



PHYSICS

BOOKS - CP SINGH PHYSICS (HINGLISH)

REFLECTION OF LIGHT



1. A concave mirror of focal length f produces

a real image n times the size of the object.

What is the distance of the object from the

mirror?



2. A concave mirror has a focal length of 20 cm. Find the position or positions of an object for which the image-size is double of the object-size.

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3. A 2.0 cm high object is placed on the principal axis of a concave mirror at a distance of 12 cm from the pole. Ilf the image is inverted, real and 5.0 cm high, find the location of the image the focal length of the mirror.

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4. A U-shaped wire is placed before a concave mirror having radius of curvature 20cm as

shown in figure,. Find the total length of the

image.





5. A concave mirror forms a real image three times larger than the object on a screen. The object and screen are moved until the image becomes twice the size of the object. If the shift of the object is 6cm, find the shift of screen.

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6. A rod of length 10 cm lies along the principal axis of a concave mirror of focal length 10 cm in such a way that the end closer to the pole is 20 cm away from it. Find the length of the image.

7. A thin rod of length f/3 is placed along the optical axis of a concave mirror of focal length f such that its image which is real and elongated just touches the rod. Calculate the magnification.



8. A plane mirrorr is placed 22.5cm in front of

a concave mirrorr of focal length 10cm. Find

where an object can be placed between the

two mirrorrs, so that the first image in both

the mirrorrs coincides.



9. Show that for virtual object, a convex mirror

gives (a) real and erect image of u < f and (b)

virtual and inverted image for u > f.

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10. A beam of light converges towards a point O , behind a convex mirror of focal length 20 cm. Find the nature and position of image if the point O is-

(1) 10cm behind the mirror, (2) 30cm behind

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11. Find the diameter of the image of the moon formed by a spherical concave mirror of focal

length 7.6 m. The diameter of the moon is 3450 km and the distance of the earth and the moon is $3.8 imes 10^5 km$.

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12. A concave mirror of focal length 10cm and a convex mirror of focal length 15cm are placed facing each other 40cm apart. A point object is placed between the mirrors, on their common axis and 15cm from the concave mirror. Find the position and nature of the image

produced by successive reflections, first at the

concave mirror and then at the convex mirror.



13. A converging mirror M_1 a point source S and a diverging mirror M_2 are arranged as shown in figure. The source is placed at a distance of 30 cm from M_1 . The focal length of each of the mirrors is 20 cm. Consider only the images formed by a maximum of two reflections. It is found that one image is formed on the source itself. (a) Find the distance between the two mirrors. (b) Find the location of the image formed by the single reflection from M_2

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14. Two concave mirrorsof equal radi of curvature R are fixed on a stand facing opposite directions. The whole system has a mass m nd is kept onn a frictionlesss horiztonal table figure



Two blocks A and B, each of mass m, are placed on the two side of the stnd. At t=0, teh separation between A and the mirrors is 2R and also the separation between B and the mirrors is 2R. The block B moves towards the mirror at a speed v. All collisions which take place are erastic. Taking the original position of the mirrors stand system to be x=0 and X axis along AB, find the position of the image of A and B at t=

$$a. \frac{R}{v}$$
, b. $\frac{3R}{v}$ c. $\frac{5R}{v}$

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15. Consider the situation shown in figure. The elevator is going up with an acceleration of 2.00 ms⁻² and the focal length of the mirror is 12.0 cm. All the surfaces are smooth and the pulley is light. The mass-pulley system is released from rest (with respect to the elevator) at t=0 when the distance of B from the mirror is 42.0 cm. Find the distance between the image of the block B and the

mirror at t=0.200 s. Take $g=10ms^{-2}$



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16. A gun of mass M fires a bullet of mass m with a horizontal speed V. The gun is fitted with a concave mirror of focal length f facing towards the receding bullet. Find the speed of separation of the bullet and the image just after the gun was fired.



17. A mass m = 50 g is dropped on a vertical spring of spring constant 500 N nfl from a height h= 10 cm as shown in figure (18-E14). The mass sticks to the spring and executes simple harmonic oscillations after that. A concave mirror of focal length 12 cm facing the mass is fixed with its principasl axis coinciding with the lilne of motion of the mss, its pole being at a distance of 30 cm from the free end of the spring. Find the length in which the

image of the mass oscillates







1. Choose the correct option:

A. Geometrical optics treats propagation of

light in terms of rays and is valid only if

wavelength of light is mush lesser than

the size of obstacles

B. Wave optics concerns with explanation

of the observed phenomena such as

interference, diffraction and polarisation

C. Quantum optics treats light as a particle

called photon is dealt with photoelectric

effect LASER etc.

D. All option are correct.

Answer: D



2. Ray optics is valid when characteristic dimensions are

A. Of the same order as the wavelength of

light

B. much smaller than the wavelength of

light

C. of the orger of 1 mm

D. much larger the wavelength of light

Answer: D



3. The light reflected by a plane mirrorr may form a real image

A. if the rays incident on the mirror are converging

B. if the rays incident on the mirror are diverging

C. if the object is placed very close to the

mirror

D. under no circumstances

Answer: A

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4. A point source of light is placed in front of a

plane mirror.

A. All the reflected rays meet at a point

when produced backward

B. Only the reflected rays close to the

normal meet at a point when produced

backward

C. Only the reflected rays marking a small

angle with the mirror, meet at a point

when produced backward

D. Light of different colours make different

images.

Answer: A



5. Figure shows two rays A and B being reflected by a mirror and going as A' and B'. The mirror



A. plane

B. convex

C. concave

D. none

Answer: A



6. A thick plane mirror shows a number of images of the filament of an electric bulb. Of these, the brightest image is the

A. 1^{st}

 $\mathsf{B.}\,2^{nd}$

 $\mathsf{C.}~3^{rd}$

 $\mathsf{D.}\,4^{th}$

Answer: B



7. A man is 180 cm tall and his eyes are 10 cm below the top of his head. In order to see his entire height right from tow to head, he uses

a plane mirror kept at a distance of 1 m from him. The minimum height of the plane mirror required is

A. 180 cm

B. 90 cm

C. 85 cm

D. 170 cm

Answer: B

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8. A boy of height 1.5m with his eye level at 1.4m stands before a plane mirror of length 0.75 m fixed on the wall. The height of the lower edge of the mirror above the floor is 0.8 m. Then ,

- A. the boy will see his full image
- B. the boy cannot see his hair
- C. the boy cannot see his feet
- D. the bay can see neither his hair nor his

feet

Answer: C



9. A man is standing at distance x from a plane mirror in front of him. He wants to see the entire wall in mirror which is at distance. y behind the man. Find the minimum size of the mirror required.

A.
$$\frac{2H}{3}$$

B. $\frac{H}{2}$

C.
$$\frac{H}{3}$$

D. $\frac{H}{4}$

Answer: C



10. When a plane mirror is placed horizontally on level ground at a distance of 60 m from the foot of a tower, the top of the tower and its image in the mirror subtend and angle of 90° at the eye. The height of the tower is A. 30 m

B. 60 m

C. 90 m

D. 120 m

Answer: B

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11. A man 180 cm tall stands 4.5 m in front of a larger vertical plane mirror. Then the angle

subtended at the eye by his image In the plane

mirror is

A. $0.2^{\,\circ}$

B. 0.4°

 $\mathsf{C.}\,0.2\,\mathsf{radian}$

 $\mathsf{D}.\,0.4\,\mathsf{radian}$

Answer: A



12. A plane mirror reflects a beam of light to form a real image, The incident beam should be

A. parallel

B. convergent

C. divergent

D. none of the above

Answer: B

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13. How many images will be formed if two mirrors are fitted on adjacent walls and one mirror on ceiling?

A. 5

B. 7

C. 11

D. 2

Answer: B



14. The number of images formed by two plane mirrors inclined at 60° of an object placed symmetrically between mirror is

A. 6

B. 7

C. 5

D. infinite

Answer: C



15. Two plane mirrors are inclined to each other at an angle θ . A ray of light is reflected at one

mirror and then at the other. Find the total deviation of the ray.

- A. 2θ
- $\mathsf{B.}\,240-\theta$
- $\mathsf{C.}\,360-2\theta$
- D. 180θ

Answer: C



16. A ray of light is incident on a plane mirror at an angle of incidence of 30° . The deviation produced by the mirror is

A. $30^{\,\circ}$

B. 60°

C. 90°

D. 120°

Answer: D



17. A ray reflected successively from two plane mirrors incline at a certain angle undergoes a deviation of 240° . Then the number of images observable is

A. 3

B. 5

C. 7

D. 9
Answer: B



18. Two plane mirrors are placed perpendicular to each other. A ray strikes one mirror and after reflection falls on the second mirror. The ray after reflection from the second mirror will be

A. perpendicular to the original ray

B. anti parallel to the original ray

C. at 45° to the original ray

D. can be at any angle to the original ray

Answer: B



19. Two plane mirrors are inclined at 70° . A ray incident on one mirror at incidence angle θ after reflection falls on the second mirror and is reflected from there parallel to the first mirror, The value of θ is

A. 50°

B. 45°

C. 30°

D. 55°

Answer: A



20. A ray of light makes an angle of 10° with the horizontal and strikes a plane mirror which is inclined at an angle θ to the horizontal. The angle θ for which the reflected

ray becomes vertical, is

A. 40

B. 50°

C. 80°

D. $100\,^\circ$

Answer: A



21. A plane mirrorr makes an angle of 30° with horizontal. If a vertical ray strikes mirrorr, find the angle between mirrorr and reflected ray

A. 30°

B. 60°

C. 90°

D. $45^{\,\circ}$

Answer: B





Figure shows two plane mirrors and an object O placed between them what will be distance of the first three imgages from the mirror M_2 ?

A. 2cm,8cm,14cm

- B. 2cm,12cm,18cm
- C. 2cm,18cm,22cm

D. 2cm,24cm,38cm

Answer: C

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23. A point object is placed midway between two plane mirrors a distance apart. The plane mirrors form an infinite number of images due to multiple reflections. The distance between n^{th} order images formed in the two mirrors is B. 2na

 $\mathsf{C.}\,0.5na$

D. n^2a

Answer: B

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24. An observer moves towards a plane mirror with a speed of $2\frac{m}{\text{sec}}$. The speed of the image with respect to the observer is



Answer: C



25. A room (cubical) is made of mirros. An insect is moving along the diagonal on the floor such that the velocity of image of insect

on two adjacent wall mirrors is $10 \frac{cm}{sec}$. The

velocity of image of insect in ceiling mirror is

A.
$$10 \frac{cm}{\text{sec}}$$

B. $20 \frac{cm}{\text{sec}}$
C. $\frac{10}{\sqrt{2}} \frac{cm}{\text{sec}}$
D. $10\sqrt{2} \frac{cm}{\text{sec}}$

Answer: D





If an object moves towards a plane mirror with a speed v at an angle θ to the perpendicular to the plane of the mirror, find the relative velocity between the object and the image.

A. v

 $\mathsf{C.}\,2v\cos\theta$

D. $2v\sin heta$

Answer: C



27. A small plane mirror placed at the centre of a spherical screen of radius R. A beam of light is falling on the mirror, If the mirror makes nrevolution per second, the speed of light on the screen after reflection from the mirror will

be

A. $4\pi nR$

B. $2\pi nR$

C.
$$rac{nR}{2\pi}$$

D. $rac{nR}{4\pi}$

Answer: A



28. A ray of light is incident on the plane mirror at rest the mirror starts turning at a uniform acceleration of $2\pi \frac{rad}{\sec^2}$. The reflected ray, at end of $\frac{1}{4}$ sec must have turned through

A. 90°

B. 45°

C. 22.5°

D. 11.25°

Answer: C



29. A point source of light B is placed at a distance L in front of the centre of a mirror of width *d* hung vertically on a wall. A man walks in front of the mirror along a line parallel to the mirror at a distance 2L from it as shown in fig. The greatest distance over which he can see the image of the light source in the mirror



A. $\frac{d}{2}$

 $\mathsf{B.}\,d$

 $\mathsf{C.}\,2d$

D. 3d

Answer: D



30. Two plane mirrors A and B are aligned parallel to each other, as shown in the figure. A light ray is incident at an angle 30degree at a point just inside one end of A. The plane of incidence coincides with the plane of the figure. The maximum number of times the ray undergoes reflections (including the first one)

before it emerges out is



A. 28

- B. 30
- C. 32
- D. 34

Answer: B





- **31.** All the following statements are correct except (for real objects)
 - A. The magnification produced by a convex

mirror is always less than one

B. A virtual erect, same sized image can be

obtained using a plane mirror

C. A virtual erect, magnigied image can be

formed using a concave mirror

D. A real inverted, same-sized image can be

formed using a convex mirror

Answer: D

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32. Mark the correct Option:

A. If the incident rays are converging we

have a real object

B. If the final rays are converging, we have a

real image

C. The image of a virtual object is called a

virtual image

D. if the image is virtual the corresponding

object is called a virtual object

Answer: B

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33. In image formatiion from spherical mirrors, only paraxial rays are considered because they

A. are easy to handle geometrically

B. contain most of the intensity of the

incident light

C. form nearly a point image of a point

source

D. show minimum dispersion effect





34. Which of the following (referred to a sphericla mirror) do (does) not depend on whether the rays are paraxial or not?

A. (i),(ii)

B. (i),(iii),(iv)

C. (iii),(iv)

D. (i),(ii),(iii)

Answer: B

35. Check the wrong statement (s), if object is real

(i) A concave mirror can give a virtual image
(ii) A concave mirror can give a diminished
virtual image
(iii) A convex mirror can give a real image
(iv) A convex mirror can give a diminished
virtual image

A. (i),(iii)

B. (iii),(iv)

C. (iii),(iv)

D. (i),(iv)

Answer: B

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36. A convex mirror is used to form an image

of a real object. The image

(i) always lies between the pole and the focus

(ii) is dimished in size

(iii) is erect

(iv) is real

A. (i),(ii)

B. (ii),(iii)

C. (iii),(iv)

D. (i),(ii),(iii)

Answer: D



37. A concave mirror of focal length f in vacuum is placed in a medium of refractive index 2. its focal length in the medium is

A.
$$\frac{f}{2}$$

B. *f*

- $\mathsf{C.}\,2f$
- $\mathsf{D.}\,4f$

Answer: B



38. A concave mirror of focal length f produces a real image n times the size of the object. The distance of the object from the mirror is

A.
$$(n-1)f$$

B.
$$(n+1)f$$

C. $\displaystyle \frac{n+1}{n}f$
D. $\displaystyle \frac{n-1}{n}f$

 \boldsymbol{n}

Answer: C



39. An object 1cm tall is placed 4cm in front of a mirrorr. In order to produce an upright image of 3cm height one needs a

A. convex mirror. R=12cm

B. concave mirror R=12cm

C. convex mirror, R=4cm

D. plane mirror of height 12cm

Answer: B



40. A spherical mirror forms an erect image three times the size of the object, If the distance between the object and the image is 80 cm. The nature and the focal length of the mirror are

A. concave, 15 cm

B. convex, 30 cm

C. concave, 30 cm

D. convex, 15 cm

Answer: C



41. A concave mirror forms the image of an object on a screen. If the lower half of the mirror is covered with an opaque card, the effect would be

A. to make the image less bright

B. to make the lower half of the image

C. to make the upper half of the image

disappear.

D. to make the image blurred

Answer: A

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42. An object is placed at 20 cm from a convex mirror of focal length 20 cm. The distance of the image from the pole of the mirror is

A. infinity

B. 10 cm

C. 15 cm

D. 40 cm

Answer: B



43. An obejct is placed at a distance 2f from

the pole of a convex mirror of focal length f.

The linear magnification is

A.
$$\frac{1}{3}$$

B. $\frac{2}{3}$
C. $\frac{3}{4}$
D. 1

Answer: C



44. An object is placed in from of a convex mirror of focal length 50 cm, if the image is

one fourth the size of the object, the distance

of the image from the mirror is

A. 25 cm

B. 37.5 cm

C. 50 cm

D. 75 cm

Answer: B



45. A concave mirror has focal length 15 cm. Where should an object be placed in front of the mirror so that the image formed is three times the size of the object?

(i) 7.5 cm

(ii) 10 cm

(iii) 17.5 cm

(iv) 20 cm

A. (i),(ii)

B. (ii),(iii)

C. (ii),(iv)
D. (i),(iii)

Answer: C

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46. The image of an object placed on the principal axis of a concave mirror of focal length 12 cm is formed at a point which is 10cm more distance form the mirror than the object. The magnification of the image is

B. 2

C. 2.5

D. 3

Answer: A

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47. In a concave mirror, an object is placed at a distance d_1 from the focus and the real image is formed aat a distance d_2 from the focus. Then the focal length of the mirror is :

A. xy

B. \sqrt{xy}

$$\mathsf{C}. x + y$$

D.
$$\sqrt{\frac{x}{y}}$$

Answer: B

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48. A square wire of side 3.0cm is placed 25cmaway from a concave mirror of focal length 10cm. What is the area enclosed by the image of the wire ? The centre of the wire is on the axis of the mirror, with its two sides normal to the axis.

A. $7.5 cm^2$

 $\mathsf{B.}\,6.0cm^2$

 $C. 4.0 cm^2$

D. $3.0cm^2$

Answer: C

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49. For a concave mirror the magnificant of a real image was found to be twice as greater when the object was 15 cm from the mirror as it was when the object was 20 cm from the mirror. The focal length mirror is

A. 5.0 cm

B. 7.5 cm

C. 10 cm

D. 12.5 cm

Answer: C



50. A concave mirror forms a real image three times larger than the object on a screen. The object and screen are moved until the image becomes twice the size of the object. If the shift of the object is 6cm, find the shift of screen.

A. 12 cm

B. 24 cm

D. 48 cm

Answer: C

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51. The sun subtends an angle half a degree at the pole of a concave mirror which has a radius of curvature of 15 m. Then the size (diameter) of the image of sun formed by the convace mirror is

A. 7.5 cm

B. 6.55 cm

C. 3.5 cm

D. 1.31 cm

Answer: B

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52. A thin rod of length $\left(\frac{f}{3}\right)$ is lying along the principal axis of a concave mirror of focal length f.Image is real , magnified and inverted and one of the end or

rod coincides with its image itself. Find length

of the image.

A.
$$\frac{f}{2}$$

B. $\frac{f}{4}$
C. 2f

$$\mathsf{D.}\,f$$

Answer: A



53. A short linear object of length b lies along the axis of a concave mirror of focal length f at a distance u from the pole of the mirror. The size of the image is approximately equal to

A.
$$b\left(\frac{u-f}{f}\right)^{\frac{1}{2}}$$

B. $b\left(\frac{f}{u-f}\right)$
C. $b\left(\frac{u-f}{f}\right)$
D. $b\left(\frac{f}{u-f}\right)^{2}$

Answer: D



54. A piece of wire bent into an L shape with upright and horizontal portion of equal lengths 10 cm each is placed with the horizontal portion along the axis of the concave mirror towards pole of mirror whose radius of curvature is 10 cm. If the bend is 20 cm from the pole of the mirror, then the ratio of the lengths of the images of the upright and horizontal portion of the wire is

B. 3:1

C. 1: 3

D. 2:1

Answer: B

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55. A cube of side 2m is placed in front of a concave mirrorr of focal length 1m with its face A at a distance of 3m and face B at a distance of 5m form the mirrorr, The distance

between the images of face A and B and

height of images of A and B are respectively.



A. 1m, 05m, 0.25

B. 0.5m, 1m, 025m

C. 0.5m, 0.25m, 1m

D. 0.25m, 1m, 0.5m





56. The firld of view is maximum for

A. plane mirror

- B. concave mirror
- C. convex mirror
- D. cylindrical mirror

Answer: C



57. A convex mirror of length 1m and a plane mirror are facing each other, if the distance between them is 1m, their images are separated by

A. 2.5 m

B. 1.5 m

C. 3.5 m

D. 4.5 m

Answer: A



58. An object is placed in front of a convex mirror at a distance of 50cm. A plane mirror is introduced covering the lower half of the convex mirror. If the distance between the object and the plane mirror is 30cm, it is found that there is no parallax between the images formed by the two mirrors. What is the radius of curvature of the convex mirror?

A. 12.5 cm

B. 25 cm

$$\mathsf{C}.\,\frac{50}{3}m$$

D. 18cm

Answer: B



59. A convex mirror and a concave mirror of radius 10cm each are placed 15cm apart facing each other. An object is placed midway

between them. If the reflection first takes place in the concave mirror and then in convex mirror, the position of the final image is

A. at the pole of the concave mirror

B. at the pole of the convex mirror

C. at the object itself

D. 5 cm behind the convex mirror

Answer: B

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60. A car is fitted with a convex side-view mirror of focal length 20 cm. A second car 2.8m behind the first car is overtaking the first car at a relative speed of 15 $\frac{m}{s}$. The speed of the image of the second car as seen in the mrror of the first one is:

A.
$$\frac{1}{10} \frac{m}{s}$$

B.
$$\frac{1}{15} \frac{m}{s}$$

C.
$$10 \frac{m}{s}$$

D.
$$15 \frac{m}{s}$$

Answer: B



61. An object is moving towards a concave mirror of focal length 24 cm. When it is at a distance of 60 cm from the mirror, its speed is 9cm/s. The speed of its image at that instant , is

A.
$$4\frac{cm}{s}$$
 towards the mirror
B. $9\frac{cm}{s}$ towards the mirror

C.
$$4\frac{cm}{s}$$
 away from the mirror

D. $9\frac{cm}{s}$ away from the mirror

Answer: C

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62. For a concave mirrorr, if real image is formed the graph between $\frac{1}{u}$ and $\frac{1}{v}$ is of the

form









Answer: A

D.



63. Which of the following graphs is the magnification of a real image against the distance from the focus of a concave mirrorr ?



Answer: D



64. The graph shows variation of v with change in u for a mirrorr. Points plotted above the point P on the curve are for values of v



A. smaller that f

B. smaller that 2f

C. larger than 2f

D. larger than f

Answer: C

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65. As the position of an object (u) reflected from a concave mirrorr is varies, the position of the image (v) also varies. By letting the u changes from 0 to $+\infty$ the graph between v

versus u will be





Answer: A



66. The graph between u and v for a convex

mirrorr is



Answer: A



67. A light ray travelling parallel to the principal axis of a concave mirror strikes the mirror at angle of incidence θ . If radius of curvature is R, then after reflection, the ray meets the principal axis at a distance d from the centre of curvature then d is

A.
$$\frac{R}{2}$$

B. $\frac{R\cos\theta}{2}$
C. $\frac{R}{2\cos\theta}$
D. $\frac{R}{2}(1 + \cos\theta)$



