Name: Nidhi Johnson Subject: Physics Reg. No.: .....

Date: .....

1. $h_o = 5cm$

(a) $f = 20cm$

$u = -30cm$

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

$\frac{1}{v} - \frac{1}{-30} = \frac{1}{20} \quad = \frac{1}{v} + \frac{1}{30} = \frac{1}{20}$

$\Rightarrow \frac{1}{v} = \frac{1}{20} - \frac{1}{30} \Rightarrow \frac{30-20}{600} = \frac{10}{600}$

$\therefore v = 60cm$

$\therefore$ the position of the image is 60cm from the lens.

(b) The image is real and inverted

(c) $h_o = 5\,cm$

$m = \frac{h_i}{h_o} = \frac{v}{u}$

$= \frac{h_i}{5} = \frac{60}{-30} \Rightarrow h_i = \frac{2}{\cancel{60}} \times 5 \over \cancel{-30} -1$

$= -10\,cm$

or size

$\therefore$ the height of the image is -10cm and it is enlarged.

2. $h_o = 4cm$

$u = -27cm$

$f = 18cm$

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

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

$= \frac{27-18}{486} = \frac{9}{486} = \frac{1}{54}$

$\therefore v = 54cm$

5_{27}
$\times 18$
216
$27\times$
486

18×17
18
9
54
$9\overline{)486}$
45
36

nature: Real and Invested image.

Size: $m = \frac{hi}{ho} = \frac{v}{u}$

$= \frac{hi}{4} = \frac{54}{-27}$

$= hi = \frac{54^2 \times 4}{-27 - 1} = -8\ cm$

$\therefore$ the size of the image is 8cm and it is enlarged.

3. $h_o = 5cm$

$u = -25cm$

$f = 10cm$

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

$\frac{1}{v} - \frac{1}{-25} = \frac{1}{10} \Rightarrow \frac{1}{v} = \frac{1}{10} - \frac{1}{25}$

$\Rightarrow \frac{25-10}{250} = \frac{15}{250} = \frac{3}{50}$

$\therefore v = \frac{50}{3} = 16.66\ cm$ away

$\therefore$ the image is 16.66 cm from the lens.

nature: the image is real and invested

Size: $m = \frac{hi}{ho} = \frac{v}{u}$

$= \frac{hi}{5} = \frac{16.66}{-25} \Rightarrow hi = \frac{16.66 \times 5}{-25 - 5}$

$= -3.33cm$

$\therefore$ the size of the image is -3.33 cm

4. (a) (i) $P = +2D$

$f = \frac{1}{P} = \frac{1}{2}\ m = 0.5\ m$

nature: It is a convex lens and it real and invested.

(ii) $P = -4D$

$f = \frac{1}{P} = \frac{1}{4}\ m = 0.25m$

nature: It is a concave lens and virtual and erect.

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(b) $u = -100cm$

$P = -4D$

$\therefore f = \frac{1}{P} = \frac{1}{-4} = -0.25m$

$= -25cm$

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

$\Rightarrow \frac{1}{v} - \frac{1}{-10} = \frac{1}{-25}$

$\Rightarrow \frac{1}{v} = \frac{1}{-25} - \frac{1}{-100} = \frac{-100-25}{-2500} = \frac{-125}{-2500} = \frac{1}{20}$

$v = 20.cm$

$\therefore$ the image distance is 20 cm

5. (i) $P = 5D$

$f = \frac{1}{P} = \frac{1}{5}m = 0.2m$

$= 20cm$

1st $\rightarrow u = 18$

$m = \frac{v}{u} = \frac{20}{18} = 1.11$

2nd $\rightarrow u = 20$

$m = \frac{v}{u} = \frac{20}{20} = 1$

3rd $\rightarrow u = 22$

$m = \frac{v}{u} = \frac{20}{22} = \frac{10}{11} = 0.9$

4th $\rightarrow u = 30$

$m = \frac{v}{u} = \frac{20}{30} = 0.88$

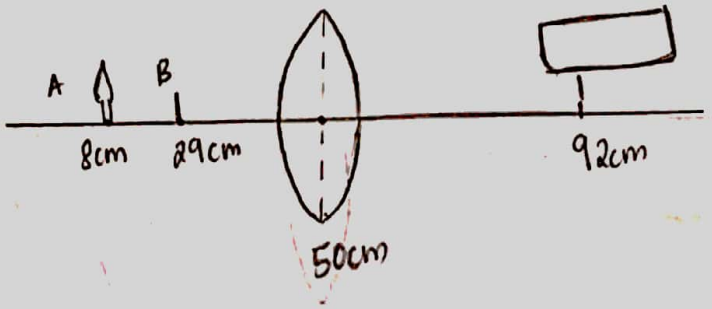
$\therefore$ An object at 18 cm, 22 cm and 30 cm, the image can be magnified.

(ii) At 22 cm and 30 cm the magnified image can be obtained on a screen. ~~it is because, the object~~

6.(i) In case 5, where, $u = 12cm$ and $v = 70cm$, the size of image will smaller than size of the object.

(ii) Yes, for the 3rd observation, the distance of the object and image from the lens is equal to 30cm. This means that the object is at $2F_1$ and hence the image will also be at $2F_2$, ∴ the image and object will be of the same size.

7.



(i) $u = 50 - 8 = -42cm$

$v = 92 - 50 = 42cm$

$\therefore u = -42cm$

$v = +42cm$

∴ object at $2F_1$

If we move it forward to 29cm,

$u = 50 - 29 = -21cm$

and $f = 21$ (as per question)

∴ now the object is at F and hence the image is at infinity

(ii) If object is further shifted forward, it will be in between F_1 and optical center and therefore the image will be on the same side of the lens. The nature of the image will be virtual and erect.