Class X, physics chapter 5 numerical

Page 120

1. f=200 (+ve)
   u= 100 (-ve)
   v=?
   we know lens formula

$$\frac{1}{f}=\frac{1}{v}-\frac{1}{u}$$
$$\frac{1}{20}=\frac{1}{v}-\frac{1}{-100}$$
$$\frac{1}{20}=\frac{1}{v}+\frac{1}{100}$$
$$\frac{1}{v}=\frac{1}{20}-\frac{1}{100}$$
$$\frac{1}{v}=\frac{5-1}{100}$$
$$\frac{1}{v}=\frac{4}{100}$$
$$v=25cm$$

2. f=50cm (+ve)
   A.T.Q.

$$I=2*O$$
$$\frac{I}{O}=2$$
$$so, m=2$$

$$(because\ \frac{I}{O}=m)$$

$$also\ m=\frac{v}{u}$$

$$so, \frac{v}{u}=2$$

$$v=2u$$

$$now\ using\ this\ relation\ in\ lens\ formula$$

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

$$\frac{1}{50}=\frac{1}{2u}-\frac{1}{u}$$

$$solving\ for\ u\ we\ get$$

$$u = -25$$

So, object should be placed at a distance of 25cm from lens in left side.

3. Considering this a convex lens

   (i) u=10 cm (-ve)

   v= 60cm (+ve)

   f=?

   using

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

$$\frac{1}{f} = \frac{1}{60} - \frac{1}{-10}$$

   Solving for f we will get

$$\frac{1}{f} = \frac{7}{60}$$

   Or

$$f = \frac{60}{7} = 8.56cm$$

   (ii) $m = \frac{v}{u}$

   $m = \frac{60}{-10}$

   m= -6

   (iii) Nature : Real and inverted image

4. u=20cm (-ve)

   v= 10cm (-ve)

   f=?

   (i) nature virtual and erect image formed

   (ii) using

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

$$\frac{1}{f} = \frac{1}{-10} - \frac{1}{-20}$$

$$\frac{1}{f} = \frac{1}{-10} + \frac{1}{20}$$

$$\frac{1}{f} = \frac{-2+1}{20}$$

$$\frac{1}{f} = -\frac{1}{20}$$

$$f = -20cm$$

5. u=30cm (-ve)
   f=30cm (-ve)
   v=?
   using

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

$$\frac{1}{-30} = \frac{1}{v} - \frac{1}{-30}$$

$$solving\ for\ v\ we\ get\ v = -15cm$$

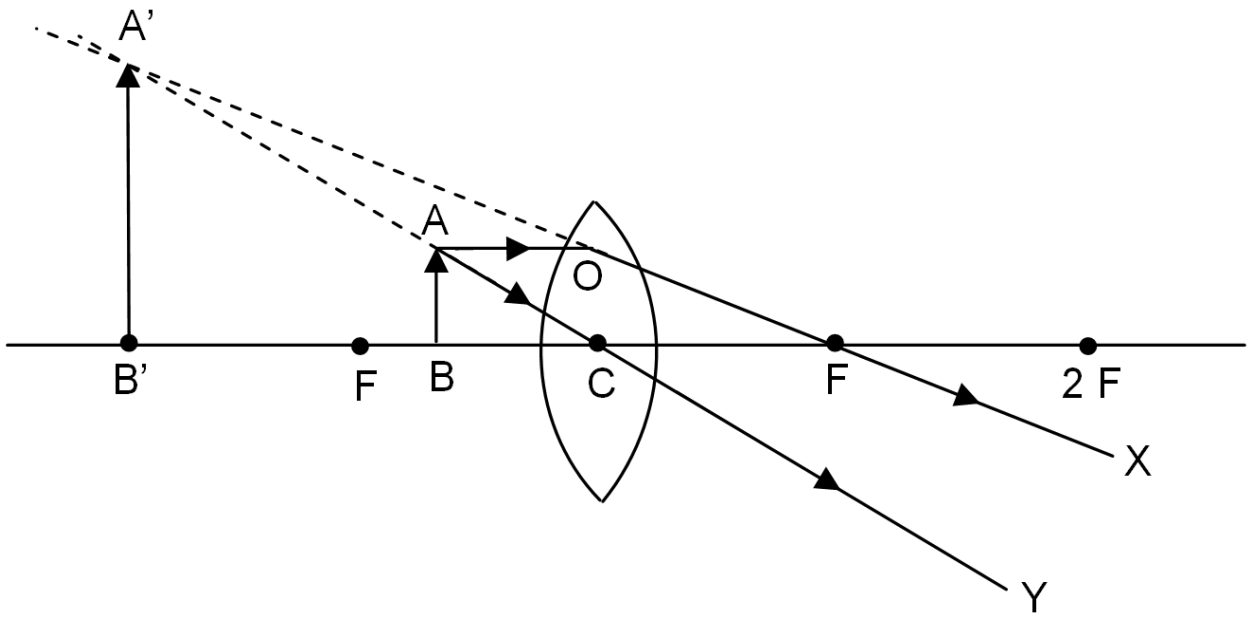
$$m = \frac{v}{u}$$

$$m = \frac{-15}{-30} = +0.5$$

Page 128 numerical

1. (i) Convex lens

   (ii).



   (iii) Power of the lens : It is the power to deviate a beam of light after refraction through lens

   (iv) Focal length f= 25cm = 0.25m

$$power = \frac{1}{focal\ length\ in\ meter}$$

$$power = \frac{1}{0.25}$$

$$power = +4D$$

2. Power of lens =-5D

   (i) Focal length = ?

$$focal\ length = \frac{1}{power}$$

$$focal\ length = \frac{1}{5}$$

$$focal\ length = 0.2m = 20cm$$

   (ii) Negative sign of power signifies that it is concave lens

3. (i) When object is placed at 2f1 real and same size image is formed (convex lens)

   (ii). Between optical center and focus

4. Focal length =8cm

   u=24cm (beyond 2f1)

   (i) Nature of image : real, inverted, diminished and is formed between f2 and 2f2.

   (ii) v=?

   f=8cm (+ve)

u=24cm (-ve)

we know

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

$$\frac{1}{8}=\frac{1}{v}-\frac{1}{-24}$$

$$\frac{1}{8}=\frac{1}{v}+\frac{1}{24}$$

$$\frac{1}{v}=\frac{1}{8}-\frac{1}{24}$$

$$v=12\ cm$$

(iii)$m=\frac{v}{u}$

$$m=\frac{12}{-24}$$

$$m=-0.5$$