UNIT TEST-04

Subject : Physics
Class : XII

Q.1 (2)	**Q.2** (1)	**Q.3** (1)	**Q.4** (1)	**Q.5** (3)	**Q.6** (1)	**Q.7** (2)	**Q.8** (1)	**Q.9** (2)	**Q.10** (3)
Q.11 (3)	**Q.12** (1)	**Q.13** (3)	**Q.14** (4)	**Q.15** (2)	**Q.16** (2)	**Q.17** (1)	**Q.18** (4)	**Q.19** (4)	**Q. 20** (4)
Q.21 (3)	**Q.22** (4)	**Q.23** (2)	**Q.24** (3)	**Q.25** (4)	**Q.26** (3)	**Q.27** (2)	**Q.28** (4)	**Q.29** (1)	**Q.30** (3)
Q.31 (1)	**Q.32** (1)	**Q.33** (3)	**Q.34** (3)	**Q.35** (4)	**Q.36** (4)	**Q.37** (1)	**Q.38** (2)	**Q.39** (4)	**Q.40** (1)
Q.41 (2)	**Q.42** (3)	**Q.43** (2)	**Q.44** (1)	**Q.45** (2)	**Q.46** (1)	**Q.47** (2)	**Q.48** (2)	**Q.49** (3)	**Q.50** (3)

Q.1 (2)

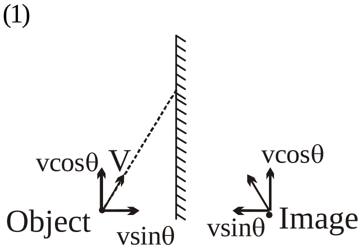
When $\theta = 90°$

then $\frac{360}{\theta} = \frac{360}{90} = 4$ is an even number.

The number of images formed is given by

$$n = \frac{360}{\theta} - 1 = \frac{360}{90} - 1 = 4 - 1 = 3$$

Q.2 (1)



Q.3 (1)

Height of man = 180 cm

∴ Min. length of plane mirror for him to see his full length image = $\frac{h}{2}$ = 90 cm

Q.4 (1)

$f = -50$ $\qquad m = -2$

$\frac{-v}{u} = -2$ $\qquad \Rightarrow v = 2u$

$\frac{1}{v} + \frac{1}{u} = \frac{1}{f} \Rightarrow \frac{3}{2u} + \frac{1}{u}$

$u = \frac{3f}{2} = \frac{3}{2} \times -50 = -75$ cm

Q.5 (3)

$|m| = 3$

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

$-3 = \frac{-15}{-15-u}$

$-15 - u = +5$

$u = -20$ cm

Q.6 (1)

$f = -15$ cm $\quad m = -3$

$u = ?$ $\qquad v = +3u$

$\frac{1}{v} + \frac{1}{u} = \frac{1}{f} \Rightarrow \frac{1}{3u} + \frac{1}{u} = \frac{1}{-15}$

$= \frac{1}{3u} + \frac{1}{u} = \frac{-1}{15} \Rightarrow \frac{(1+3)}{3u} = \frac{-1}{15}$

$= \left(\frac{4}{3}\right) \times 15 = u \Rightarrow u = 20$ cm

Q.7 (2)

$h_0 = 7.5$ cm $\quad f = \frac{25}{2}$ $\qquad u = -40$

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

$\frac{1}{v} = \frac{2}{25} + \frac{1}{40} = \frac{16+5}{200} = \frac{21}{200}$

$m = -\frac{200}{21. + 40} = \frac{5}{21}$

$\frac{h_1}{h_0} = \frac{5}{21} \Rightarrow h_I = \frac{5}{21} \times \frac{15}{2} = \frac{75}{42} = 1.78$

Q.8 (1)

Q.9 (2)

$D_{BF} = D_F + D_B\,\mu_{water} = 16 + 12 \times \frac{4}{3} = 32$

Q.10 (3)

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

On value of focal length is there, number of images = 1

(b) $\frac{1}{f_1} = \left(\frac{\mu_2}{\mu_1} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

$$\frac{1}{f_2}=\left(\frac{\mu_3}{\mu_1}-1\right)\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$$

Two values of focal length is there, so number of images are two

(c) As many reflections, that many images. Infinite number of reflections will be there, so infinite number of images.

(d) Other side of lens have three different medium, so number of images are three

Q.11 (3)

$\mu_y > \mu_R$

$$\therefore \text{ As } \theta_{c_{red}} = \sin^{-1}\frac{1}{\mu_R}$$

$$\theta_{c_{yellow}} = \sin^{-1}\frac{1}{\mu_y}$$

$\therefore$ As $\mu_y > \mu_R$

$$\Rightarrow \therefore \sin^{-1}\frac{1}{u_y} < \sin^{-1}\frac{1}{\mu_R}$$

$$\Rightarrow \theta_{c_{yellow}} < \theta$$

Q.12 (1)

Rainbow is formed due to dispersion of light where all component clours got splitted into 7 colours.

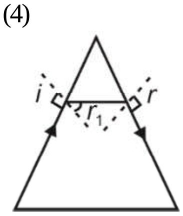
Q.13 (3)

Angle of prism, A = 60º

Angle of minimum deviation, δ_m = 40º

$$\text{Angle of incidence, } i=\frac{A+\delta_m}{2}=\frac{60^o+40^o}{2}=50$$

Q.14 (4)



$\angle i = \angle r = 90^o$

$r_1 + r_2 = A$

$2r = 60^o \Rightarrow r = 30^o$

$$\mu=\frac{\sin 90^o}{\sin 30^o}=2$$

Q.15 (2)

$\sin\theta = \sqrt{3}\,\sin\theta/2$

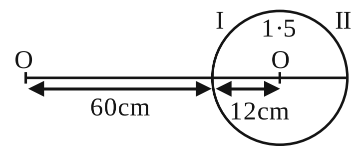
$$2\sin\frac{\theta}{2}\cos\frac{\theta}{2}=\sqrt{3}\,\sin\frac{\theta}{2}$$

$$\cos\frac{\theta}{2}=\frac{\sqrt{3}}{2}$$

$$\frac{\theta}{2}=\cos^{1}\left(\frac{\sqrt{3}}{2}\right) = 30$$

$\theta = 60°$

Q.16 (2)



for I refracting surface

$$\frac{1\cdot5}{v}-\frac{1}{-60}=\frac{(1\cdot5-1)}{12}$$

solving, we get

v = 60 cm

$\therefore$ for II refracting surface

v = + (60 – 24) = + 36 cm

$$\frac{1}{v}-\frac{1.5}{36}=\frac{(1-1\cdot5)}{-12}$$

Solving, we get

v = 12 cm

$\therefore$ distance from the centre is 12 + 12 = 24 cm

Q.17 (1)

Lens Maker's formula

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

where, $R_2=\infty, R_1=0.3\text{m}$

$$\therefore \frac{1}{f}=\left(\frac{5}{3}-1\right)\left(\frac{1}{0.3}-\frac{1}{\infty}\right)$$

$$\Rightarrow \frac{1}{f}=\frac{2}{3}\times\frac{1}{0.3}$$

or f = 0.45 m

Q.18 (4)

If two thin lenses of focal lengths f_1, f_2 are placed in contact coaxially, then equivalent focal length of combination is

$$\frac{1}{F}=\frac{1}{f_1}+\frac{1}{f_2}-\frac{0}{f_1f_2}=\frac{1}{f_1}+\frac{1}{f_2}$$

Power for the combination is

$$P=\frac{1}{F}=\frac{1}{f_1}+\frac{1}{f_2}=\frac{f_1+f_2}{f_1f_2}$$

Q.19 (4)

Magnifying power when image is formed at near point

$$M = -\frac{f_0}{f_e}\left[1+\frac{f_e}{D}\right] = -\frac{50}{5}\left[1+\frac{5}{25}\right]=12$$

Q. 20 (4)

$$m = \frac{f_0}{f_e}\ ;\ f_0 = 150\text{cm}$$

$$\Rightarrow f_e = \frac{f_0}{m} = \frac{150}{30} = 5\text{ cm}$$

Length of telescope

$l = f_0 - f_e = 150 - 5 = 145$ cm

Q.21 (3)

$$W_a = \frac{\lambda}{d}$$

$$1\times\frac{\pi}{180} = \frac{6000\times10^{-10}}{d}$$

$d = 0.03$ mm

Q.22 (4)

$$\frac{I_{max}}{I_{min}} = \left(\frac{\frac{a_1}{a_2}+1}{\frac{a_1}{a_2}-1}\right)^2 \Rightarrow \frac{a_1+a_2}{a_1-a_2} = 6$$

$$\frac{7}{5} = \frac{a_1}{a_2}$$

Q.23 (2)

$d = 0.1\text{ mm} = 10^{-4}\text{m}, D = 1.2\text{ m},$

$\beta = 6\text{ mm} = 6\times10^{-3}\text{ m}$

$$\beta = \frac{D\lambda}{d}$$

$$6\times10^{-3} = \frac{1.2\times\lambda}{10^{-4}} \Rightarrow \lambda = 5\times10^{-7}\text{m} = 5000\text{Å}$$

Q.24 (3)

$$\sin\theta = \frac{\lambda}{d} = \frac{1}{2}$$

$\Rightarrow d = 2\lambda \quad = 2\times6500\times10^{-10}$

$= 13000\times10^{-10} = 1.3$ mm

Q.25 (4)

Q.26 (3)

Monochromatic light means light containing single frequency or single wavelength or only one colour. Here bulb, candle, sun $\rightarrow$ all are poly chromatic

Laser $\rightarrow$ Monochromatic

Q.27 (2)

$n\lambda = m\lambda'$

$$\frac{n}{m} = \frac{\lambda'}{\lambda} = \frac{5500}{6000} = \frac{11}{12}$$

Q.28 (4)

Q.29 (1)

Q.30 (3)

Q.31 (1)

Change in optical path diff $\Delta x = (\mu - 1)t$

Phase diff $\Delta\phi = \frac{2\pi}{\lambda}\ \Delta x$

$$= \frac{2\pi}{600\times10^{-9}}\times0.4\times5\times10^{-6} = \frac{20\pi}{3}$$

$$I_{res} = I_0\cos^2\left(\frac{\Delta\phi}{2}\right) = I_0\cos^2\left(\frac{10\pi}{3}\right) \Rightarrow I_{res} = \frac{I_0}{4}$$

Q.32 (1)

$t(\mu - 1) = n\lambda$

$$t = \frac{n\lambda}{\mu-1} = \frac{4\times6\times10^{-7}}{0.5}$$

$t = 4.8\ \mu$m

$\therefore$ (1)

Q.33 (3)

Let intensity of light coming from each slit of a coherent source is I.

As first slit has width 4 times the width of the second slit, so

$I_1 = 4I$ and $I_2 = I$

$$\therefore\ \frac{I_{max}}{I_{min}} = \frac{(\sqrt{I_1}+\sqrt{I_2})^2}{(\sqrt{I_1}-\sqrt{I_2})^2} = \frac{\left(\sqrt{4I}+\sqrt{I}\right)^2}{\left(\sqrt{4I}-\sqrt{I}\right)^2} = \frac{9}{1}$$

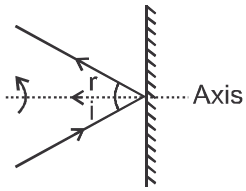
Q.34 (3)

Fringe width $\beta\propto\lambda$. Therefore, λ and hence β decreases 1.5 times when immersed in liquid.

Q.35 (4)

Only transverse waves undergo polarisation. As sound waves are longitudinal in nature, so they can't be polarised

Q.36 (4)



Normal of the mirror won't change if the rotating axis is $\perp_r$ to the plane of mirror.

$\therefore$ i & r are the same.

Q.37 (1)

u = –4f, O = 6cm, I = ?

By mirror formula $\frac{1}{-f} = \frac{1}{v} + \frac{1}{-4f} \Rightarrow v = -\frac{4}{3}f$

Also

$$\frac{I}{O} = -\frac{v}{u} \Rightarrow \frac{I}{(+6)} = -\frac{\left(\frac{-4}{3}f\right)}{(-4f)} \Rightarrow I = -2\text{cm}$$

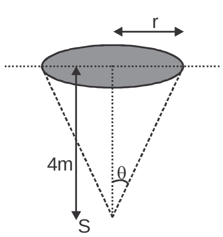
Q.38 (2)

θ is the critical angle.

$\therefore \theta = \sin^{-1}(1/\mu) = \sin^{-1}(3/5)$

or, $\sin\theta = 3/5$.

$\therefore \tan\theta = 3/4 = r/4$ or $r = 3$m.



Hence, the correct answer is option (2).

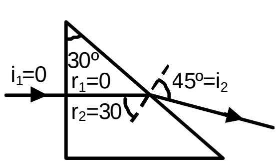
Q.39 (4)

$$C \propto \frac{1}{n}$$

$$\therefore \frac{C_w}{C_g} = \frac{n_g}{n_w}$$

or $C_w = 2\times10^8 \times \frac{1.5\times3}{4} = 2.25\times10^8 \text{m/s}$

Q.40 (1)



$$\sqrt{2}\times\sin30° = 1\times\sin i_2$$

$i_2 = 45°$

$\delta = i_1 + i_2 - A$

$= 0° + 45° - 30° = 15°$

Q.41 (2)

$m_2 = 1$ $\mu_1 = 1.5$ R = – 5 cm

u = – 3

$$\frac{1}{v} - \frac{1.5}{-3} = \frac{1-1.5}{-5} \Rightarrow v = -2.5 \text{ cm}$$

Q.42 (3)

Q.43 (2)

Direction of wave is perpendicular to the wavefront.

Q.44 (1)

Q.45 (2)

$$I_R = 4I\cos^2\left(\frac{\Delta\phi}{2}\right)$$

$$\frac{I_{max}}{2} = I_{max}\cos^2\left(\frac{\Delta\phi}{2}\right)$$

$$\Delta\phi = \frac{\pi}{2}$$

$$\therefore \Delta x = \frac{\lambda}{4}$$

$$y = \frac{\Delta xD}{d} = \frac{500\times10^{-9}}{4}\times\frac{1}{1\times10^{-3}} = 1.25\times10^{-4}\text{m}$$

Q.46 (1)

Q.47 (2)

Constructive interference occurs when the path difference $(S_1P - S_2P)$ is an integral multiple of λ.

or $S_1P - S_2P = n\lambda$

where n = 0, 1, 2, 3,......

Q.48 (2)

Shift $\Delta x = [(\mu-1)t]\frac{D}{d}$

Here $\Delta x = 5\beta$

$$\Rightarrow 5\left(\frac{\lambda D}{d}\right) = [(\mu-1)t]\frac{D}{d}$$

$$\Rightarrow 5\lambda = (\mu - \lambda)t$$

$$\Rightarrow \lambda = (\mu - 1)\ \frac{t}{5}$$

$$\Rightarrow \lambda = \frac{(0.5)(6\times10^{-6})}{5}$$

$$\Rightarrow \lambda = 6 \times 10^{-7}\ m$$

$$\Rightarrow \lambda = 6000\ Å$$

Q.49 (3)

$$\beta = \frac{\lambda D}{d}$$

$$\beta' = \frac{\lambda' D}{d}$$

$$\frac{\beta'}{\beta} = \frac{\lambda'}{\lambda} = \frac{\mu}{\lambda} = \frac{1}{\mu}$$

$$\beta' = \frac{\beta}{\mu} = \frac{0.6mm}{1.5} = 0.4mm$$

Q.50 (3)

$$y = \frac{n\lambda D}{d}$$

$$1.6\times10^{-2} = \frac{2\times\lambda\times2}{0.14\times10^{-3}}$$

$$\lambda = 5600Å$$