DPP
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 4

Topic :- RAY OPTICS AND OPTICAL INSTRUMENTS

2 **(d)**

Convergence (or power) is independent of medium for mirror

3 **(d)**

$\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{60} + \frac{1}{(-20)} \Rightarrow F = -30$

4 **(b)**

$m = \frac{f}{f-u}$

If $m = +3$, then

$3 = \frac{-24}{-24-u}$

Or $-24 - u = -8$ or $u + 24 = 8$

Or $u = 8 - 24$ cm $= -16$ cm

If $m = -3$, then

$-3 = \frac{-24}{-24-u}$

$u + 24 = -8$

Or $u = -32$cm

5 **(b)**

The first images is due to reflection from the front surface *ie* unpolised surface of the mirror. So, only a small fraction is the incident light energy is reflected. The second image is due to reflection from polished surface. So, a major portion of light is reflected. Thus, the second image is the brightest

6 **(d)**

Given focal length of concave mirror

$f = -15$ cm

$u = -20$ cm

Magnification $m = \frac{f}{u-f} = \frac{-15}{-20+15}$

$m = 3$ cm

The area enclosed by the image of the wire

$= m^2 = 9\ \text{cm}^2$

7 **(b)**

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

$-\frac{du}{u^2}-\frac{dv}{v^2}=0$

or $-\frac{dv}{v^2}=\frac{du}{u^2}$

Or $\frac{dv}{dt}=-\frac{v^2 du}{u^2 dt}=-\frac{10\times 10}{30\times 30}\times 9\ \text{ms}^{-1}=-1\ \text{ms}^{-1}$

8 **(a)**

$\frac{f}{f-u}=\frac{1}{4}=\frac{f}{f-(-0.5)}$

Or $4f=f+0.5$ or $3f=0.5$

Or $f=\frac{0.5}{3}\text{m}=0.17\text{m}$

9 **(c)**

The critical angle C is given by

$\sin C=\frac{n_2}{n_1}=\frac{\lambda_1}{\lambda_2}=\frac{3500}{7000}=\frac{1}{2}\Rightarrow C=30°$

10 **(d)**

For a lens $m=\frac{f-v}{f}=-\frac{1}{f}v+1$

Comparing it with $y=mx+c$

Slope $=m=-\frac{1}{f}$

From graph, slope of the line $=\frac{b}{c}$

Hence $-\frac{1}{f}=\frac{b}{c}\Rightarrow|f|=\frac{c}{b}$

12 **(d)**

$I=\frac{L}{r^2}$

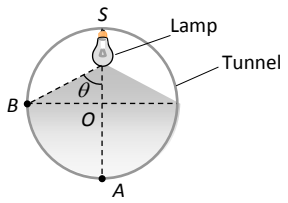
$\Rightarrow\frac{dI}{I}=-\frac{2dr}{r}$ $[\because L=\text{constant}]$

$\Rightarrow\frac{dI}{I}\times 100=-\frac{2\times dr}{r}\times 100=-2\times 1=-2\%$

13 **(c)**

The rainbow is seen as a virtual image in the form of a coloured are centered on the anti-solar point that is the point below the horizon, directly opposite the sun in the sky. When conditions are favorable two rainbows are seen the brighter is the primary and a fainter second one with the colours reversed. Hence, both primary and secondary rainbow are virtual images.

14 **(d)**



$I_A = \frac{L}{(2r)^2}$ and $I_B = \frac{L}{(r\sqrt{2})^2}\cos\theta$

$= \frac{L}{2r^2}\cdot\frac{r}{r\sqrt{2}} = \frac{L}{2\sqrt{2}\,r^2}$

$\therefore \frac{I_A}{I_B} = \frac{2\sqrt{2}}{4} = \frac{1}{\sqrt{2}}$

15 **(a)**

For vacuum $t = n\,\lambda_o$ ...(i)

For air $t = (n+1)\lambda_a$ ...(ii)

From equation (i) and (ii)

$t = \frac{\lambda}{\mu - 1} = \frac{6\times10^{-7}}{1.0003 - 1}\left(\mu = \frac{\lambda_o}{\lambda_a}\right)$

$= 2\times10^{-3}m = 2mm$

16 **(d)**

Time of exposure $\propto \frac{1}{(\text{Aperture})^2}$

17 **(c)**

$\frac{f_l}{f_a} = \frac{({}_a\mu_g - 1)}{({}_l\mu_g - 1)} \Rightarrow f_l = \infty$ if ${}_l\mu_g = 1 \Rightarrow {}_a\mu_l = {}_a\mu_g$

18 **(b)**

Focal length of convex lens

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

$R_1 = 10$ cm, $R_2 = -10$ cm, $\mu = 1.5$ (for glass)

$\frac{1}{f} = (1.5 - 1)\left(\frac{1}{10} - \frac{1}{-10}\right)$

$= 0.5\left(\frac{2}{10}\right)$

$f = \frac{10}{2\times0.5}$

$\Rightarrow f = 10$ cm

$\therefore$ Focal length of concave mirror

$= 10$ cm

$\therefore$ Radius of curvature $= 2 \times 10 = 20$ cm

19 **(a)**

$u = -25\ cm, v = +75\ cm$

$\Rightarrow \frac{1}{f} = \frac{1}{+75} - \frac{1}{-25} \Rightarrow f = +18.75\ cm$; convex lens

20 **(a)**

We have

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

But $\mu = \frac{v_2}{v_1} = \frac{1480}{340}$

$$\therefore \sin C = \frac{340}{1480}$$

Or $C = \sin^{-1}\left(\frac{340}{1480}\right)$

$= 13.28° \approx 13.3°$

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