Multiple Choice Questions (MCQs)

1. A ray of light is incident on a concave mirror. If it is parallel to the principal axis, the reflected ray will
(a) pass through the focus
(b) pass through the centre of curvature
(c) pass through the pole
(d) retrace its path.

2. Choose the wrong statement.
(a) A concave mirror can form a magnified real image.
(b) A concave mirror can form a magnified virtual image.
(c) A convex mirror can form a diminished virtual image.
(d) A convex mirror can form a diminished real image.

3. A person standing in front of a mirror finds his image thinner but with normal height. This implies that the mirror is
(a) convex and cylindrical with axis vertical
(b) convex and cylindrical with axis horizontal
(c) convex and spherical
(d) concave and spherical.

4. At what distance from a concave mirror of focal length 10 cm must an object be placed in order that an image double its size may be obtained?
(a) Either 5 cm or 15 cm
(b) 10 cm
(c) 5 cm (d) 15 cm

5. $f = \frac{R}{2}$ is valid
(a) for convex mirrors but not for concave mirrors
(b) for concave mirrors but not for convex mirrors
(c) for both convex and concave mirrors
(d) neither for convex mirrors not for concave mirrors.

6. A ray of light passes from a medium A to another medium B. No bending of light occurs if the ray of light hits the boundary of medium B at an angle of
(a) 0° (b) 45°
(c) 90° (d) 120°

7. To form an image twice the size of the object, using a convex lens of focal length 20 cm, the object distance must be
(a) < 20 cm
(b) > 20 cm
(c) < 20 cm and between 20 cm and 40 cm
(d) cannot say

8. A layered lens is made of two types of transparent materials indicated by different shades. A point object is placed on its axis. The object will form

(a) 1 image (b) 2 images
(c) 3 images (d) 9 images

9. The refractive index of dense flint glass is 1.65 and for alcohol, it is 1.36 with respect to air, then the refractive index of the dense flint glass with respect to alcohol is
(a) 1.31 (b) 1.21
(c) 1.11 (d) 1.01

10. Power of a convex lens of focal length 50 cm is
(a) − 2 D (b) − 0.5 D
(c) + 2 D (d) + 0.5 D

11. Given a point source of light, which of the following can produce a parallel beam of light ?
(a) Concave lens
(b) Two plane mirrors inclined at 90° to each other
(c) Convex mirror
(d) Concave mirror

12. A person standing in front of a mirror finds his image larger than himself. This implies that the mirror is
(a) concave
(b) cylindrical with bulging side outwards
(c) plane
(d) convex.

13. An object is at a distance of 10 cm from a mirror and the image of the object is at a distance of 30 cm from the mirror on the same side as the object. Then the nature of the mirror and its focal length is
(a) convex, 15 cm (b) concave, 1.5 cm
(c) convex, 7.5 cm (d) concave, 7.5 cm

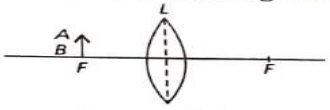
14. In the case of refraction of light from a rectangular glass slab, if i be the angle of incidence and e be the angle of emergence, then
(a) $e = i$ (b) $e < i$
(c) $\left(\frac{1+n}{n}\right)f$ (d) $\left(\frac{1-n}{n}\right)f$

16. A ray of light travelling in air is incident on the plane of a transparent medium. The angle of incident is 45° and that of refraction is 30°. Find the refractive index of the medium.
(a) 2 (b) $\frac{1}{\sqrt{2}}$
(c) 1 (d) $\sqrt{2}$

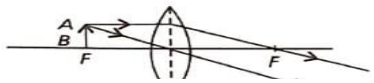
17. Match the column I with column II and select the correct answer by choosing an appropriate option.

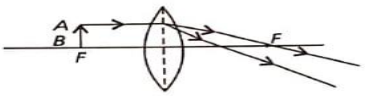
Column I	Column II
P. $\sin i/\sin r$ = constant	1. Refractive index of the medium

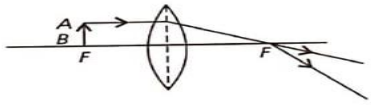
19. An object AB is placed in front of a convex lens at its focus as shown in figure.



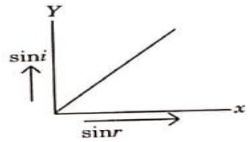
Which of the ray diagram below correctly depicts the refraction through the lens L?

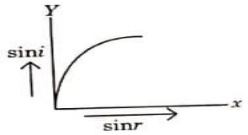
(a)


(c)


(d)


20. Which of the following correctly represents graphical relation between sine of angle of incidence (i) and sine of angle of refraction (r)?

(a)


(b)


Reflection & Refraction

Q. $\frac{\text{Speed of light in vaccum}}{\text{Speed of light in a medium}}$ 2. Snell's law

R. $\mu_{ga} \times \mu_{aw}$ 3. μ_{gw}

(a) P-1, Q-2, R-3 (b) P-3, Q-2, R-1
(c) P-2, Q-3, R-1 (d) P-2, Q-1, R-3

18. At what distance from a concave mirror of focal length 12 cm must an object be placed in order that an image double its size may be obtained?
(a) Either 5 cm or 15 cm
(b) Either 6 cm or 18 cm
(c) Either 12 cm or 6 cm
(d) 12 cm only

22. A thin lens has focal length f, and its aperture has diameter d. It forms an image of intensity I. Now, the central part of the aperture upto diameter $d/2$ is blocked by an opaque paper. The focal length and image intensity will change to
(a) $f/2$ and $I/2$ (b) f and $I/4$
(c) $3f/4$ and $I/2$ (d) f and $3I/4$

23. With regard to refraction which of the given statements is false.
(a) It is a change in direction of light when it passes from one transparent medium into another of different optical density.
(b) Light is deviated away from the normal when it enters an optically dense medium from a less dense medium.
(c) The velocity of light is changed during refraction.
(d) No refraction occurs at the boundary that separates two media of equal refractive indices.

24. How much time will light take to cross 2 mm thick glass plane if refractive index of glass is 3/2?
(a) 10^{-15} s (b) 10^{-11} s
(c) 10^{-12} s (d) 3×10^{-8} s

25. A candle flame 3 cm high is placed at a distance of 3 m from a wall. How far from the wall must a concave mirror be placed in order that it may form an image of the flame 9 cm high on the wall ?
(a) 450 cm (b) 150 cm
(c) 225 cm (d) 300 cm

26. The distance between object and the screen is D. Real images of an object are formed on the screen for two positions of a lens separated by a distance d. The ratio between the sizes of two images will be
(a) D/d (b) D^2/d^2
(c) $(D-d)^2/(D+d)^2$ (d) $\sqrt{(D/d)}$

27. Select the incorrect statement stated below related to concave mirror.
(a) Outer surface is coated with opaque substance.
(b) Inner surface is polished and thus reflective.
(c) It is known as converging mirror.
(d) It is used to observe the phenomenon of refraction.

34. An object is placed at a distance of 10 cm from a convex mirror of focal length 15 cm. Find the image distance.
(a) –6 cm (b) 1/6 cm
(c) 6 cm (d) –1/6 cm

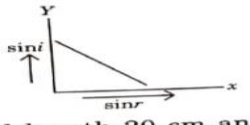
35. Find the focal length of a convex mirror whose radius of curvature is 32 cm.
(a) –32 cm (b) 16 cm
(c) 64 cm (d) –16 cm

36. A concave mirror produces three times magnified real image of an object placed at 10 cm in front of it. The image distance is
(a) 30 cm (b) 10/3 cm
(c) –10/3 cm (d) –30 cm

37. Choose the wrong statement from the following.
(a) When the object is kept at a distance equal to its radius of curvature.
(b) When object is kept at a distance less than its focal length.
(c) When object is placed between the focus and centre of curvature.
(d) When object is kept at a distance greater than its radius of curvature.

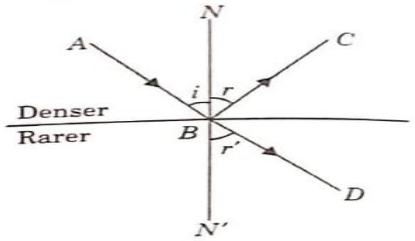
42. Which of the following statements is true?
(a) A convex lens has 4 dioptre power having a focal length 0.25 m.
(b) A convex lens has –4 dioptre power having a focal length 0.25 m.
(c) A concave lens has 4 dioptre power having a focal length 0.25 m.
(d) A concave lens has –4 dioptre power having a focal length 0.25 m.

(c) 

(d) 

21. A convex lens A of focal length 20 cm and a concave lens B of focal length 5 cm are kept along the same axis with a distance d between them. If a parallel beam of light falling on A leaves B as a parallel beam, then the distance d (in cm) will be
(a) 25 (b) 15
(c) 30 (d) 50

28. A ray of light from a denser medium strikes a rarer medium at angle of incidence 45° as shown in figure. The reflected and refracted rays make an angle of 90° with each other. The angles of reflection and refraction are r and r'. The angle r' is given by



(a) 30° (b) 45°
(c) 60° (d) 90°

29. Two thin lenses of power, + 3.5 D and – 2.5 D are placed in contact, then the power and focal length of the lens combination is
(a) + 1 D, + 100 cm (b) + 2 D, + 150 cm
(c) + 1 D, + 200 cm (d) + 2 D, + 100 cm

30. If an incident ray passes through the centre of curvature of spherical mirror, the reflected ray will
(a) pass through the pole
(b) pass through the focus
(c) retrace its path
(d) be parallel to the principal axis.

31. The Sun subtends an angle of 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 the Sun formed by the concave mirror is
(a) 3.5 cm (b) 13.1 cm
(c) 7.5 cm (d) 6.5 cm

32. An object is placed at the centre of curvature of a concave mirror. The distance between its image and the pole is
(a) equal to f (b) between f and $2f$
(c) equal to $2f$ (d) greater than $2f$.

33. The magnification m of an image formed by a spherical mirror is negative. It means, the images is
(a) smaller than the object
(b) larger than the object
(c) erect
(d) inverted

(a) A convex mirror forms virtual images for all positions of the object.
(b) A concave mirror forms real images for all positions of the object.
(c) A concave mirror, if suitably placed in front of an object, can form a unity.
(d) The magnification produced by a convex mirror is always less than unity.

38. Refractive index of diamond with respect to glass is 1.6 and the absolute refractive index of glass is 1.5, then the absolute refractive index of diamond is
(a) 1.4 (b) 2.4
(c) 3.4 (d) 4.4

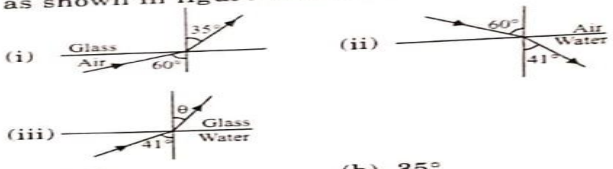
39. A point source of light is placed 4 m below the surface of water of refractive index = 5/3. The minimum diameter of a disc, which should placed over the source, on the surface of water to cut off all light coming out of water is
(Assume that to cut off all light sin $i = 1/\mu$)
(a) 1 m (b) 4 m
(c) 3 m (d) 6 m

40. The refractive index of glass with respect to air is 3/2 and the refractive index of water with respect to air is 4/3. The refractive index of glass with respect to water will be
(a) 1.525 (b) 1.225
(c) 1.425 (d) 1.125

41. Under which of the following conditions, a concave mirror can form an image larger than the actual object?

(a) −9.6 cm (b) −3.6 cm
(c) −6.3 cm (d) −8.3 cm

48. Refraction of light from air to glass and from air to water are shown in figure (i) and figure (ii). The value of the angle θ in the case of refraction as shown in figure (iii) will be



(a) 30° (b) 35°
(c) 60° (d) 41°

49. A tree is 18.0 m away and 2.0 m high from a concave lens. How high is the image formed by the given lens of focal length 6 m?
(a) 1.0 m (b) 1.5 m
(c) 0.75 m (d) 0.50 m

50. Which of the following forms a virtual and erect image for all positions of the object?
(a) Concave lens (b) Concave mirror
(c) Convex mirror (d) Both (a) and (c)

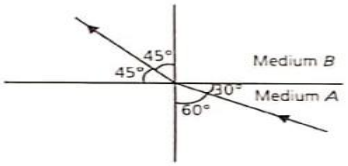
51. A convergent beam of light passes through a diverging lens of focal length 0.2 m and comes to focus 0.3 m behind the lens. The position of the point at which the beam would converge in the absence of the lens is
(a) 0.12 m (b) 0.6 m
(c) 0.3 m (d) 0.15 m

52. A convex lens is dipped in a liquid whose refractive index is equal to the refractive index of the lens. Then its focal length will
(a) become zero (b) become infinite
(c) become small, but non-zero
(d) remain unchanged

53. The refractive indices of four substances P, Q, R and S are 1.50, 1.36, 1.77 and 1.31 respectively. The speed of light is the maximum in the substance
(a) P (b) Q
(c) R (d) S

54. The refractive indices of four materials A, B, C and D are 1.33, 1.43, 1.71 and 1.52 respectively. When the light rays pass from air into these materials, they refract the maximum in
(a) material A (b) material B
(c) material C (d) material D

43. Figure shows a ray of light as it travels from medium A to medium B. Refractive index of the medium B relative to medium A is



(a) $\sqrt{3}/\sqrt{2}$ (b) $\sqrt{2}/\sqrt{3}$
(c) $1/\sqrt{2}$ (d) $\sqrt{2}$

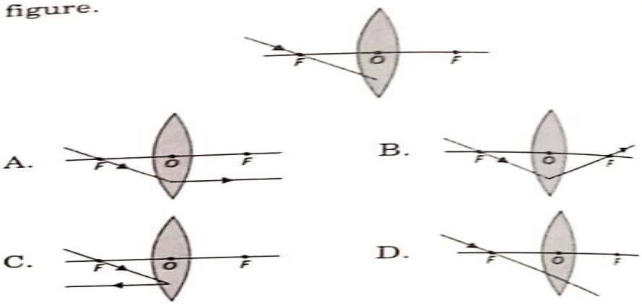
44. Which of the following can make a parallel beam of light when light from a point source is incident on it?
(a) Concave mirror as well as convex lens.
(b) Convex mirror as well as concave lens.
(c) Two plane mirrors placed at 90° to each other.
(d) Concave mirror as well as concave lens.

45. Refractive indices of water, sulphuric acid, glass and carbon disulphide are 1.33, 1.43,1.53 and 1.63 respectively. The light travels slowest in
(a) sulphuric acid (b) glass
(c) water (d) carbon disulphide

46. What can be the largest distance of an image of a real object from a convex mirror of radius of curvature is 20 cm?
(a) 10 cm (b) 20 cm
(c) Infinity (d) Zero

47. An object 2 cm high is placed at a distance of 16 cm from a concave mirror, which produces a real image 3 cm high. What is the focal length of the mirror?

55. Which of the following ray diagrams is correct for the ray of light incident on a lens shown in figure.



(a) Figure A (b) Figure B
(c) Figure C (d) Figure D

56. How will the image formed by a convex lens be affected if the upper half of the lens is wrapped with a black paper?

(a) The size of the image is reduced to one-half.
(b) The upper half of the image will be absent.
(c) The brightness of the image is reduced.
(d) There will be no effect.

57. The optical perception for a pair of spectacles is right eye : − 3.50 D; left eye : − 4.00 D. Which of the following statements is correct?
(a) Lens of power − 3.50 D is thinner at the edges.
(b) Lens of power − 4.00 D has a greater focal length.
(c) Left eye is weaker eye.
(d) None of these.

58. If the power of lens is −2.0 D. Then
(a) the focal length of lens is 50 cm, lens must be concave.
(b) the focal length of lens is −50 cm, lens must be convex.
(c) the focal length of lens is −50 cm, lens must be concave.
(d) the focal length of lens is 25 cm, lens must be concave.

59. A doctor has prescribed a corrective lens of power +1.5 D. Then,
(i) focal length is 66.7 cm.
(ii) lens is converging lens.
(iii) lens is diverging lens.
(iv) focal length is 0.66 cm
Choose the correct options from the following.
(a) (i) and (ii) (b) (i) and (iii)
(c) (iii) and (iv) (d) (ii) and (iv)

60. In torches, search lights and headlights of vehicles the bulb is placed
(a) between the pole and the focus of the reflector
(b) very near to the focus of the reflector
(c) between the focus and centre of curvature of the reflector
(d) at the centre of curvature of reflector

Case Based MCQs

Case I : Read the passage given below and answer the following questions from 61 to 65.
The relation between distance of an object from the mirror (u), distance of image from the mirror (v) and the focal length (f) is called mirror formula. Hence, $\frac{1}{u}+\frac{1}{v}=\frac{1}{f}$.
This formula is valid in all situations for all spherical mirrors for all positions of the object. The size of image formed by a spherical mirror depends on the position of the object from the mirror. The image formed by a spherical mirror can be bigger than the object, equal to the object or smaller than the object. The size of the image relative to the object is given by the linear magnification (m). Thus, the magnification is given by the ratio of height of image to the height of object. If magnification is negative, image is real and if it is positive, image is virtual.

61. What is the position of an image when an object is placed at a distance of 20 cm from a concave mirror of focal length 20 cm?
(a) 5 cm (b) 20 cm
(c) 10 cm (d) infinity

62. Which of the following ray diagrams is correct for the ray of light incident on a concave mirror as shown in figure?

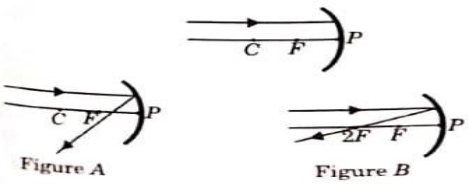


Figure A Figure B

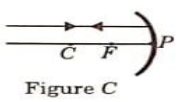


Figure C

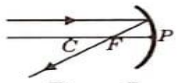


Figure D

(a) Figure A (b) Figure B
(c) Figure C (d) Figure D

63. If the magnification of an image is −2, the characteristic of image will be
(a) real and inverted
(b) virtual and enlarged
(c) virtual and inverted
(d) real and small.

64. The mirror formula holds for
(a) concave mirror (b) convex mirror
(c) plane mirror (d) all of these

65. A parallel beam of light is made to fall on a concave mirror. An image is formed at a distance of 7.5 from the mirror. The focal length of the mirror is
(a) 15 cm (b) 7.5 cm
(c) 3.75 cm (d) 10 cm

Case II : Read the passage given below and answer the following questions from 66 to 70.
The refraction of light on going from one medium to another takes place according to two laws which are known as the laws of refraction of light. These laws are :
(i) The ratio of sine of angle of incidence to the sine of angle of refraction is always constant for the pair of media in contact.

$$\frac{\sin i}{\sin r}=\mu=\text{constant}$$

This constant is called refractive index of the second medium with respect to the first medium. Refractive index is also defined as the ratio of speed of light in vacuum to the speed of light in medium.
(ii) The incident ray, refracted ray and normal all lie in the same plane.
This law is called Snell's law of refraction.

66. When light travels from air to glass,
(a) angle of incidence > angle of refraction
(b) angle of incidence < angle of refraction
(c) angle of incidence = angle of refraction
(d) can't say

Convex lens is made up of a transparent medium bounded by two spherical surfaces such that thicker at the middle and thinner at the edges. Concave lens is also made up of a transparent medium such that thicker at the edge and thinner at the middle. The mid-point of the lens is called optical centre.
A point on the principal axis, where the incident parallel rays meet or appears to come out after refraction is called focus.
A convex lens converges a parallel beam of light to other side whereas concave lens spreads out.

71. A ray passing through which part of a lens emerges undeviated ?
(a) Focus

67. When light travels from air to medium, the angle of incidence is 45° and angle of refraction is 30°. The refractive index of second medium with respect to the first medium is

(a) 1.41 (b) 1.50
(c) 1.23 (d) 1

68. In which medium, the speed of light is minimum?

(a) Air (b) Glass
(c) Water (d) Diamond

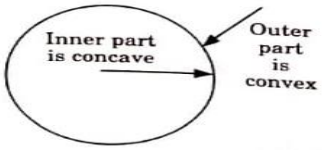
69. If the refractive index of glass is 1.5 and speed of light in air is 3×10^8 m/s. The speed of light in glass is

(a) 2×10^8 m/s (b) 2.9×10^8 m/s
(c) 4.5×10^8 m/s (d) 3×10^8 m/s

70. Refractive index of a with respect to b is 2. Find the refractive index of b with respect to a.

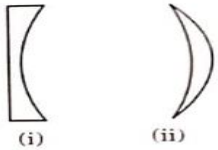
(a) 0.4 (b) 0.5
(c) 0.25 (d) 2.

Case III : Read the passage given below and answer the following questions from 71 to 75.
A lens is a piece of any transparent material bounded by two curved surfaces. There are two types of lenses : convex lens and concave lens.



(b) Centre of curvature
(c) Optical centre
(d) Between focus and centre of curvature

72. Which type of lenes are shown in given figure (i) and (ii)?



(a) Plano concave, concavo convex
(b) Plano convex, convexo concave
(c) Double concave, concave convex
(d) Convexo concave, double convex

73. A small bulb is placed at the focal point of a converging lens. When the bulb is switched on, the lens produces

(a) a convergent beam of light
(b) a divergent beam of light
(c) a parallel beam of light
(d) a patch of coloured light.

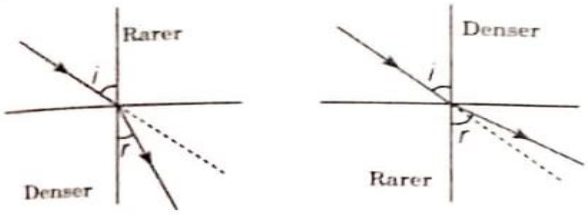
74. The part of lens through which the refraction takes place is called

(a) aperture (b) centre of curvature
(c) principal axis (d) focus

75. A water drop acts as a

(a) convex lens
(b) concave lens
(c) double concave lens
(d) none of these

Case IV : Read the passage given below and answer the following questions from 76 to 80.
When the rays of light travels from one transparent medium to another, the path of light is deviated. This phenomena is called refraction of light. The bending of light depends on the optical density of medium through which the light pass.



The speed of light varies from medium to medium. A medium in which the speed of light is more is optically rarer medium whereas in which the speed of light is less is optically denser medium. Whenever light goes from one medium to another, the frequency of light does not change however, speed and wavelength change. It concluded that change in speed of light is the basic cause of refraction.

80. The bottom of pool filled with water appears to be _____ due to refraction of light.

(a) shallower (b) deeper
(c) at same depth (d) empty

Case V : Read the passage given below and answer the following questions from 81 to 85.
The relationship between the distance of object from the lens (u), distance of image from the lens (v) and the focal length (f) of the lens is called lens formula. It can be written as $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$.
The size of image formed by a lens depends on the position of the object from the lens. A lens of short focal length has more power whereas a lens of long focal length has less power. When the lens is convex, the power is positive and for concave lens, the power is negative.
The magnification produced by a lens is the ratio of height of image to the height of object as the size of the image relative to the object is given by linear magnification (m).
When, m is negative, image formed is real and when m is positive, image formed is virtual. If $m < 1$, size of image is smaller than the object. If $m > 1$, size of image is larger than the object.

76. When light travels from air to glass, the ray of light bends
(a) towards the normal
(b) away from normal
(c) anywhere
(d) none of these

77. A ray of light passes from a medium A to another medium B. No bending of light occurs if
(a) $i = r$ (b) $i = 60°$
(c) $i < r$ (d) $i > r$

78. When light passes from one medium to another, the frequency of light
(a) increases (b) decreases
(c) remains same (d) none of these

79. When light passes from glass to water, the speed of light
(a) increases
(b) decreases
(c) remains same
(d) first increases then decrease

81. An object 4 cm in height is placed at a distance of 10 cm from a convex lens of focal length 20 cm. The position of image is
(a) − 20 cm (b) 20 cm
(c) −10 cm (d) 10 cm

82. In the above question, the size of image is
(a) 16 cm (b) 8 cm
(c) 4 cm (d) 2 cm

83. An object is placed 50 cm from a concave lens and produces a virtual image at a distance of 10 cm infront of lens. The focal length of lens is
(a) −25 cm (b) −12.5 cm
(c) 12.5 cm (d) 10 cm

84. A convex lens forms an image of magnification −2 of the height of image is 6 cm, the height of object is
(a) 6 cm (b) 4 cm
(c) 3 cm (d) 2 cm

85. A concave lens of focal length 5 cm, the power of lens is
(a) 20 D (b) −20 D
(c) 90 D (d) −5 D

90

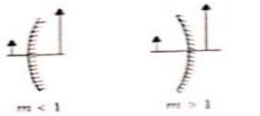
Assertion & Reasoning Based MCQs

For question numbers 86-100, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.
(a) Both assertion and reason are true, and reason is correct explanation of the assertion.
(b) Both assertion and reason are true, but reason is not the correct explanation of the assertion.
(c) Assertion is true, but reason is false.
(d) Assertion is false, but reason is true.

86. Assertion : Light is able to reach Earth from the Sun.
Reason : Light rays can travel in vaccum.

87. Assertion : Property of converging of a convergent lens does not remain same in all media.
Reason : Property of lens whether the ray is diverging or converging is independent of the surrounding medium.

88. Assertion : We can decide the nature of a mirror by observing the size of erect image in the mirror.



Reason : The minimum distance between a real object and its real image in a concave mirror is non zero.

89. Assertion : A convex lens is made of two different materials. A point object is placed on the principal axis. The number of images formed by the lens will be two.
Reason : The image formed by convex lens is always virtual.

90. Assertion : In diffused reflection, a parallel beam of incident light is reflected in different direction.
Reason : The diffused reflection of light is due to the failure of the laws of reflection.

91. Assertion : The image of a virtual object formed by a thin converging lens is always real.
Reason : In the case of a thin lens, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$.

92. Assertion : In the case of concave mirror, the minimum distance between real object and its real image is zero.
Reason : If concave mirror forms virtual image of real object, the image is magnified.

93. Assertion : The size of the mirror affect the nature of the image.
Reason : Small mirrors do not always form virtual images.

94. Assertion : When a ray of light travels from air into water it bends towards the normal.
Reason : Water is optically denser than air.

95. Assertion : Convex lens is a converging lens.
Reason : Convex lens converges the rays of light falling on it.

96. Assertion : The radius of curvature of a mirror is double of the focal length.
Reason : A concave mirror of focal length f in air is used in a medium of refractive index 2. Then the focal length of mirror in medium becomes $2f$.

97. Assertion : The illuminance of an image produced by a convex lens is greater in the middle and less towards the edges.
Reason : The middle part of image is formed by undeflected rays outer part by inclined rays.

98. Assertion : When a concave mirror is held under water, its focal length will increase.
Reason : The focal length of a concave mirror depends on the medium in which it is placed

99. Assertion : If a ray of light is incident on a convex mirror along its principal axis, then the angle of incidence as well as the angle of reflection for a ray of light will be zero.
Reason : A ray of light going towards the centre of curvature of a convex mirror is reflected back along the same path.

100. Assertion : Linear magnification of a mirror has no unit.
Reason : The ratio of height of the image to the height of the object is the linear magnification produced by mirror.