

Refraction and Reflection SECTION - I

Straight Objective Type

1.
$$\lambda = 7000 \stackrel{0}{\text{A}} = 7 \times 10^{-7} m \left(\because 1 \, A = 10^{-10} \, m \right)$$

$$c = 3 \times 10^8 m s^{-1}$$

$$v = \frac{c}{\lambda} = \frac{3 \times 10^8 m s^{-1}}{7 \times 10^{-7} m} 4.2 \times 10^{24} Hz$$

Hence (a) is the correct answer.

2.
$$7.5 \times 10^{14} Hz$$

 $c = 3 \times 10^8 ms^{-1}$
 $\lambda = \frac{c}{v} = \frac{3 \times 10^8 ms^{-1}}{7 \times 10^{14} s^{-1}} = 4000 \text{ Å}$

Hence (b) is the correct answer.

- **3.** $4000\overset{\circ}{A}$ to $7000\overset{\circ}{A}$ Hence (c) is the correct answer.
- **4.** Remains same because it is the property of the source but not the medium.

Hence C) is the correct answer.

- 5. Rectilinear propagation of lightHence (c) sit he correct answer.
- 6. Rectilinear propagation of lightHence (d) sit he correct answer.
- 7. $V_{A} > V_{W} > V_{G}$ Hence (a) is the correct answer.

8. According to snell's law $\mu_1 \sin i = \mu_2 \sin r$ $\Rightarrow \frac{\sin i}{dr} = \frac{\mu_2}{dr}$

Hence (b) is the correct answer.

- 9. As velocity changes suddenly, it leads to refraction Hence (a) is the correct answer.
- 10. Virtual + erectHence (d) sit he correct answer.
- Transverse wave
 Hence (a) is the correct answer.
- **12.** Concave mirror is a converging mirror. **Hence (b) is the correct answer.**
- 13. Convex mirrorHence (a) is the correct answer.
- 14. Infinity because any plane mirror is a small part of very large spherical mirror.
 Hence (c) sit he correct answer.
- **15.** Mirror causes reflection of light. **Hence (a) is the correct answer.**
- **16.** 6 m.



Hence (b) is the correct answer.

17. 5*m*s⁻¹



Hence (d) sit he correct answer.

18. $8ms^{-1}$; because $v = (4ms^{-1}) - (-4ms^{-1})$ $8ms^{-1}$

Hence (c) sit he correct answer.

19.
$$n = \frac{360^{\circ}}{\theta} - 1$$

 $= \frac{360^{\circ}}{45^{\circ}} - 1 = 8 - 1 = 7$

Hence (b) is the correct answer.

20.
$$n = \frac{360^{\circ}}{\theta} - 1$$

 $= \frac{360^{\circ}}{60^{\circ}} - 1 = 6 - 1 = 5$

Hence (a) is the correct answer.

- 21. + 1 because it is virtual & erect
 Hence (d) sit he correct answer.
- **22.** 30° Hence (d) sit he correct answer.
- 2G = d; see diagram of reflectionHence (c) sit he correct answer.
- **24.** $R = 2f \Rightarrow R = 2(40cm) = 40cm$ Hence (d) sit he correct answer.

$$25. \quad \frac{1}{t} = \frac{1}{u} + \frac{1}{v}$$
$$\Rightarrow -\frac{1}{10} = -\frac{1}{30} + \frac{1}{v}$$
$$\Rightarrow \frac{1}{v} = -\frac{1}{10} + \frac{1}{30}$$
$$\Rightarrow \frac{1}{v} = -\frac{-3+1}{30} = -15cm$$

Hence (d) sit he correct answer.

$$26. \qquad -\frac{1}{10} = -\frac{1}{20} + \frac{1}{v}$$
$$\Rightarrow \frac{1}{v} = -\frac{1}{10} + \frac{1}{20}$$
$$= \frac{-2+1}{20} = -20$$
$$\therefore v = -20cm$$

$$m = -\frac{\upsilon}{u}$$
$$= -\frac{(-20cm)}{(-20cm)} = -1$$

Image is real and inverted and of same size. Image forms at 20 cm from the pole m = -ve indicates real & inverted nature.

m=1 indicates S.O.I = S.O.O.

Hence (a) is the correct answer.

27.
$$-\frac{1}{10} = -\frac{1}{5} + \frac{1}{v}$$
$$\Rightarrow \frac{1}{v} = -\frac{1}{10} + \frac{1}{5} = -\frac{1+2}{10}$$
$$v = 10 \text{ cm}$$
$$m = -\frac{v}{u} = -\frac{(+10cm)}{(-5cm)} = +2$$
$$m = +ve \Rightarrow \text{ Virtual \& erect}$$
$$m = 2 \Rightarrow (\text{S.O.I.}) = (\text{S.O.O.})$$
Hence (b) is the correct answer.

28. Given that,

$$-\frac{1}{9} = \frac{3+1}{3u} \Longrightarrow -\frac{1}{3} = \frac{4}{u}$$
$$\Rightarrow u = -12 \, cm$$

Object is at 12 cm from the pole. Hence (c) sit he correct answer.

29.
$$c = \frac{c_0}{\mu} = \frac{3 \times 10^8 \, m s^{-1}}{3} \times 2 = 2 \times 10^8 \, m s^{-1}$$

Hence (a) is the correct answer

30.
$$c = \frac{c_0}{\mu} = \frac{3 \times 10^8 \, m \text{s}^{-1}}{4} \times 3$$
$$= 2.25 \times 10^8 \, m \text{s}^{-1}$$
Hence (b) is the correct answer.

31.



Given that image formed by the concave mirror is real. So it will be definitely inverted. Therefore magnification is negative.

:. magnification m = -5We have $m = \frac{-v}{u}$ in case of concave Mirror, u is -ve:. -ve = m (-u) $\Rightarrow V = mu$ $= -5 \times 10 cm$ V = -50 cmImage is in front of the concave mirror.

Hence (a) is the correct answer

32.



Given that f = 20 cm and u = 15 cm in case of concave mirror,

f = -ve & u = -ve $we have \frac{1}{V} = \frac{1}{f} - \frac{1}{u}$ $= \frac{1}{-20} - \frac{1}{-15}$ $= -\frac{1}{20} + \frac{1}{15}$ $= \frac{-3+4}{60}$ V = 60 cm Image is formed on the other side of the pole. $magnification \ m = -\frac{v}{u}$ $= \frac{+60cm}{-15cm}$ m = 4 image is erect and virtual. Hence (b) is the correct answer.

33. Object size O = 2 cmImage size I = 4 cmObject distance u = 15 cmand V = ?, f = ?We have magnification $m = -\frac{\upsilon}{u} = \frac{\text{size of image}}{\text{size of objext}}$ Given that $m = \frac{-4cm}{2cm}$ m = -2and then $-\frac{\upsilon}{u} = -2$

$$\Rightarrow \frac{-V}{(-15cm)} = -2$$

$$\Rightarrow V = -30 \ cm$$

and focal length is calculated from

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

$$= \frac{1}{-15cm} + \frac{1}{-30cm}$$

$$= \frac{-2 - 1}{30cm}$$

$$\therefore \ f = -10 \ cm$$

Hence (a) is the correct answer

34. Speed of the man w.r. to mirror is $4ms^{-1}$ Speed of the image of man w.r. to mirror is $4ms^{-1}$ Speed of the man relative to his image =V-(-V) $= 2V = 8ms^{-1}$ Hence (d) sit he correct answer.

35.



:. The angle of diviation

$$d = 180^{\circ} - (i + r)$$

$$d = 180^{\circ} - 2i$$

(since $r = i$)
 $\therefore d = 180^{\circ} - 2(60^{\circ}) = 180^{\circ} - 120^{\circ}$
 $= 60^{\circ}$
Hence (c) sit he correct answer.

36. The no. of images formed

$$n = \frac{2(180^{\circ})}{\theta}$$

$$= \frac{360^{\circ}}{75^{\circ}} = 5$$

$$\therefore 5 \text{ image will be formed.}$$
Hence (c) sit he correct answer

37.



Since the ray after successive reflection becomes parallel to itself, it means,

diviation due to deviation due to first mirror + second mirror $=180^{\circ}$ Let angles of incidence at fist & second mirror are θ_1 and θ_2 $\therefore 180^0 - 2\theta_1 + 180^0 - 2 \theta_2 = 180^0$ $180^0 - (2\theta_1 + 2 \theta_2) = 0 \Longrightarrow \theta_1 + \theta_2$ $= 90^0 \Longrightarrow \theta = 90^0$ \therefore The angle between two mirror is 90° Hence (d) sit he correct answer.

38.



The angle of reflection, from mirror μ_1 will be 45° .

So the angle $|CAB| = 90^{\circ} - 45^{\circ} = 45^{\circ}$ from the question, "the ray after reflection it retraces its path". That means the angle of incident is zero degree so that $|ACB| = 90^{\circ}$.

 \therefore The angle between the two mirrors is

 $|ABC = 180^{\circ} - (90^{\circ} + 45^{\circ}) = 45^{\circ}$

Hence (b) sit he correct answer.

39. The power of a converging mirror (concave) is $P = \frac{-100}{f}$ (here 'f' in cm and it is – ve) $\therefore P = \frac{-100}{-18cm} = 5.56D$ $\therefore Power of the given concave mirror is +5.56 dioter.$

Hence (a) sit he correct answer.

40. Given that image is real and magnified. So it must be inverted.

We know magnification
$$m = \frac{v}{u}$$

Here in this situation $m = -\frac{(-v)}{u}$
(\therefore image is inverted)
 $\Rightarrow V = mu$
 $\Rightarrow V = nu$ (\because magnification $m = n$)
We have the mirror formula,
 $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$
 $\Rightarrow \frac{1}{-f} = \frac{1}{u} + \frac{1}{nv}$
 $\Rightarrow -\frac{1}{f} = \frac{(1+n)}{nu}$
 $\Rightarrow u = -\frac{(n+1)}{n}f$

:. Object is in front of mirror at a distance $\frac{(n+1)}{n}f$ Hence (c) sit he correct answer.

- **41.** The refractive index of water

$$\mu_{w} = \frac{\mu_{w}}{\mu_{oir}} = \frac{4}{3}$$

The refractive index of glass

$$\mu_g = \frac{\mu_g}{\mu_{air}} = \frac{3}{2}$$

 \therefore The refractive index of water w.r. to glass is $\frac{\mu_{w}}{\mu_{g}}$

$$\Rightarrow \frac{\mu_w}{\mu_{air}} \times \frac{\mu_{air}}{\mu_g} = \frac{4}{3} \times \frac{3}{2} = \frac{8}{9}$$

$$\therefore r.I. of water w.r. to glass = 8/9$$

Hence (a) sit he correct answer.

42.



The focal length of the concave mirror is f = 5 cm.

The light rays coming from the object will be divergent rays. So the point of divergence 0 shifts towards the glass, due to the presence of it in the path of the divergent beam.

The shift of divergent point towards the glass slab is given by

$$x = t \left(1 - \frac{1}{\mu} \right) = 3 \operatorname{cm} \left(1 - \frac{1}{3/2} \right) = 1 \operatorname{cm}$$

Therefore the objects is shifted to 0^1 , then u = 20 cm

$$\therefore$$
 The position of image $\frac{1}{V} = \frac{1}{f} - \frac{1}{u}$

$$= \frac{1}{-5cm} - \frac{1}{-20cm}$$
$$= \frac{-4+1}{20cm}$$
$$= -\frac{3}{20}cm$$
$$\therefore V = -\frac{20}{3}cm$$

: image is formed at a distance of $\frac{20}{3}$ cm from mirror. But the

reflected ray beam is a convergent in nature, as the convergent beam passes through glass slab, the point of convergence shifts away by an amount $t\left(1-\frac{1}{\mu}\right) = 1cm$

:. the final image point will be at
$$J^{1}$$

= $\frac{20}{3}cm + 1cm$
= $\frac{23}{3}cm$
= 7.67 cm

Hence (c) sit he correct answer.

43.



The image will be at
$$\frac{1}{V} = \frac{1}{f} - \frac{1}{u}$$

$$\Rightarrow \frac{1}{V} = \frac{1}{+15cm} - \frac{1}{-30cm}$$

$$\Rightarrow = +10cm$$

 \therefore image due to convex mirror is virtual and forms on the other side as that of the object, with a magnification

$$m = -\frac{\upsilon}{u} = -\frac{+10cm}{-30cm} = \frac{1}{3}$$

$$\therefore \text{ Size of image} = \frac{1}{3} \times 5$$

(max size of object)

 $=\frac{5}{3}$

Now this image formed by convex mirror acts as an objects for the concave mirror. So final image due to concave

mirror is
$$\frac{1}{V} = \frac{1}{f} - \frac{1}{u}$$

 $\Rightarrow \frac{1}{V} = \frac{1}{-15} - \frac{1}{-70}$
 $\Rightarrow V = \frac{-210cm}{11}$
here magnification $m = \frac{-V}{u}$
 $= \frac{\frac{-210cm}{11}}{-70cm} = -\frac{3}{11}$
 \Rightarrow The size of the final image
 $= \frac{-3}{11} \times \frac{5}{3} = \frac{5}{11}$

(-ve sign indicates inverted nature) *Hence (a) sit he correct answer.*





From the diagram & the definition of critical angle, We can write, r = h Tanc

$$=\frac{h}{\sqrt{\mu^2-1}}$$

$$\therefore r = \frac{h}{\sqrt{\frac{16}{9} - 1}}$$
$$r = \frac{3h}{\sqrt{7}}$$

Hence (d) sit he correct answer.





$$\Rightarrow \frac{\sin i}{\sin r^{1}} = \frac{1}{\mu}$$

$$\Rightarrow \frac{\sin i}{\sin(90 - i)} = \sin c \rightarrow \text{(from definition critical angle)}$$

$$\Rightarrow \frac{\sin i}{\cos i} = \sin c$$

$$\Rightarrow \tan i = \sin c$$

$$\Rightarrow c = \sin^{-1}(\operatorname{Tan} i)$$
(or) $c = \sin^{-1}(\operatorname{Tan} r)$

Hence (c) sit he correct answer.

46.



$$= \frac{100}{+25cm} = 4 dioptre$$

Hence (a) sit he correct answer.

47. We have the lens formula,
$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

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

$$\Rightarrow \frac{1}{v} = \frac{1}{+18cm} + \frac{1}{-27cm}$$

$$= \frac{3-2}{54cm}$$

$$\therefore \text{ screen is to be placed at } V = +54 \text{ cm}$$

 \therefore screen is to be placed at V = + 54 cm from optic centre of the lens

$$\therefore$$
 Magnification $m = \frac{+v}{-u}$

$$=\frac{+54}{-27}=-2$$

: image is real and inverted and is twice that of the object. *Hence (b) sit he correct answer.*

48. Given
$$m = -4$$
 and $u = -10$ cm
We known $m = -\frac{\upsilon}{u}$
 $\Rightarrow -\frac{\upsilon}{u} = -4$
 $\Rightarrow V = 4u$
 $\Rightarrow \therefore V = 4(-10 \text{ cm})$
 $V = -40 \text{ cm}$ image in front of mirror.
Hence (c) sit he correct answer.

49. Here $u = -25 \, cm$ and $f = -20 \, cm$

We know
$$\frac{1}{f} = \frac{1}{u} + \frac{1}{V} \Longrightarrow -\frac{1}{20}$$

 $= -\frac{1}{25} + \frac{1}{V}$
 $\Rightarrow \frac{1}{V} = -\frac{1}{20} + \frac{1}{25}$
 $\frac{-5+4}{100}$
 $\therefore V = -100 \, cm$.

Hence (a) sit he correct answer.

Given that $\frac{S.O.I}{S.O.O} = \frac{-15 \, cm}{+5 \, cm}$ **50**. (:: image is inverted) \Rightarrow *m* = -3 (:: image in inverted) $\Rightarrow -\frac{V}{V} = -3$ $\Rightarrow V = 3u \Rightarrow V = 3(-15 cm)$ $\Rightarrow V = -45 cm$ We have $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ $=-\frac{1}{15}+\frac{1}{45}$ $\frac{1}{f} = \frac{-3-1}{45}$ $\therefore f = \frac{45 \, cm}{\Lambda}$ $f = -11.25 \, cm$ in general f'=11.25 cmHence (b) sit he correct answer.

- 51. If object moves with a speed 'V' towards a plane mirror its image approaches with a relative speed of '2V'.
 Hence (b) sit he correct answer.
- **52.** Hint : If ' θ ' is the angle between two plane mirrors then $m = \frac{360^{\circ}}{2}$

, If 'm' = even, then no. of images n = m - 1If m = odd, the no. of image n = m(if object is not on the bisector) **Hence (d) sit he correct answer.**

53. Given that
$$u = -f$$

We have $\frac{1}{f} = \frac{1}{u} + \frac{1}{V}$
In convex mirror, $\frac{1}{f} = -\frac{1}{f} + \frac{1}{V}$
 $\Rightarrow \frac{1}{V} = \frac{2}{f} \Rightarrow V = \frac{f}{2}$

Hence (b) sit he correct answer.

54. Here $u_1 = 25cm$ and given that $m = \frac{V_1 - V_2}{u_2 - u_1} = -4$ $u_2 = 40 cm \Longrightarrow V_1 - V_2 = -4(15)$ $\Longrightarrow V_1 - V_2 = -60$

> Here '-ve' sign shows real inverted nature of image. In both the cases same mirror is used.

So that
$$-\frac{1}{25} + \frac{1}{V_1} = -\frac{1}{40} + \frac{1}{V_2}$$

$$= \frac{V_2 - V_1}{V_1 V_2} = \frac{-5 + 8}{200}$$

$$\Rightarrow V_1 V_2 = \frac{200 \times 60}{3} = 4000$$

We have
 $(V_1 + V_2)^2 = (V_1 - V_2)^2 + 4V_1 V_2$
 $= (3600) + 16000$
 $= 19600$
 $\Rightarrow V_1 + V_2 = 140$ on solving $V_1 - V_2 = 60$
 $V_1 + V_2 = 140$, the values of $V_1 = 100$ cm; $V_2 = 40$ cm
 \therefore focal length $\frac{1}{f} = -\frac{1}{25} - \frac{1}{100}$
 $= \frac{-4 - 1}{100}$
 $\therefore f = -20$ cm

Hence (a) sit he correct answer.

55. Here shift
$$x = t\left(1 - \frac{1}{\mu}\right) \Rightarrow x = 6 \ cm$$

 $\left(1 - \frac{1}{\frac{3}{2}}\right) \Rightarrow x = 2 \ cm$
Position of object is reduced by 2 cm
 $\therefore -\frac{1}{8} = -\frac{1}{40} + \frac{1}{V} \Rightarrow \frac{1}{V} = -\frac{1}{8} + \frac{1}{40} \Rightarrow \frac{1}{V} = \frac{-5+1}{40}$
 $\Rightarrow V = -10 \ cm$
 \therefore final image is at 12 cm due to shift.
Hence (b) sit he correct answer.

56. The distance through which the screen is to be moved away is

$$x = t \left(1 - \frac{1}{\mu} \right) \Longrightarrow x = 18 \, cm \left(1 - \frac{2}{3} \right) a$$
$$= 6 \, cm$$

Hence (c) sit he correct answer.

57. The radius of the circle is $r = \frac{3h}{\sqrt{7}} = \frac{3 \times 8 \, cm}{\sqrt{7}}$ $\therefore r = \frac{24}{\sqrt{7}} \, cm$

Hence (b) sit he correct answer.

58. Let d - real depth and x - apparent depth. Given that $4 = d\left(1 - \frac{1}{\mu}\right)$ and(1) $7 = (d+12)\left(1 - \frac{1}{\mu}\right)$ (2) From $\frac{(2)}{(1)} \Rightarrow \frac{d+12}{d} = \frac{7}{4} \Rightarrow \frac{12}{d}$ $= \frac{3}{4} \Rightarrow d = 16cm$ Then, from (1) $\Rightarrow 4 = 16\left(1 - \frac{1}{\mu}\right) \Rightarrow \frac{1}{4}$

$$=1-\frac{1}{\mu} \Rightarrow \mu = \frac{4}{3}$$

Hence (c) sit he correct answer.

59. We have
$$r = \frac{h}{\sqrt{\mu^2 - 1}} = \frac{\frac{1}{2}cm}{\sqrt{\left(\frac{3}{2}\right)^2 - 1}}$$

$$=\frac{\frac{1}{2}cm\times 2}{\sqrt{5}}=\frac{1}{\sqrt{5}}cm$$

$$\therefore \text{Area} = \pi r^2 \Longrightarrow area = \frac{\pi}{5} cm^2$$

Hence (d) sit he correct answer.

60. Use
$$r = \frac{h}{\sqrt{\mu^2 - 1}}$$
 then area πr^2

Hence (b) sit he correct answer.

61.
$$\frac{\mu_g}{\mu_w} = \frac{3}{2} \times \frac{3}{4} \Rightarrow_w \mu_g = \frac{9}{8} = 1.125$$

Hence (c) sit he correct answer.

62. Use
$$i = \operatorname{Tan}^{-1}(\mu)$$

Hence (b) sit he correct answer.

63. Use
$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$
 to calculate V.
Hence (a) sit he correct answer.

64. Hint: Use focal power
$$P = \frac{1}{f}$$
 diopter
 $\Rightarrow f = \frac{1}{P}$ meter

- **65.** Hint: $P = P_1 + P_2$ here P = +5D - 3D= + 2D Convex nature. **Hence (b) sit he correct answer.**
- **66.** Hint: $P = \frac{1}{f_1} + \frac{1}{f_2}$; f = +ve for convex lens f = -ve for concave lens **Hence (b) sit he correct answer.**
- 67. Hint: f = -0.2 m = -20cm v = +0.3 = +30 cm and then find 'u' from $\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$ Hence (b) sit he correct answer.
- **68.** Because when an object is placed at the focus of a concave mirror is final image is formed at infinity and the image will be real, inverted and magnified.

Hence (b) sit he correct answer.

- 69. Virtual, erect and magnified.Hence (d) sit he correct answer.
- **70.** Use $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ and then $m = \frac{v}{u}$

Hence (a) sit he correct answer.

71. Here $m = -\frac{v}{u} = -\frac{3}{2}$

$$\Rightarrow V = \frac{3u}{2}; \text{ given that } u = -16 \text{ cm}$$
$$\Rightarrow V = \frac{3(-16)}{2}$$
$$\therefore V = -24 \text{ cm}$$

Hence (c) sit he correct answer.

72. Hint : If the object is on the bisector, then the no. of image formed is

$$=\frac{360^{\circ}}{\theta} - 1$$

$$\therefore 3 = \frac{360^{\circ}}{\theta} = -1$$

$$\Rightarrow \theta = 90^{\circ}$$

Hence (c) sit he correct answer.

- **73.** Angle of deviation $d = 180^{\circ} 2i$ **Hence (c) sit he correct answer.**
- **74.** Because, in case of normal incidence the angle of incidence $i = 0^{0}$ and angle of reflection $r = 0^{0}$, then light ray retraces its path. The difference in 'i' and 'r' will be zero. **Hence (d) sit he correct answer.**
- 75. Hint: d = 2G d' = 2G' $\therefore \Delta d = d' - d$ $= 2(G + \theta) - 2G$ $= 2\theta$

Hence (a) sit he correct answer.

76. Use
$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

Hence (b) sit he correct answer.

- **77.** Reflection causes 180° . (or) π radian phase difference **Hence (c) sit he correct answer.**
- $\mathbf{78.} \qquad \frac{\mu_g}{\mu_D} = \frac{3}{2} \times \frac{2}{5} \Longrightarrow_D \mu_g = \frac{3}{5}$

Hence (a) sit he correct answer.

79. Shift
$$x = t \left(1 - \frac{1}{\mu} \right)$$
$$= 18cm \left(1 - \frac{2}{3} \right)$$

 $x = 6 \ cm$.

Hence (b) sit he correct answer.

- **80.** Because it is a characteristic property of the source of light. Hence (b) sit he correct answer.
- 81. Because image is virtual and of same size.Hence (b) sit he correct answer.
- **82.** The point of convergence is shifts away $x = t \left(1 \frac{1}{\mu} \right)$

Hence (a) sit he correct answer.

83. The minimum distance between an object and its real image is 4f.Hence (d) sit he correct answer.

84.



Hence (d) sit he correct answer.

- 85. The U–V graph in case of a convex lens will be in rectangular hyperbola shape.
 Hence (d) sit he correct answer.
- 86. The maximum image distance in case of a concave lens is limited within its focal length.
 Hence (b) sit he correct answer.
- **87.** Due to the scattering of light sky appears blue in colour. **Hence (c) sit he correct answer.**

88. Because
$$P = \frac{1}{f_1} + \frac{1}{f_2} \Rightarrow P = \frac{f_1 + f_2}{f_1 f_2}$$

Hence (a) sit he correct answer.

89. Straight line.Hence (a) sit he correct answer.

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

Hence (d) sit he correct answer.

91. Because $\lambda \propto \frac{1}{\mu}$ and $f \propto \frac{1}{\mu}$

Hence (d) sit he correct answer.

92. Due to optical illusion.

Hence (a) is the correct answer.

SECTION - II Assertion - Reason Questions

- **93.** No, a concave mirror also gives virtual image, when an object is placed between its pole ands focus the image will be virtual. **Hence (d) sit he correct answer.**
- 94. Yes the statement 2 is the correct explanation of statement 1.Hence (a) is the correct answer.
- **95.** Because, the focal length of plane mirror is infinity. **Hence (b) is the correct answer.**
- 96. Both are correct and individual statement.Hence (b) is the correct answer.

SECTION - III Linked Comprehension Type

- **97.** $i = 60^{\circ}$, here $G = 30^{\circ}$ because $i = 60^{\circ}$. Hence (b) is the correct answer.
- **98.** i = r, So angle of reflection $i = 60^{\circ}$. **Hence (a) is the correct answer.**

99.
$$d = 180^{\circ} - 2i$$

= $180^{\circ} - 2(60^{\circ}) = 60^{\circ}$
(or)
 $d = 2G$
= $2(30) = 60^{\circ}$
Hence (c) is the correct answer.

100. Here
$$u = -15 \text{ cm}; f = -10 \text{ cm}$$

 $\frac{1}{f} = \frac{1}{u} + \frac{1}{v} \Rightarrow -\frac{1}{10} = -\frac{1}{15} + \frac{1}{v}$
 $\Rightarrow \frac{1}{v} = -\frac{1}{10} + \frac{1}{15} = \frac{-3+2}{30}$
 $\Rightarrow v = -30$
Hence (b) is the correct answer.

101.
$$m = -\frac{\upsilon}{u}$$

 $= -\frac{(-30cm)}{(-15cm)} = -2$
 $m = -\upsilon e \Rightarrow real of inverted$
 $m = 2 \Rightarrow \frac{(S.O.I.)}{(S.O.O.)} = 2$

Hence (a) is the correct answer.

102.
$$m > 1$$
.
Hence (c) is the correct answer.

103. Here
$$f = -9 cm$$
; $m = -3$
 $R = 2f \implies R = 2(-9cm) = -18cm$

Radius of curvature = 18 cm Hence (a) is the correct answer.

104.
$$m = -3$$

 $-\frac{\upsilon}{u} = -3$
 $\upsilon = 3u$
 $\therefore -\frac{1}{9} = \frac{1}{u} + \frac{1}{3u} \Rightarrow -\frac{1}{9} = \frac{3+1}{3u}$
 $\Rightarrow -\frac{1}{3} = \frac{4}{3u} \Rightarrow u = -12 \text{ cm}$
Object is at 12 cm from the pole.
Hence (b) is the correct answer.

105. Here
$$v = 3u$$

 $\Rightarrow v = 3(12) cm$
 $\therefore v = 36 cm$

Hence (d) is the correct answer.

SECTION - IV Matrix - Match Type









108.

