1}{100}=-\frac{1}{100}$$

So the power $=\frac{-100}{100}=-1\ D$

[Distance is given in cm but $P=\frac{1}{f}$ in $metres$]

9 **(b)**

$$\mu=\cot\frac{A}{2}=\frac{\sin(\frac{A+\delta m}{2})}{\sin A/2}$$

$$or \frac{\cos\frac{A}{2}}{\sin\frac{A}{2}} = \frac{\sin(\frac{A+\delta m}{2})}{\sin A/2}$$

$$or\ \sin\left(90° - \frac{A}{2}\right) = \sin\left(\frac{A+\delta m}{2}\right)$$

$$or\ 90° - \frac{A}{2} = \left(\frac{A+\delta m}{2}\right)$$

$$or\ 180° - A = A + \delta m$$

$$\delta m = 180° - 2A = \pi - 2A$$

10 **(c)**

$$\frac{\text{Speed of light in air}}{\text{Speed of light in aqueous humor}} = \frac{\text{Wavelength of light in air}}{\text{Wavelength of light in aqueous humor}}$$

$$\Rightarrow \frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2}$$

Or $v_2 = \frac{\lambda_2}{\lambda_1} \times v_1 = \frac{474}{633} \times 3 \times 10^8$

$$= 2.25 \times 10^8 \text{ms}^{-1}$$

11 **(a)**

$$M = \frac{f_o}{f_e}, 10 = \frac{f_o}{20}, f_0 = 200 \text{ cm}$$

12 **(a)**

$$I \propto \frac{1}{r^2} \Rightarrow \frac{I_2}{I_1} = \frac{r_1^2}{r_2^2} = \frac{60^2}{180^2} = \frac{1}{9}$$

13 **(b)**

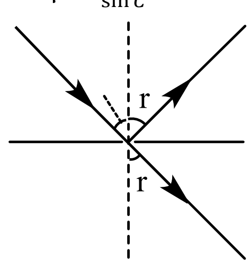
Here $i = r$

$r' = 90° - r$

So, $\mu = \frac{\sin r'}{\sin r} = \frac{\sin(90° - r)}{\sin r}$

$$\mu = \frac{\cos r}{\sin r} = \frac{1}{\tan r}$$

But $\mu = \frac{1}{\sin C}$



Where C is the critical angle.

So, $\frac{1}{\sin C}=\frac{1}{\tan r}$

$\Rightarrow \sin C = \tan r$

Or $C = \sin^{-1}(\tan r)$

14 **(c)**

$m = m_o \times m_e \Rightarrow m = m_o \times \left(1+\frac{D}{f_e}\right)$

$\Rightarrow 100 = 10 \times \left(1+\frac{25}{f_e}\right) \Rightarrow f_e = \frac{25}{9}\,cm$

15 **(a)**

$n = \frac{360°}{72°} = 5$

Note that $\frac{360}{\theta}$ is odd and object line asymmetrically

16 **(d)**

$f = \frac{1.6}{2}\text{ m} = 0.8\text{m}, u = -1\text{ m}$

$\frac{1}{v} = \frac{1}{0.8} - \frac{1}{-1} = \frac{10}{8} + 1 = \frac{18}{8} = \frac{9}{4}$

Or $v = \frac{4}{9}\text{m}$

17 **(a)**

$\frac{1}{f_a} = (\mu - 1)(\frac{1}{R_1} - \frac{1}{R_2})$

$= (1.5-1)\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$ ....(i)

$and\,\frac{1}{f_m} = \frac{\mu_g - \mu_m}{\mu_m}(\frac{1}{R_1} - \frac{1}{R_2})$

$\frac{1}{f_m} = \left(\frac{1.5}{1.6}-1\right)\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$ ....(ii)

Thus,

$\frac{f_m}{f_a} = \frac{(1.5-1)}{\left(\frac{1.5}{1.6}-1\right)} = -8$

$f_m = -8 \times f_a$

$= -8 \times \frac{-1}{5}$ $\left(\because f_a = \frac{1}{p} = -\frac{1}{5}m\right)$

$= 1.6\,m$

$\therefore P_m = \frac{\mu}{f_m}$

$= \frac{1.6}{1.6} = 1D$

18 **(b)**

$$\mu = \frac{\sin\left(\frac{A+\delta_m}{2}\right)}{\sin\frac{A}{2}}$$

$$\sqrt{2} = \frac{\sin\left(\frac{60° + \delta_m}{2}\right)}{\sin\frac{60°}{2}}$$

$$\frac{1}{\sqrt{2}} = \sin\left(\frac{60° + \delta_m}{2}\right)$$

Or $\sin 45° = \sin\left(\frac{60° + \delta_m}{2}\right)$

$\delta_m = 30°$

Or $i = \frac{A + \delta_m}{2}$

$= \frac{60 + 30}{2} = \frac{90}{2} = 45°$

19 **(c)**

$\mu_g \sin\theta_c = \mu_1 \sin 90°$

Or $\mu_g \sin\theta_c = 1$

When water is poured,

$\mu_w \sin r = \mu_s \sin\theta_c$ or $\mu_w \sin r = 1$

Again, $\mu_a \sin\theta = \mu_w \sin r$

Or $\mu_a \sin\theta = 1$

Or $\sin\theta = 1$ or $\theta = 90°$

20 **(d)**

Form displacement method size of object, $O = \sqrt{I_1 I_2}$

Here, $O = 3$ cm, $I_1 = 9$ cm

$\therefore\ 3 = \sqrt{9 I_2}$

Or $I_2 = 1$ cm

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	A	B	B	B	C	C	A	D	B	C
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	A	B	C	A	D	A	B	C	D