DPP
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 3

Topic :- RAY OPTICS AND OPTICAL INSTRUMENTS

1 **(d)**

If a lens of focal length f is divided into two equal parts as shown in figure (i) and each has a focal length f' then

$\frac{1}{f} = \frac{1}{f'} + \frac{1}{f'}$ $ie, f' = 2f$

ie, each part will have focal length $2f$

Now if these parts are put in contact as in figure (2), then resultant focal length of the combination will be

$\frac{1}{F} = \frac{1}{2f} + \frac{1}{2f} ie, F = f$ $(initial\ value)$

For this combination,

$\frac{1}{F} = ({}_a\mu_g - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$ ……(i)

Now, if this combination is immersed in liquid, then

$\frac{1}{F'} = ({}_1\mu_g - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$ …..(ii)

$$\frac{F'}{f} = \frac{({}_a\mu_g - 1)}{({}_1\mu_g - 1)} = \frac{(1.5) - 1)}{\left(\frac{\frac{3}{2}}{\frac{4}{3}} - 1\right)}$$

$$or\ \frac{F'}{f} = \frac{0.5}{\left(\frac{9}{8} - 1\right)} = 0.5 \times 8$$

$\therefore$ F' $= 0.5 \times 8 \times 10 = 40cm$

2 **(b)**

The angular range is clearly twice the critical angle

3 **(d)**

$$\frac{1}{f} = \left(\frac{\mu_1}{\mu_2} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$\frac{1}{f} = \left(\frac{3/2}{4/3} - 1\right)\left(\frac{1}{0.3} + \frac{1}{0.3}\right)$$

Or $\frac{1}{f}=\left(\frac{9}{8}-1\right)\left(\frac{2}{0.3}\right)$

Or $\frac{1}{f}=\frac{1}{8}\times\frac{2}{0.3}$ or $f=1.20$ m

4 **(b)**

$f=-15cm, m=+2$ [Positive because image is virtual]

$\because m=-\frac{v}{u}\Rightarrow v-2u.$ By using mirror formula

$$\frac{1}{-15}=\frac{1}{(-2u)}+\frac{1}{u}\Rightarrow u=-7.5\ cm$$

5 **(a)**

$$n=\frac{\text{Real depth}}{\text{Apparent depth}}=\frac{6}{4}=\frac{3}{2}$$

$$\frac{n_1}{\text{u}}+\frac{n_2}{v}=\frac{n_1\sim n_2}{R}$$

$$\frac{1.5}{6}-\frac{4}{17}=\frac{1.5-1}{R}$$

$R=34$ cm

6 **(c)**

$\delta_{\text{net}}=\delta_{\text{mirror}}+\delta_{\text{prism}}$

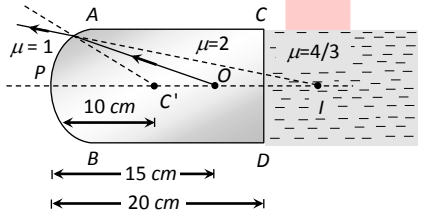
$=(180-2i)+(\mu-1)A$

$=(180-2\times45)+(1.5-1)\times4=92°$

7 **(b)**

In case of refraction from a curved surface, we have

$$\frac{\mu_2}{v}-\frac{\mu_1}{u}=\frac{\mu_2-\mu_1}{R}\Rightarrow\frac{1}{v}-\frac{2}{(-15)}=\frac{(1-2)}{-10}\Rightarrow v=-30\ cm$$



i.e., the curved surface will form virtual image I at distance of 30 cm from P. Since the image is virtual there will be no refraction at the plane surface CD (as the rays are not actually passing through the boundary), the distance of final image I from P will remain

30 cm

9 **(a)**

A lens made of three different materials as shown has only one focal length. Thus, for a given object there is only on image.

10 **(c)**

The optical fibres are used to transmit light signals from one place to another without any practical loss in the intensity of light signal. It works on the principle of total internal reflection.

11 **(a)**

We know that $\delta=i+e-A\Rightarrow e=\delta+A-i$

$=30°+30°-60°=0°$

$\therefore$ Emergent ray will be perpendicular to the face.

Therefore it will make an angle of 90° with the face through which it emerges

12 **(c)**

Distance of jeep, $x = \frac{D \times d}{1.22 \times \lambda}$

Where D = diameter of lens

d = separation between sources.

$$\Rightarrow x = \frac{(2 \times 10^{-3}) \times 1.2}{1.22 \times 5896 \times 10^{-10}}$$

$$= 3337\ m$$

$$\Rightarrow x = 3.34\ km$$

13 **(a)**

$$\mu = \frac{h'}{h} \Rightarrow h' = \mu h = \frac{4}{3} \times 18 = 24\ cm$$

14 **(b)**

Focal length for violet colour is minimum

17 **(d)**

Out of the given choices concave mirror can produce real image.

Provided the object is not placed between the pole and focus of concave mirror.

18 **(b)**

Speed of light is given by

$$v = \frac{c}{n} = \frac{3 \times 10^8}{1.5} = 2 \times 10^8\ \text{ms}^{-1}$$

19 **(b)**

Resolving power of microscope $\propto \frac{1}{\lambda}$

20 **(b)**

According to lens makers formula

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

Since $\mu_{\text{Red}} < \mu_{\text{violet}} \Rightarrow f_v < f_r$ and $F_v < F_r$

Note: Always keep in mind that whenever you are asked to compared (greater than or less than) u, v or f you must not apply sign conventions for comparison

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