

1. (c) : Let f be focal length of the convex mirror.
According to new cartesian sign convention
Object distance, $u = -f$, focal length $= +f$
According to mirror formula

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

$$\frac{1}{-f} + \frac{1}{v} = \frac{1}{f} \text{ or } \frac{1}{v} = \frac{1}{f} + \frac{1}{f} = \frac{2}{f} \text{ or } v = \frac{f}{2}$$

The image is formed at a distance $\frac{f}{2}$ behind the mirror.
It is a virtual image.

$$\text{Magnification, } m = -\frac{v}{u} = -\frac{(f/2)}{(-f)} = \frac{1}{2}$$

$$\text{Also, } m = \frac{\text{Height of image}(h_I)}{\text{Height of object}(h_O)}$$

$$\therefore h_I = mh_O = \frac{1}{2}(1\text{ m}) = 0.5\text{ m}$$

2. (c) : For spherical mirror, $f = \frac{R}{2}$

Here, $R = 35.0\text{ cm}$

$$\therefore f = \frac{35}{2} = 17.5\text{ cm}$$

$$\text{Now, } \frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

Also, magnification $m = \frac{-v}{u}$ or $v = -mu$

$$\therefore \frac{1}{f} = \frac{1}{u} - \frac{1}{mu}$$

$$\text{or } u = f\left(1 - \frac{1}{m}\right)$$

$$= 17.5\left(1 - \frac{1}{2.5}\right) = 17.5 \times (0.6) = 10.5\text{ cm}$$

3. (b) : According to mirror formula,

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

Differentiating with respect to t , we get

$$\therefore -\frac{1}{u^2} \frac{du}{dt} - \frac{1}{v^2} \frac{dv}{dt} = 0 \quad (\because f \text{ is constant})$$

$$\text{or } \frac{dv}{dt} = -\left(\frac{v}{u}\right)^2 \frac{du}{dt}$$

$$v_i = -\left(\frac{v}{u}\right)^2 v_o \quad \left(\because \frac{dv}{dt} = v_i \text{ and } \frac{du}{dt} = v_o\right)$$

Substituting the given values, we get

$$v_i = -\left(\frac{10}{30}\right)^2 \times 9 = -1\text{ m s}^{-1}$$

$$|v_i| = 1\text{ m s}^{-1}$$

4. (a) : Here, $h_1 = 2\text{ cm}$, $u = -16\text{ cm}$
 $h_2 = -3\text{ cm}$ (since image is real and inverted)

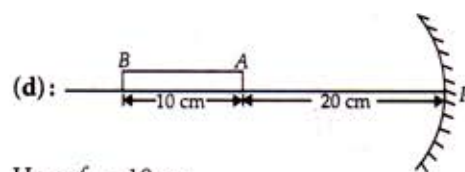
$$\therefore m = \frac{-h_2}{h_1} = \frac{v}{u}$$

$$\therefore v = \frac{-h_2}{h_1} u = \frac{3}{2} \times (-16) = -24\text{ cm}$$

$$\text{Now, } \frac{1}{f} = \frac{1}{v} + \frac{1}{u} = -\frac{1}{24} - \frac{1}{16} = \frac{-2-3}{48} = \frac{-5}{48}$$

$$f = \frac{-48}{5} = -9.6\text{ cm}$$

5.



Here, $f = -10\text{ cm}$

For end A, $u_A = -20\text{ cm}$

Image position of end A,

$$\frac{1}{v_A} + \frac{1}{u_A} = \frac{1}{f}$$

$$\frac{1}{v_A} + \frac{1}{(-20)} = \frac{1}{(-10)} \text{ or } \frac{1}{v_A} = \frac{1}{-10} + \frac{1}{20} = -\frac{1}{20}$$

$$v_A = -20\text{ cm}$$

For end B, $u_B = -30\text{ cm}$

Image position of end B,

$$\frac{1}{v_B} + \frac{1}{u_B} = \frac{1}{f}$$

$$\frac{1}{v_B} + \frac{1}{(-30)} = \frac{1}{(-10)} \text{ or } \frac{1}{v_B} = \frac{1}{-10} + \frac{1}{30} = -\frac{2}{30}$$

$$v_B = -15\text{ cm}$$

Length of the image

$$= |v_A| - |v_B| = 20\text{ cm} - 15\text{ cm} = 5\text{ cm}$$

6. (a) : Apparent depth = $\frac{\text{Real depth}}{a\mu_i}$

Here, Real depth = 12.5 cm and $a\mu_i = 1.33$

$$\therefore \text{Apparent depth} = \frac{12.5}{1.63} = 7.67\text{ cm}$$

Now the microscope will have to shift from its initial position to focus 9.4 cm depth object to focus 7.67 cm depth object.

Shift distance = 9.4 - 7.67 = 1.73 cm

7. (b) : ${}^a\mu_g = \frac{\sin 60^\circ}{\sin 35^\circ}$... (i)

$${}^a\mu_w = \frac{\sin 60^\circ}{\sin 41^\circ}$$
 ... (ii)

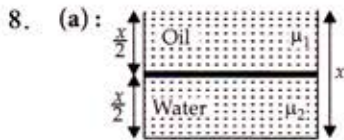
$${}^w\mu_g = \frac{\sin 41^\circ}{\sin \theta}$$
 ... (iii)

$${}^a\mu_w \times {}^w\mu_g = {}^a\mu_g$$

$$\frac{\sin 60^\circ}{\sin 41^\circ} \times \frac{\sin 41^\circ}{\sin \theta} = \frac{\sin 60^\circ}{\sin 35^\circ} \quad \text{(Using (i), (ii) and (iii))}$$

$$\sin \theta = \sin 35^\circ$$

$$\theta = 35^\circ$$



As refractive index, $\mu = \frac{\text{Real depth}}{\text{Apparent depth}}$

\therefore Apparent depth of the vessel when viewed from above is

$$d_{\text{apparent}} = \frac{x}{2\mu_1} + \frac{x}{2\mu_2} = \frac{x}{2} \left(\frac{1}{\mu_1} + \frac{1}{\mu_2} \right)$$

$$= \frac{x}{2} \left(\frac{\mu_2 + \mu_1}{\mu_1 \mu_2} \right) = \frac{x(\mu_1 + \mu_2)}{2\mu_1 \mu_2}$$

9. (d): Let x_1 be apparent depth of the dot when seen from air.

$$\therefore \mu_1 = \frac{h/3}{x_1}$$

(Here, $h/3$ is real depth of the dot under liquid of density d_1)

$$\Rightarrow x_1 = \frac{h}{3\mu_1}$$

Similarly, apparent depths of the dot when seen from air through two other liquids are

$$x_2 = \frac{h}{3\mu_2} \text{ and } x_3 = \frac{h}{3\mu_3}$$

$$\therefore \text{Apparent depth of the dot} = x_1 + x_2 + x_3$$

$$= \frac{h}{3\mu_1} + \frac{h}{3\mu_2} + \frac{h}{3\mu_3} = \frac{h}{3} \left[\frac{1}{\mu_1} + \frac{1}{\mu_2} + \frac{1}{\mu_3} \right]$$

10. (c): Here, $i = 45^\circ$

Applying Snell's law at air-glass surface, we get

$$\mu_a \sin i = \mu_g \sin r'$$

$$1 \sin i = \sqrt{2} \sin r'$$

$$\sin r' = \frac{1}{\sqrt{2}} \sin i$$

$$= \frac{1}{\sqrt{2}} \sin 45^\circ$$

$$\Rightarrow \sin r' = \frac{1}{2}$$

$$r' = \sin^{-1} \left(\frac{1}{2} \right) = 30^\circ$$

From figure,

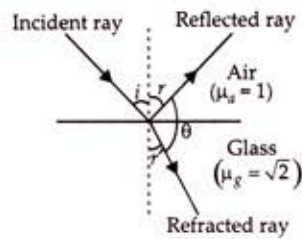
$$r + \theta + r' = 180^\circ$$

$$i + \theta + 30^\circ = 180^\circ \quad (\because i = r)$$

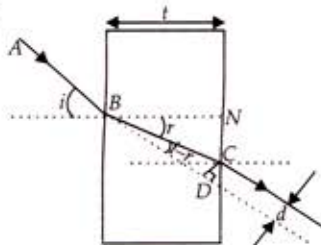
$$45^\circ + \theta + 30^\circ = 180^\circ$$

$$\theta = 180^\circ - 75^\circ = 105^\circ$$

Hence, the angle between reflected and refracted rays is 105° .



11. (c):



From figure, in right angled ΔCDB

$$\angle CBD = (i - r)$$

$$\therefore \sin(i - r) = \frac{CD}{BC} = \frac{d}{BC}$$

$$\text{or } d = BC \sin(i - r)$$

... (i)

Also, in right angled ΔCNB

$$\cos r = \frac{BN}{BC} = \frac{t}{BC}$$

$$\text{or } BC = \frac{t}{\cos r}$$

... (ii)

Substitute equation (ii) in equation (i), we get

$$d = \frac{t}{\cos r} \sin(i - r)$$

For small angles $\sin(i - r) \approx i - r$; $\cos r \approx 1$

$$d = t(i - r), \quad d = it \left[1 - \frac{r}{i} \right]$$

12. (c): Actual depth of the needle in water

$$h_1 = 12.5 \text{ cm}$$

Apparent depth of needle in water

$$h_2 = 9.4 \text{ cm}$$

$$\therefore \mu_{\text{water}} = \frac{h_1}{h_2} = \frac{12.5}{9.4} = 1.33$$

Hence, $\mu_{\text{water}} = 1.33$, when water replaced by a liquid of refractive index $\mu' = 1.63$.

The actual depth remains the same, but its apparent depth changes.

Let H be the new apparent depth of the needle

$$\therefore \mu' = \frac{h_1}{H} \text{ or } H = \frac{h_1}{\mu'} = \frac{12.5}{1.63} = 7.67 \text{ cm}$$

Here, H is less than h_2 . Thus to focus the needle again, the microscope should be moved up. Distance by which the microscope should be moved up

$$= 9.4 - 7.67 = 1.73 \text{ cm}$$

13. (c): Refraction at P ,

$$\frac{\sin 60^\circ}{\sin r_1} = \sqrt{3}$$

$$\sin r_1 = \frac{1}{2}$$

$$\text{or } r_1 = 30^\circ$$

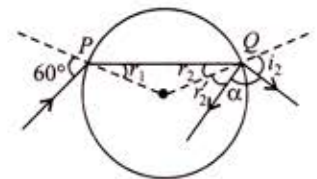
$$\text{Since, } r_2 = r_1$$

$$\therefore r_2 = 30^\circ$$

$$\text{Refraction at } Q, \frac{\sin r_2}{\sin i_2} = \frac{1}{\sqrt{3}} \text{ or } \frac{\sin 30^\circ}{\sin i_2} = \frac{1}{\sqrt{3}} \text{ or } i_2 = 60^\circ$$

$$\text{At point } Q, r_2' = r_2 = 30^\circ$$

$$\therefore \alpha = 180^\circ - (r_2' + i_2) = 180^\circ - (30^\circ + 60^\circ) = 90^\circ$$



14. (c): For total internal reflection,

$$\sin i > \sin C$$

where,

i = angle of incidence, C = critical angle

$$\text{But, } \sin C = \frac{1}{\mu} \therefore \sin i > \frac{1}{\mu} \text{ or } \mu > \frac{1}{\sin i}$$

$$\mu > \frac{1}{\sin 45^\circ} \quad (i = 45^\circ \text{ (Given)})$$

$$\mu > \sqrt{2}$$

Hence, option (c) is correct.

15. (C)

16. (d): Here, $v_A = 1.8 \times 10^8 \text{ m s}^{-1}$
 $v_B = 2.4 \times 10^8 \text{ m s}^{-1}$

Light travels slower in denser medium. Hence medium A is a denser medium and medium B is a rarer medium. Here, light travels from medium A to medium B. Let C be the critical angle between them.

$$\therefore \sin C = {}^A\mu_B = \frac{1}{{}^B\mu_A}$$

Refractive index of medium B w.r.t. to medium A is

$${}^A\mu_B = \frac{\text{Velocity of light in medium A}}{\text{Velocity of light in medium B}} = \frac{v_A}{v_B}$$

$$\therefore \sin C = \frac{v_A}{v_B} = \frac{1.8 \times 10^8}{2.4 \times 10^8} = \frac{3}{4} \quad \text{or} \quad C = \sin^{-1}\left(\frac{3}{4}\right)$$

17. (a): The figure shows incidence from water at critical angle θ_c for the limiting case.

$$\text{Now, } \sin \theta_c = \frac{1}{\mu}$$

$$\text{so that } \tan \theta_c = \frac{1}{(\mu^2 - 1)^{1/2}}$$

$$\text{From figure, } \tan \theta_c = \frac{r}{h}$$

where r is the radius of the disc.
 Therefore, diameter of the disc is

$$2r = 2h \tan \theta_c = \frac{2h}{(\mu^2 - 1)^{1/2}}$$

18. (b): $\sin \theta = \frac{\mu_2}{\mu_1} = \frac{v}{v'}$

where v and v' are the speeds of light in medium (i) and medium (ii) respectively.

$$v' = \frac{v}{\sin \theta}$$

19. (b): Since refraction occurs from denser to rarer medium,

$$\text{Therefore, } -\frac{\mu_2}{u} + \frac{\mu_1}{v} = \frac{\mu_1 - \mu_2}{R}$$

$$-\frac{3}{2(-3)} + \frac{1}{v} = \frac{1 - \frac{3}{2}}{-5} = \frac{1}{10} \quad \text{or} \quad \frac{1}{v} = \frac{1}{10} - \frac{1}{2} = -\frac{4}{10}$$

$$\Rightarrow v = -2.5 \text{ cm}$$

20. (d): Here, $P_1 = 10 \text{ D}$ and $P_2 = -5 \text{ D}$
 Therefore, power of the combined lens is
 $P = P_1 + P_2 = +10 + (-5) = +5 \text{ D}$

$$\text{Now, magnification, } m = \frac{f}{u+f}$$

$$\text{Here, } m = 2 \text{ and } f = \frac{1}{P} = \frac{1}{5} = 0.2 \text{ m} = 20 \text{ cm}$$

$$\therefore 2 = \frac{20}{u+20} \Rightarrow u+20 = 10$$

$$\Rightarrow u = -10 \text{ cm}$$

$$21. \text{ (a): } \frac{1}{f} = (\mu - 1) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$$

$$\text{Here, } f = \frac{2}{3}R, R_1 = +R, R_2 = -R$$

$$\therefore \frac{1}{(2/3)R} = (\mu - 1) \left(\frac{1}{R} + \frac{1}{R} \right) = \frac{(\mu - 1) \times 2}{R}$$

$$\mu - 1 = \frac{3}{4} = 0.75$$

$$\Rightarrow \mu = 1.75$$

22. (d): The far point of 6.0 m tell us that the focal length of the lens is $f = -6.0 \text{ m}$, $u = -18 \text{ m}$ and $h = 2 \text{ m}$

$$\text{Using, } \frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{v} = \frac{1}{f} + \frac{1}{u} = \frac{1}{-6.0} - \frac{1}{18.0}$$

$$\Rightarrow v = -4.5 \text{ m}$$

$$\therefore \text{The image size, } h' = h \left(\frac{-v}{u} \right) = 2 \times \left(\frac{-4.5}{18.0} \right) = 0.50 \text{ m}$$

23. (b): Power of the lens combination is

$$P = P_1 + P_2 = \frac{1}{f_1(\text{in m})} + \frac{1}{f_2(\text{in m})} = \frac{1}{+0.40 \text{ m}} + \frac{1}{-0.25 \text{ m}} = -1.5 \text{ m}^{-1} = -1.5 \text{ D}$$

24. (a): Area of a square card = $1 \text{ mm} \times 1 \text{ mm} = 1 \text{ mm}^2$
 Focal length of magnifying lens (converging lens),
 $f = +10 \text{ cm}$

Object distance, $u = -9 \text{ cm}$

According to thin lens formula

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

$$\frac{1}{v} = \frac{1}{f} + \frac{1}{u} = \frac{1}{+10 \text{ cm}} + \frac{1}{-9 \text{ cm}} = \frac{1}{10 \text{ cm}} - \frac{1}{9 \text{ cm}}$$

or $v = -90 \text{ cm}$

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

$$\therefore \text{Apparent area of the card through the lens} = 10 \times 10 \times 1 \text{ mm}^2 = 100 \text{ mm}^2 = 1 \text{ cm}^2$$

25. (b): Lens maker formula,

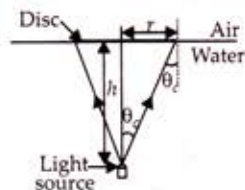
$$\frac{1}{f} = (\mu - 1) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$$

Here, $f = 20 \text{ cm}$, $\mu = 1.55$, $R_1 = R$ and $R_2 = -R$

$$\therefore \frac{1}{20} = (1.55 - 1) \left(\frac{1}{R} - \frac{1}{(-R)} \right) = 0.55 \times \left(\frac{1}{R} + \frac{1}{R} \right)$$

$$\frac{1}{20} = 0.55 \times \frac{2}{R}$$

$$R = 1.1 \times 20 = 22 \text{ cm}$$



26. (d): $\frac{1}{f} = \frac{2}{f_L} + \frac{1}{f_M}$
 For a plane mirror, $f_M = \infty$
 $\therefore \frac{1}{f} = \frac{2}{f_L}$
 or $f = \frac{f_L}{2} = \frac{20 \text{ cm}}{2} = 10 \text{ cm}$



27. (d): According to lens maker's formula

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

Here, $f = 30 \text{ cm}$, $R_1 = \infty$ (For plane surface)
 $R_2 = -10 \text{ cm}$

$$\therefore \frac{1}{30} = (\mu - 1) \left(\frac{1}{\infty} - \frac{1}{-10} \right) \Rightarrow \frac{1}{30} = \frac{(\mu - 1)}{10}$$

$$3(\mu - 1) = 1$$

$$3\mu = 4$$

$$\mu = \frac{4}{3}$$

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

Here, $R_1 = 20 \text{ cm}$, $R_2 = -40 \text{ cm}$, $f = 20 \text{ cm}$

$$\therefore \frac{1}{20} = (\mu - 1) \left(\frac{1}{20} + \frac{1}{40} \right)$$

$$\frac{1}{20} = (\mu - 1) \frac{3}{40} \Rightarrow (\mu - 1) = \frac{2}{3} \text{ or } \mu = \frac{2}{3} + 1$$

$$\mu = \frac{5}{3}$$

29. (b): Focal length for lens

$$\frac{1}{f_L} = (\mu_g - 1) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$$

Here, $\mu_g = 1.5$, $R_1 = 20 \text{ cm}$, $R_2 = -30 \text{ cm}$

$$= (1.5 - 1) \left(\frac{1}{20} - \frac{1}{-30} \right) = 0.5 \times \left(\frac{5}{60} \right)$$

$$\text{or } f_L = \frac{120}{5} = 24 \text{ cm}$$

Focal length for mirror

$$f_m = \frac{R}{2} = \frac{-20}{2} = -10 \text{ cm}$$

\therefore Equivalent focal length

$$f_{eq} = \frac{-2}{f_L} + \frac{1}{f_m} = \frac{-2}{24} + \frac{1}{-10} = \frac{-11}{60}$$

$$\Rightarrow f_{eq} = \frac{-60}{11} \text{ cm}$$

Hence, this system behaves like a concave mirror of focal length $\frac{-60}{11} \text{ cm}$.

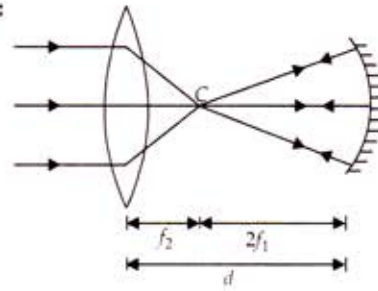
30. (c): Here, $m = \frac{v}{u} = -4$ or $u = \frac{-v}{4}$

$$\text{Also, } |u| + |v| = 1.5$$

$$\frac{v}{4} + v = 1.5 \text{ or } v = 1.2 \text{ m and } u = \frac{-1.2}{4} = -0.3 \text{ m}$$

$$\therefore f = \frac{uv}{u-v} = \frac{-0.3 \times 1.2}{-0.3 - 1.2} = 0.24 \text{ m}$$

31. (c):



$$\therefore d = 2f_1 + f_2$$

32. (b): Using, $A + \delta = i + e$

Here, $A = 60^\circ$, $\mu = 1.5$,

$$i = e = \frac{3}{4} A = \frac{3}{4} \times 60^\circ = 45^\circ$$

$$\therefore 60^\circ + \delta = 45^\circ + 45^\circ \Rightarrow \delta = 90^\circ - 60^\circ = 30^\circ$$

33. (c): As refracted ray emerges normally from opposite surface, $r_2 = 0$

$$\text{As } A = r_1 + r_2 \quad \therefore r_1 = A$$

$$\text{Now, } \mu = \frac{\sin i_1}{\sin r_1} = \frac{i_1}{r_1} = \frac{i}{A} \text{ or } i = \mu A$$

34. (c): Magnification, of compound microscope

$$m = m_o \times m_e = \left(\frac{L}{f_o} \right) \times \left(\frac{D}{f_e} \right)$$

Here, $L = 20 \text{ cm}$, $D = 25 \text{ cm}$ (near point), $f_o = 1 \text{ cm}$ and $f_e = 2 \text{ cm}$

$$\therefore m = \frac{20}{1} \times \frac{25}{2} = 250$$

35. (d): As $u \gg f_o$, $v = f_o = 19 \text{ m}$.

Now $u = -3.8 \times 10^8 \text{ m}$. Therefore, magnification produced by the objective is

$$m_o = \frac{v}{u} = -\frac{19}{3.8 \times 10^8} = -0.5 \times 10^{-7}$$

\therefore Diameter of the image of moon is

$$3.5 \times 10^6 \times 0.5 \times 10^{-7} = 0.175 \text{ m} = 17.5 \text{ cm}$$

36. (d): Here, $f_o = 1.5 \text{ cm}$, $f_e = 6.25 \text{ cm}$, $u_o = -2 \text{ cm}$, $v_e = -25 \text{ cm}$

For objective,

$$\frac{1}{v_o} - \frac{1}{u_o} = \frac{1}{f_o} \quad \therefore \frac{1}{v_o} - \frac{1}{-2} = \frac{1}{1.5}$$

$$\frac{1}{v_o} = \frac{1}{1.5} - \frac{1}{2} \text{ or } v_o = 6 \text{ cm}$$

For eye piece

$$\frac{1}{v_e} - \frac{1}{u_e} = \frac{1}{f_e}$$

$$\frac{1}{-25} - \frac{1}{u_e} = \frac{1}{6.25}$$

$$-\frac{1}{u_e} = \frac{1}{6.25} + \frac{1}{25} \text{ or } u_e = -5 \text{ cm}$$

$$\begin{aligned} \text{Distance between two lenses} &= |v_o| + |u_e| \\ &= 6 \text{ cm} + 5 \text{ cm} = 11 \text{ cm} \end{aligned}$$

37. (d): In normal adjustment,
Length of telescope tube, $L = f_o + f_e$
Here, $f_o = 20 \text{ m}$ and $f_e = 2 \text{ cm} = 0.02 \text{ m}$
 $\therefore L = 20 + 0.02 = 20.02 \text{ m}$
and magnification, $m = \frac{f_o}{f_e} = \frac{20}{0.02} = 1000$
The image formed is inverted with respect to the object.

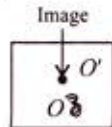
38. (b): Here, $f_o = 15 \text{ m} = 15 \times 10^2 \text{ cm}$, $f_e = 1.0 \text{ cm}$

$$\begin{aligned} \therefore \text{magnification, } m &= \frac{f_o}{f_e} = \frac{15 \times 10^2}{1} \\ m &= 1500 \end{aligned}$$

39. (d): In the later case microscope will be focussed for O' .
So, it is required to be lifted by distance OO' .
 $OO' = \text{real depth of } O - \text{apparent depth of } O$

$$= 3 - \frac{3}{1.5}$$

$$\left[\mu = \frac{\text{real depth}}{\text{apparent depth}} \right]$$



$$= 3 \left[\frac{1.5 - 1}{1.5} \right] = \frac{3 \times 0.5}{1.5} = 1 \text{ cm (upward)}$$

40. (a): Here, $d = 25 \text{ cm}$, $f_o = 8.0 \text{ mm}$, $f_e = 2.5 \text{ cm}$,
 $u_o = -9.0 \text{ mm} = -0.9 \text{ cm}$

$$\begin{aligned} \text{Now, } \frac{1}{v_e} - \frac{1}{u_e} &= \frac{1}{f_e} \quad \therefore \frac{1}{u_e} = \frac{1}{v_e} - \frac{1}{f_e} = \frac{1}{-25} - \frac{1}{2.5} \\ &= \frac{-1 - 10}{25} = \frac{-11}{25} \quad (\because v_e = -d = -25 \text{ cm}) \end{aligned}$$

$$u_e = \frac{-25}{11} = 2.27 \text{ cm}$$

$$\text{Again, } \frac{1}{v_o} - \frac{1}{u_o} = \frac{1}{f_o}$$

$$\frac{1}{v_o} = \frac{1}{f_o} + \frac{1}{u_o} = \frac{1}{0.8} + \frac{1}{-0.9} = \frac{0.9 - 0.8}{0.72} = \frac{0.1}{0.72}$$

$$v_o = \frac{0.72}{0.1} = 7.2 \text{ cm}$$

Therefore, separation between two lenses

$$= u_e + v_o = 2.27 + 7.2 = 9.47 \text{ cm}$$

$$\text{Magnifying power, } m = \frac{v_o}{u_o} \left(1 + \frac{d}{f_e} \right) = \frac{7.2}{0.9} \left(1 + \frac{25}{2.5} \right) = 88$$