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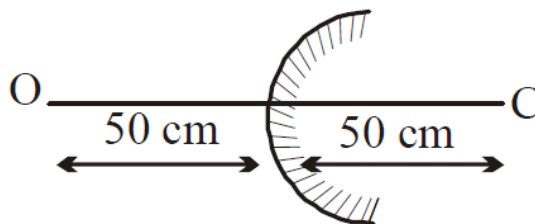
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Written Solution on YouTube:-

<https://physicsaholics.com/note/notesDetailis/58>

- Q 1. The centre of sphere of which the reflecting surface of a spherical mirror is a part is called?
- (a) Pole (b) Aperture  
(c) Radius of curvature (d) Centre of curvature
- Q 2. An object is placed 60 cm from a spherical convex mirror. If the mirror forms a virtual image 20 cm from the mirror, what's the magnitude of the mirror's radius of curvature?
- (a) 120 cm (b) 60 cm  
(c) 30 cm (d) 15 cm
- Q 3. The position of the image of 1 cm tall object which is placed 8 cm in front of a concave mirror of radius of curvature 24 cm is:
- (a) 24 cm (b) 25 cm (c) 26 cm (d) 27 cm
- Q 4. There is a convex mirror of radius 50 cm. The image of a point at a distance 50 cm from the pole of mirror on its axis will be formed at :



- (a) infinity  
(b) pole  
(c) focus  
(d) 16.67 cm behind the mirror
- Q 5. An object of length 1 cm is placed at a distance of 15 cm from a concave mirror of focal length 10 cm. The nature and size of the image are
- (a) real, inverted, 1.0 cm (b) real, inverted, 2.0 cm  
(c) virtual, erect, 0.5 cm (d) virtual, erect, 1.0 cm



- Q 6. The relation between the linear magnification  $m$ , the object distance  $u$  and the focal length  $f$  for a spherical mirror is
- (a)  $m = \frac{f-u}{f}$  (b)  $m = \frac{f}{f-u}$   
(c)  $m = \frac{f+u}{f}$  (d)  $m = \frac{f}{f+u}$
- Q 7. The focal length of a concave mirror is 30cm. Find the distance of the object from the pole in front of the mirror, so that the image is real and three times the size of the object?
- (a) 40cm (b) 30cm  
(c) 50cm (d) None of these
- Q 8. A Convex mirror of focal length  $f$  forms an image which is  $\frac{1}{n}$  times the object. The distance of the object from the mirror is:
- (a)  $(n-1)f$  (b)  $\frac{(n-1)}{n}f$   
(c)  $\frac{(n+1)}{n}f$  (d)  $(n+1)f$
- Q 9. The focal length of concave mirror is 50cm. Where an object be placed in front of the mirror so that its image is two times and inverted?
- (a) 70cm (b) 50cm  
(c) 75cm (d) 60cm
- Q 10. An object (0.40m height) is placed in front of a concave mirror of focal length 0.60 m. A sharp image forms on a screen placed 0.90 m in front of the mirror. What is the height of the image formed by the mirror?
- (a) 0.020m (b) -2m  
(c) -0.20m (d) 20m
- Q 11. A candle is placed in front of a convex mirror of focal length 8.0cm. The mirror forms a virtual image 3.0cm behind it. Find magnification of the candle's image produced by the mirror?
- (a) 0.63 (b) 1.63  
(c) 1 (d) 2
- Q 12. If a man's face is 30 cm in front of a concave shaving mirror creating an upright image 1.5 times as large as the object, what is the magnitude of mirror's focal length?
- (a) 12 cm (b) 18cm  
(c) 90 cm (d) 20 cm
- Q 13. A concave mirror having a radius of curvature 40 cm is placed in front of an illuminated point source at a distance of 30 cm from it. Find the location of the image?
- (a) 60 cm from the mirror in front of the mirror  
(b) 60 cm from the mirror behind the mirror  
(c) 30 cm from the mirror on the side of the object  
(d) 30 cm from the mirror behind the mirror



## Answer Key

<b>Q.1 d</b>	<b>Q.2 b</b>	<b>Q.3 a</b>	<b>Q.4 d</b>	<b>Q.5 b</b>
<b>Q.6 b</b>	<b>Q.7 a</b>	<b>Q.8 a</b>	<b>Q.9 c</b>	<b>Q.10 c</b>
<b>Q.11 a</b>	<b>Q.12 c</b>	<b>Q.13 a</b>		

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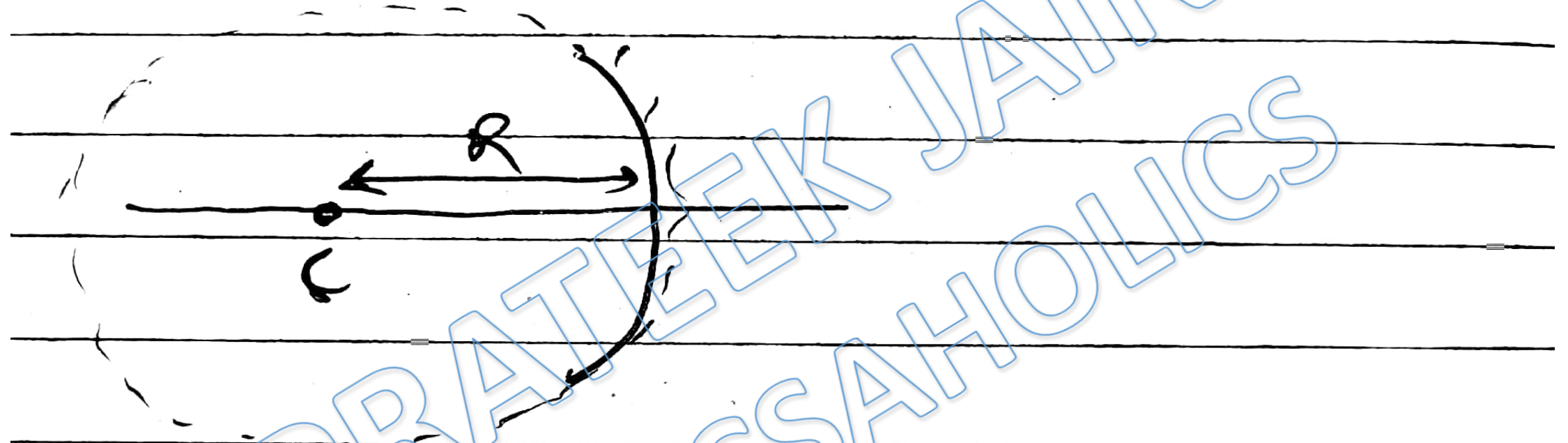
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# Written Solution

**DPP-3 Spherical Mirrors**

**By Physicsaholics Team**

Solution: 1



$c =$  Centre of curvature.

Ans. d



Solution: 2

$$u = -60 \text{ cm}$$

$$v = +20 \text{ cm}$$

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

$$\frac{1}{20} + \frac{1}{-60} = \frac{1}{f} \Rightarrow \frac{1}{f} = \frac{60 - 20}{20 \times 60}$$

$$\frac{1}{f} = \frac{40}{1200} \Rightarrow \boxed{f = +30 \text{ cm}}$$

$$\boxed{R = 2f = 60 \text{ cm}}$$

Ans. b

Solution: 3

Concave Mirror:

$$|R| = 24 \text{ cm.}$$

$$f = -\left(\frac{R}{2}\right) = -\left(\frac{24}{2}\right)$$

$$f = -12 \text{ cm}$$

$$u = -8 \text{ cm.}$$

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

$$\frac{1}{v} + \frac{1}{-8} = \frac{1}{-12}$$

$$\frac{1}{v} = \frac{1}{8} - \frac{1}{12} = \frac{3}{24} - \frac{2}{24}$$

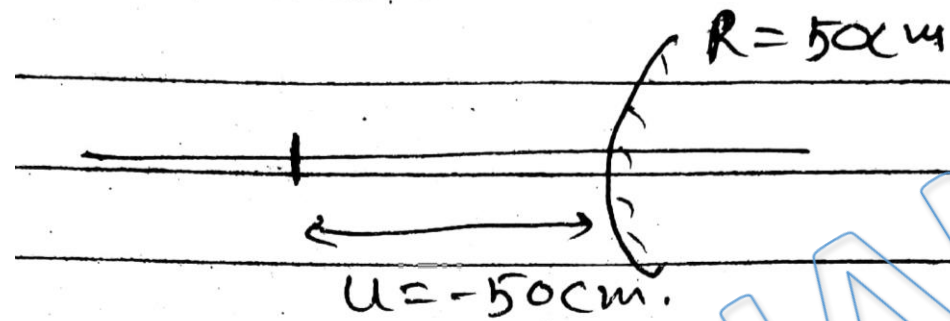
$$\frac{1}{v} = \frac{1}{24}$$

$$v = 24 \text{ cm}$$

Ans. a



Solution: 4



$$f = \frac{R}{2} = \frac{50}{2} = 25 \text{ cm.}$$

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

$$\frac{1}{v} + \frac{1}{-50} = \frac{1}{25}$$

$$\frac{1}{v} = \frac{1}{25} + \frac{1}{50}$$

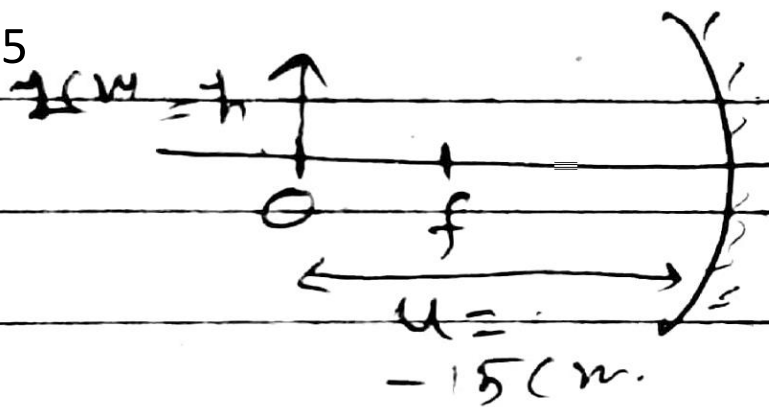
$$\frac{1}{v} = \frac{3}{50}$$

$$v = \frac{50}{3} \text{ cm.}$$

$$v = 16.67 \text{ cm}$$

Ans. d

Solution: 5



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

$$\text{Now, } m = \frac{-v}{u}$$

$$m = -\left(\frac{-30}{-15}\right)$$

$$m = -2$$

(Inverted and)

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

$$\frac{1}{v} + \frac{1}{-15} = \frac{1}{-10}$$

$$\frac{1}{v} = \frac{1}{-10} + \frac{1}{15}$$

$$\frac{1}{v} = \frac{-3}{30} + \frac{2}{30}$$

$$v = -30\text{ cm} \quad (\text{R.I})$$

( $\because v = -ve$ )

$$\left| \frac{h_i}{h_o} \right| = 2 \Rightarrow h_i = 2\text{ cm}$$

Ans. b

Solution: 6

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

$$4 \quad \frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

[Multiply eq<sup>n</sup> by 'u']

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

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

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

$$\Rightarrow \boxed{m = -\frac{v}{u} = \frac{f}{f-u}}$$

Ans. b

Solution: 7

Concave mirror!

$$f = -30 \text{ cm.}$$

$$|m| = 3$$

for real image.

$$m = -3$$

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

$$|v = 3u|$$

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

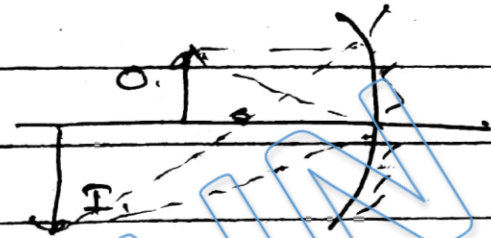
$$\frac{1}{3u} + \frac{1}{u} = \frac{1}{-30}$$

$$\frac{4}{3u} = \frac{-1}{30}$$

$$\frac{3u}{4} = -30$$

$$u = -90 \text{ cm}$$

$$|u| = 90 \text{ cm}$$



Ans. a



Solution: 8

$$\text{focal length} = f$$

$$m = \frac{1}{n}$$

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

$$v = -\frac{u}{n}$$

→ Now

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

$$\left(\frac{-n}{u}\right) + \frac{1}{u} = \frac{1}{f}$$

$$\frac{-n}{u} + \frac{1}{u} = \frac{1}{f}$$

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

$$u = (1-n)f$$

$$\text{or } u = -(n-1)f$$

$$\begin{aligned} \text{distance} &= |u| = |(n-1)f| \\ &= (n-1)f \end{aligned}$$

Ans. a

Solution: 9

Concave mirror:  $f = -50 \text{ cm}$

$m = -2$  ( $\because$  inverted image)

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$
$$\left[ \begin{array}{l} m = -\frac{v}{u} = -2 \\ v = 2u \end{array} \right]$$

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

$$-\frac{3}{2u} = \frac{1}{-50} \Rightarrow$$

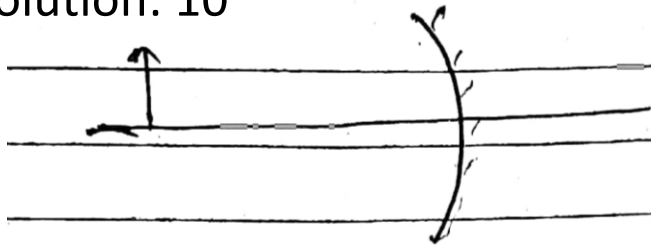
$$u = -75 \text{ cm}$$

$$|u| = 75 \text{ cm}$$

Ans. c



Solution: 10



$$f = -0.60 \text{ m,}$$

$$h_o = 0.40 \text{ m,}$$

$$v = -0.90 \text{ m,}$$

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

$$\frac{1}{-0.9} + \frac{1}{u} = \frac{1}{-0.6}$$

$$\frac{1}{u} = \frac{1}{0.9} - \frac{1}{0.6}$$

$$\frac{1}{u} = \frac{0.6 - 0.9}{0.9 \times 0.6}$$

$$u = \frac{0.9 \times 0.6^2}{-0.3}$$

$$\boxed{u = -1.8 \text{ m}}$$

$$\boxed{u = -1.8 \text{ m}}$$

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

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

$$= -\left(\frac{-0.9}{-1.8}\right) (0.40)$$

$$= -\left(\frac{1}{2}\right) (0.40)$$

$$\boxed{h_i = -0.20 \text{ m,}}$$

Ans. c

Solution: 11

Concave Mirror:

$$f = +8 \text{ cm,}$$

for virtual image

$$v = +3 \text{ cm,}$$

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

$$\frac{1}{3} + \frac{1}{u} = \frac{1}{8}$$

$$\frac{1}{u} = \frac{1}{8} - \frac{1}{3}$$

$$\frac{1}{u} = \frac{3-8}{3 \times 8} = \frac{-5}{3 \times 8}$$

$$u = -\frac{24}{5}$$

$$m = -\frac{v}{u} = + \left( \frac{3}{+24/5} \right)$$

$$m = + \left( \frac{5 \times 3}{24} \right)$$

$$m = 0.625$$

$$m \approx 0.63$$

Ans. a

Solution: 12

Concave Mirror:

$$u = -30 \text{ cm}$$

$$m = +1.5$$

$$-\frac{v}{u} = +1.5$$

$$-v = 1.5u$$

$$-v = 1.5(-30)$$

$$\boxed{v = +45 \text{ cm}}$$

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

$$\frac{1}{f} = \frac{1}{45} + \frac{1}{-30} = \frac{1}{45} - \frac{1}{30}$$

$$\frac{1}{f} = \frac{30 - 45}{30 \times 45} = \frac{-15}{30 \times 45}$$

$$f = \frac{-30 \times 45}{-15}$$

$$f = -90 \text{ cm}$$

$$\boxed{|f| = 90 \text{ cm}}$$

Ans. c

Solution: 13

Concave MIRROR:

$$|R| = 40 \text{ cm.}$$

$$\therefore f = -20 \text{ cm.}$$

$$u = -30 \text{ cm.}$$

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

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

$$\frac{1}{v} = \frac{1}{30} - \frac{1}{20} = \frac{2}{60} - \frac{3}{60}$$

$$\frac{1}{v} = -\frac{1}{60}$$

$$v = -60 \text{ cm}$$

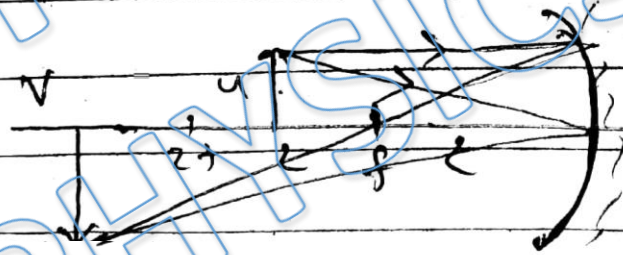


Image is in front of the mirror

je

Ans. a

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