DPP

DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 8

Topic :- RAY OPTICS AND OPTICAL INSTRUMENTS

1 **(c)**

Distance of object from mirror $= 15 + \frac{33.25}{1.33} = 40$ cm

Distance of image from mirror $= 15 + \frac{25}{1.33} = 33.8$ cm

For the mirror, $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

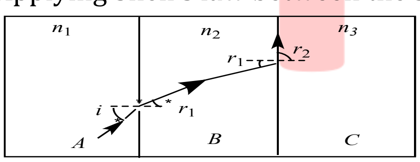
$$\therefore \frac{1}{-33.8} + \frac{1}{-40} = \frac{1}{f}$$

$\therefore f = -18.3$ cm

$\therefore$ Most suitable answer is (c).

2 **(a)**

Applying Snell's law between the surfaces A and B



$n_1 \sin i = n_2 \sin r_1$ ...(i)

Again applying Snell's law between surfaces B and C

$n_2 \sin r_1 = n_3 \sin r_2$ ...(ii)

From Eqs. (i) and (ii), we get

$n_1 isn\, i = n_3 \sin r_2$

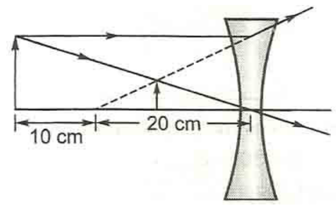
Here, $r_2 = 90°$

$\therefore n_1 \sin i = n_3$

$$\Rightarrow \sin i = \frac{n_3}{n_1}$$

3 **(b)**

When an object is placed between $2f$ and f (focal length) of the diverging lens, the image is virtual, erect and diminished as shown in the graph. To calculate the distance of the image from the lens, we apply



$$\frac{1}{f}=\frac{1}{v}-\frac{1}{u}\Rightarrow\frac{1}{-20}=\frac{1}{v}-\frac{1}{30}$$

$$\Rightarrow v=-\frac{(20)(30)}{20+30}$$

$=-12$ cm (to the left to the diverging lens.)

4 **(b)**

For a telescope, magnification when final image is formed at infinity

$$m_\infty=\frac{f_0}{f_e}=\frac{100}{10}=10$$

6 **(c)**

A simple microscope is just a convex lens with object lying between optical centre and focus of the lens

7 **(d)**

For real image $m=-2$

$$\therefore m=\frac{f}{u+f}\Rightarrow-2=\frac{f}{u+f}=\frac{20}{u+20}\Rightarrow u=-30\ cm$$

8 **(c)**

$$\frac{1}{f}=(\mu-1)\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$$

For biconvex lens $R_2=-R_1$ $\therefore\frac{1}{f}=(\mu-1)\left(\frac{2}{R}\right)$

Given $R=\infty$ $\therefore f=\infty$, so no focus at real distance

9 **(b)**

Erect and enlarged image can produced by concave mirror

$$\frac{I}{O}=\frac{f}{f-u}\Rightarrow\frac{+3}{+1}=\frac{f}{f-(-4)}\Rightarrow f=-6\ cm$$

$\Rightarrow R=2f=-12\ cm$

11 **(a)**

The real depth $=\mu$ [apparent depth]

$\Rightarrow$ In first case, the real depth $h_1=\mu(b-a)$

Similarly in the second case, the real depth $h_2=\mu(d-c)$

Since $h_2>h_1$, the difference of real depths

$=h_2-h_1=\mu(d-c-b+a)$

Since the liquid is added in second case,

$$h_2-h_1=(d-b)\Rightarrow\mu=\frac{(d-b)}{(d-c-b+a)}$$

13 **(b)**

Optical path $\mu x=$ constant

i.e., $\mu_1 x_1 = \mu_2 x_2$

$\Rightarrow 1.53 \times 4 = \mu_2 \times 4.5$

$$\Rightarrow \mu_w = \frac{1.53 \times 4}{4.5} = 1.36$$

14 **(a)**

Focal length of converging lens $f = +10$ cm

u = -9 cm

From lens formula

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

$$or \quad \frac{1}{v} = \frac{1}{f} + \frac{1}{u} = \frac{1}{10} + \frac{1}{(-9)}$$

$$\frac{1}{v} = \frac{1}{10} - \frac{1}{9}$$

$$Or \quad v = -90\ cm$$

Magnification , $m = \frac{v}{u} = \frac{-90}{-9} = 10$m

$\therefore$ Apparent area of card through lens

$= 10 \times 10 \times 1 \times 1 = 100\ mm^2 = 1\ cm^2$

15 **(b)**

For the relaxed eye, magnifying power is

$$M = -\frac{v_0}{u_0}\frac{D}{f_e}$$

$$\therefore -45 = -\frac{v_0}{u_0} \times \frac{25}{5}, \ \frac{v_0}{u_0} = 9$$

For objective lens, image is real

$$\therefore v_0 = +v_0, u_0 = -\frac{v_0}{9}$$

Given, $f_0 = 1$ cm

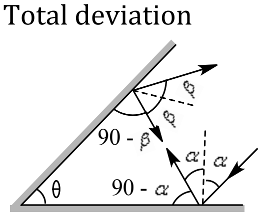
Form $\frac{1}{v_0} - \frac{1}{u_0} = \frac{1}{f_0}$

$\frac{1}{v_0} + \frac{9}{v_0} = \frac{1}{1}$; $v_0 = 10$ cm

Length of the tube $= v_0 + f_e = 10 + 5 = 15$ cm

16 **(c)**

Total deviation



$= (180° - 2\alpha) + (180° - 2\beta)$

$= 360° - 2(\alpha + \beta)$

But $90° - \alpha + 90° - \beta + \theta = 180°$

Or $\theta = \alpha + \beta$

$\therefore$ Total deviation $= 360° - 2\theta$

17 **(c)**

If eye is kept at a distance d then $MP = \frac{L(D-d)}{f_0 f_e}$, MP decreases

18 **(c)**

When f_1 and f_2 are focal lengths of lenses combined together, image formation takes place as follows

From lens formula

$$\frac{1}{v'} - \frac{1}{u} = \frac{1}{f_1} \quad \ldots\ldots\ldots\ldots(i)$$

$$\frac{1}{v} - \frac{1}{v'} = \frac{1}{f_2} \quad \ldots\ldots\ldots(ii)$$

Adding Eqs. (i) and (ii), we get

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f_1} + \frac{1}{f_2}$$

If this lens is replaced by a single lens, then focal length of combination is

$$\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{v} - \frac{1}{u}$$

$$\Rightarrow F = \frac{f_1 f_2}{f_1 + f_2}$$

19 **(a)**

Here we treat the line on the objective as the object and the eyepiece as the lens

Hence $u = -(f_o + f_e)$ and $f = f_e$

Now $\frac{1}{v} - \frac{1}{-(f_o + f_e)} = \frac{1}{f_e}$

Solving we get $v = \frac{(f_o + f_e) f_e}{f_o}$

Magnification $= \left|\frac{v}{u}\right| = \frac{f_e}{f_o} = \frac{\text{Image size}}{\text{Object size}} = \frac{l}{L}$

$\therefore$ Magnification of telescope in normal adjustment

$$= \frac{f_o}{f_e} = \frac{L}{l}$$

20 **(d)**

$$\frac{I}{O} = \frac{v}{u}$$

$$\frac{I}{15} = \frac{-25}{-10}$$

$I = 15 \times 2.5 \text{ cm} = 37.5 \text{ cm}$

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