

# Ray Optics and Optical Instruments

- Assertion (A):** A simple microscope may have different magnification for different persons.

**Reason (R):** All persons must have the same near point distance of 25 cm.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
(3) (A) is true but (R) is false  
(4) Both (A) and (R) are false
- Assertion (A):** If an object placed on the optic axis of a lens is illuminated by white light, then image formed will be coloured and not exactly white.

**Reason (R):** The lens has different focal lengths for different colours.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
(3) (A) is true but (R) is false  
(4) Both (A) and (R) are false
- Assertion (A):** Paraxial rays are always parallel to the principal axis.

**Reason (R):** A parallel beam parallel to principal axis converges at the focal point.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
(3) (A) is true but (R) is false  
(4) Both (A) and (R) are false
- Assertion (A):** The image focus (2<sup>nd</sup> focus) and the object focus (1st focus) are on the opposite side of the biconvex or biconcave lens.

**Reason (R):** The radii of curvature of a biconvex lens and biconcave lens are on the opposite side of the lens.

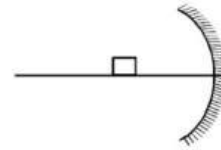
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
(3) (A) is true but (R) is false  
(4) Both (A) and (R) are false

- Assertion (A):** Keeping a point object fixed, if a plane mirror is moved, the image will also move.

**Reason (R):** In case of a plane mirror, distance of object and its image is equal from any point on the mirror.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
(3) (A) is true but (R) is false  
(4) Both (A) and (R) are false

- Assertion (A):** A small square loop is kept in front of the concave mirror as shown in the figure. Its image will also be a square. (Assume paraxial rays)

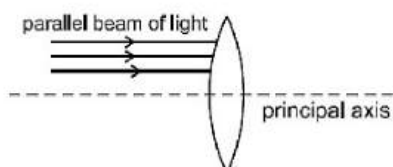


- Reason (R):** All dimensions will be magnified equally because all dimensions are almost at the same distance from the mirror.
- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
(3) (A) is true but (R) is false  
(4) Both (A) and (R) are false
- Assertion (A):** A lens has two principal focal lengths which may be different in magnitude.

**Reason (R):** The distance of both principal focus from optical centre of lens depend on the two radii of curvature of the lens. Distance of both principal focus from optical centre a lens are same only if radii of curvature of both sides of lens are same.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
(3) (A) is true but (R) is false  
(4) Both (A) and (R) are false

8. **Assertion (A):** A parallel beam of light is incident on a thin convex lens and is also parallel to the principal axis of convex lens as shown. The magnitude of deviation of each ray of this beam produced by given convex lens is different.



**Reason (R):** A thin convex lens can be assumed to be made of prisms of small angles. The magnitude of deviation produced by prism of small angle for small angles of incidence depends on angle of prism. Each ray of the beam in situation of assertion is incident on a prism of different angles, hence the magnitude of deviation for each ray is different.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
9. **Assertion (A):** If there is relative motion between a point object & a plane mirror then there must be relative motion between object and image formed by mirror.
- Reason (R):** If the gap between object and mirror will change, the gap between object and image remains same.
- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false

10. **Assertion (A):** When the upper half of a converging lens is missing, a real image formed by the lens for a real object will lack its lower half.

**Reason (R):** The real image formed by a thin lens for a real object will be always erected.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
11. **Assertion (A):** A parallel beam of light travelling in air can be displaced laterally by a parallel transparent slab by distance more than the thickness of the plate.
- Reason (R):** The lateral displacement of light travelling in air increases with fall in value of refractive index of slab.
- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
12. **Assertion (A):** A virtual image formed by plane mirror may be inverted.
- Reason (R):** Longitudinal magnification in this case of plane mirror is  $-1$ .
- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
13. **Assertion (A):** A convex lens of glass ( $\mu = 1.5$ ) behaves as a diverging lens when immersed in a medium of refractive index  $\mu = 1.65$ .
- Reason (R):** A diverging lens is thinner in the middle and thicker at the edges.
- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false



14. **Assertion (A):** Biconvex lens can form virtual image of a virtual object.

**Reason (R):** Nature of lens depends on refractive index of surrounding.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** The minimum length of mirror required to form complete image of man of height H is H/2.

**Reason (R):** Image of an object is obtained if incident light ray reaches the reflecting surface.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. **Assertion (A):** Concave mirror can not form real image of real object.

**Reason (R):** Concave mirror behave as a diverging mirror.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

17. **Assertion (A):** Radius of curvature of a concave mirror is 20 cm. If a real object is placed in front of a mirror at 10cm from pole of the mirror, image is formed at infinity.

**Reason (R):** When object is placed at focus of a converging optical system then its image is formed at infinity.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

18. **Assertion (A):** The Snell's law  $\mu \sin \theta = \text{constant}$  is valid at different boundaries irrespective of the shape of the boundaries.

**Reason (R):** When light enters from vacuum into a medium of refractive index  $\mu$ , its speed and wavelength increases by  $\mu$ .

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

19. **Assertion (A):** A solid glass sphere is placed in air. A light ray enters into the sphere from outside. The ray cannot undergo total internal reflection inside the sphere.

**Reason (R):** The angle of incidence at 1<sup>st</sup> surface cannot be greater than the critical angle for air-glass system.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

20. **Assertion (A):** Wavelength of light changes on changing medium.

**Reason (R):** Light ray always deviates from its path when refracted.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

21. **Assertion (A):** Turpentine is denser medium than water for light

**Reason (R):** Unit volume of turpentine is heavier than unit volume of water

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false



22. **Assertion (A):** The sun appears oval shape at sunrise.

**Reason (R):** At the time of sunrise sun appears a little before the actual sunrise

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

23. **Assertion (A):** An object placed at a distance less than 25 cm, in front of a normal eye. The image of this object on retina is blurred.

**Reason (R):** Image is formed before retina.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

24. **Assertion (A):** In telescopes objective lens is taken of large diameter or aperture

**Reason (R):** Larger aperture remove spherical aberration.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

25. **Assertion (A):** Splitting of light into its component colours is possible in refraction at plane surface of two media.

**Reason (R):** On each refraction dispersion is possible but in prism at both surface dispersion is in same direction so it is clearly seen.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

26. **Assertion (A):** In case of a concave mirror if a point object is moving towards the mirror along its principal axis then its image will always move away from the mirror.

**Reason (R):** In case of reflection (along the principal axis of mirror) object and image always travel in same directions.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

27. **Assertion (A):** Any ray of light suffers a deviation of  $180^\circ - 2i$  after one reflection from plane mirror .

**Reason (R):** For normal incidence of light on the plane mirror deviation is zero.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

28. **Assertion (A):** Rear view mirror of a vehicle is a convex mirror.

**Reason (R):** It never makes real image of real objects.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

29. **Assertion (A):** There is refracting glass slab between Ram and Anoop, then Ram appears nearer to Anoop as Compared to the actual distance between them.

**Reason (R):** Ray of light starting from Ram will undergo two times refraction before reaching to Anoop.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false



30. **Assertion (A):** In case of single refraction by plane surface image and object are on the same side.

**Reason (R):** If object is real, image will be virtual and vice-versa.

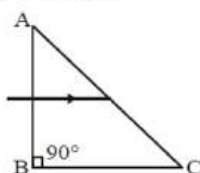
- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

31. **Assertion (A):** In displacement method of finding focal length of a convex lens, if magnification in a position of lens is  $-2$ , then magnification in another position of lens should be  $-1/2$ .

**Reason (R):** This method can not be applied for diverging lens.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

32. **Assertion (A):** White light is incident on face AB of an isosceles right angle prism as shown in figure. Colours for which refractive index of the material of prism is more than 1.414 will be able to emerge from the face AC.



**Reason (R):** Total internal reflection can take place for the light travelling from rarer medium to denser medium.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

33. **Assertion (A):** If one half of a mirror is covered by an opaque material, then only half image of the object is formed.

**Reason (R):** By covering one half of the mirror, focal length of mirror will be halved.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

34. **Assertion (A):** In medical technology endoscopy, optical fibres are used to facilitate visual examination of internal organs of the body.

**Reason (R):** Optical fibres are fabricated so that there should be very less absorption of light and hence no appreciable loss of light intensity.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

35. **Assertion (A):** When light passes through a prism, it disperses while if the same light passes through a rectangular glass slab of same material, it doesn't disperse.

**Reason (R):** Dispersive power of prism is non zero while that of glass slab is zero.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

- 36. Assertion (A):** When white light passes successively through two identical prisms, one inverted with respect to other, then in emergent side, again white light is obtained.  
**Reason (R):** Prism has no ability to create colour but it only separates the colours already present in white light.  
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
- 37. Assertion (A):** Secondary rainbow is fainter than primary rainbow.  
**Reason (R):** Secondary rainbow is seen due to the scattering of primary rainbow through water molecules.  
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
- 38. Assertion (A):** In clear weather, sky appears to be blue not violet.  
**Reason (R):** In clear atmosphere, light of shorter wavelength is scattered more as compared to light of longer wavelength.  
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
- 39. Assertion (A):** During sunset and sunrise sun appears to be red.  
**Reason (R):** During sunrise or sunset, sun emits electromagnetic radiations of comparatively higher wavelength only.  
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
- 40. Assertion (A):** Iris of the eye contains rods and cones which transmits electric signal to brain through optic nerve.  
**Reason (R):** Rods sense colour of object and cone sense intensity of light.  
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
- 41. Assertion (A):** A virtual image can't be caught on screen, yet we see a virtual image. We are obviously bringing it on to the screen, i.e. the retina.  
**Reason (R):** The retina is a special type of screen present in the back of eye consisting of nerve fibre which can catch both real & virtual image.  
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
- 42. Assertion (A):** In a magnifying glass, the angle subtended by an object at the eye is equal to the angle subtended by its virtual image at the eye. Still the magnifying glass provides angular magnification.  
**Reason (R):** Magnifying glass produce a virtual magnified image of the object.  
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
- 43. Assertion (A):** Concave mirror can't form virtual image of a virtual object.  
**Reason (R):** Convex mirror can't form real image of a real object.  
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false



- 44. Assertion (A):** In total internal reflection reflected light is in the phase with incident light.  
**Reason (R):** Reflecting surface is rarer in TIR.  
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
- 45. Assertion (A):** For a Concave mirror, if object is made to accelerate uniformly toward the mirror from infinity, then its image will also show uniform acceleration in opposite direction.  
**Reason (R):** Concave mirror may act as a diverging mirror.  
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
- 46. Assertion (A):** When two thin equiconvex lens are placed in contact, the effective power of combination may decrease.  
**Reason (R):** Power of lens is defined as ability of bending of light.  
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
- 47. Assertion (A):** Although the surface of goggle lens are curved, it does not have any power  
**Reason (R):** In case of goggle, both the curved surfaces have equal radius of curvature and have centre of curvature on the same side  
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
- 48. Assertion (A):** Lens formula can be applied only for thin lenses  
**Reason (R):** For thick lenses one cannot find image position.  
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
- 49. Assertion (A):** For better resolution, in microscope we prefer "Oil immersed object".  
**Reason (R):** Refractive index of oil is closer to the refractive index of objective glass.  
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
- 50. Assertion (A):** Rainbow is an example of the dispersion of sunlight by the water droplets.  
**Reason (R):** Light of shorter wavelength is scattered much more than light of larger wavelength.  
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false
- 51. Assertion (A):** The focal length of a spherical mirror does not depend on the wavelength of light.  
**Reason (R):** In case of reflection of light from a denser medium the phase changes by  $\pi$ .  
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)  
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)  
 (3) (A) is true but (R) is false  
 (4) Both (A) and (R) are false

52. **Assertion (A):** A healthy man wearing glasses of focal length + 1m cannot see beyond 1m.

**Reason (R):** A convex lens can form a real image of a point object placed on its principal axis. If the upper half of the lens is painted black, the intensity of the image will decrease but the image will not be shifted upward or downward.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

53. **Assertion (A):** Sky appears blue.

**Reason (R):** Sensitivity of eye is higher for blue colour as compare to violet colour.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

54. **Assertion (A):** Blue colour of sky is due to scattering.

**Reason (R):** According to Rayleigh blue colour shows more scattering as compare to violet colour.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

55. **Assertion (A):** A convex lens of glass ( $\mu = 1.5$ ) behave as a diverging lens when immersed in carbon disulphide of higher refractive index ( $\mu = 1.65$ )

**Reason (R):** A diverging lens is thinner in the middle and thicker at the edges.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

56. **Assertion (A):** A ray of white light shows no dispersion on emerging from a glass slab although there occurs dispersion inside the glass slab.

**Reason (R):** The velocity of light inside the glass slab is same for all different colours.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

57. **Assertion (A):** A completely transparent material will be invisible in vacuum, when the refractive index is unity.

**Reason (R):** The ratio of the refractive index of red light to blue light in vacuum is less than unity.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

58. **Assertion (A):** For every observer rainbow is a personal one.

**Reason (R):** Every observer intercepts light from same water drops.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

59. **Assertion (A):** The persistence of vision (1/16 second) is used in cinematography.

**Reason (R):** The human eye forms the real image of an object at its retina.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false



**60. Assertion (A):** Warning signals installed at the top of tall buildings and monuments employ red light.

**Reason (R):** Human eye is most sensitive to red colour.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**61. Assertion (A):** A single lens cannot be free from chromatic aberration.

**Reason (R):** When light passes through single lens dispersion must occur.

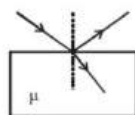
- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**62. Assertion (A):** When white light passes through a prism, deviation of violet light is more than green light.

**Reason (R):** In a prism average deviation is measured as deviation of yellow light.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**63. Assertion (A):** A light ray is incident on a glass slab. Some portion of it is reflected and some is refracted. Refracted and reflected rays are always perpendicular to each other.



**Reason (R):** Angle of incidence is not equal to angle of reflection.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**64. Assertion (A):** Law of reflection is applicable for all type of mirrors.

**Reason (R):** Rays which are parallel to principal axis are known as paraxial rays.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**65. Assertion (A):** A convex lens suffers from chromatic aberration.

**Reason (R):** All parallel rays of monochromatic light passing through a convex lens do not come to a focus at the same point.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**66. Assertion (A):** If an object moves in front of a concave mirror parallel to principal axis. The angle between the object velocity and image velocity can never be acute.

**Reason (R):** Object velocity and image velocity perpendicular to principal axis for spherical mirror is not same.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**67. Assertion (A):** The Focal length of lens is same for all colours of light

**Reason (R):** The focal length depends only upon the material of the lens

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**68. Assertion (A):** When light moves from a denser medium to rarer medium then snell's law can't satisfied for all angle of incidence.

**Reason (R):** When light moves from denser to rarer medium, for angle of incidence greater than the critical angle, no refraction is possible.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**69. Assertion (A):** On hot summer days, optical density of different layer of air increases with height from ground.

**Reason (R):** Refractive index of air increases with its density.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**70. Assertion (A):** For observing a rainbow, sun should be shining in one part of the sky and it is raining in the opposite part of sky, and observer should stand with his back towards raining side.

**Reason (R):** Rainbow appears due to directly reflection of sunlight from water drops of rain.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**71. Assertion (A):** If an object is placed between  $f$  and  $2f$  of a convex lens, a real image can be seen on a screen placed at image location. If the screen is removed then image will not be seen.

**Reason (R):** Real image of a object can not formed in air.

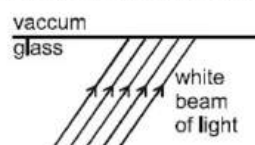
- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**72. Assertion (A):** Optical fibre communication is fastest way of communication.

**Reason (R):** Optical interference between fibres is zero.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**73. Assertion (A):** A white parallel beam of light is incident on a plane glass-vacuum interface as shown. The beam may undergo dispersion after suffering deviation at the interface (The beam is not incident normally on the interface.)



**Reason (R):** Vacuum has same refractive index for all colours of white light.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false



74. **Assertion (A):** The formula  $\left(\frac{1}{v} + \frac{1}{u} = \frac{1}{f}\right)$

connecting  $u$  and  $v$  for a spherical mirror is valid only for mirrors whose sizes are very small compared to their radii of curvatures.

**Reason (R):** Laws of reflection are strictly valid for smaller size of optical system.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

75. **Assertion (A):** A point object is placed at a distance of 26 cm from a convex mirror of focal length 26 cm. The image will form at infinity.

**Reason (R):** For above given system the equation  $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$  gives position of image.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

76. **Assertion (A):** Focal length of a convex mirror may be negative.

**Reason (R):** Distances measured in the direction of incident rays may be taken as negative.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

77. **Assertion (A):** A rectangular glass slab produces no deviation and no dispersion.

**Reason (R):** Dispersive power of glass slab is zero.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

78. **Assertion (A):** Diamond in air shine brightly and when dipped in transparent oil, its shine reduces.

**Reason (R):** Diamond shines due to multiple total internal reflections.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

79. **Assertion (A):** A plano-convex lens is silvered at plane surface. It can act as a converging mirror.

**Reason (R):** Focal length of concave mirror is independent of medium.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

80. **Assertion (A):** Biconvex lens can form virtual image of a virtual object.

**Reason (R):** Nature of lens depends on refractive index of surrounding.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

81. **Assertion (A):** Optical path length is always greater than or equal to geometrical path length.

**Reason (R):** Light travels with speed of  $3 \times 10^8$  m/s in vacuum.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**82. Assertion (A):** It is never possible to produce a real image using a plane mirror.

**Reason (R):** Radius of curvature of a plane mirror is negative.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**83. Assertion (A):** A dentist uses a concave mirror to examine a small cavity.

**Reason (R):** A concave mirror always forms a magnified and erect image.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**84. Assertion (A):** Law of reflection is applicable for all type of mirrors.

**Reason (R):** Rays which are parallel to the principal axis are known as paraxial rays.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**85. Assertion (A):** When an object is placed between two plane parallel mirrors, all the images formed are of equal intensity.

**Reason (R):** In above situation of two plane parallel mirrors, only two images are possible.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**86. Assertion (A):** The focal length of spherical mirror does not depend on the wavelength of light.

**Reason (R):** The number of wavelengths in the visible region of spectrum are infinite.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**87. Assertion (A):** A real object is placed on the optic axis of a lens such that an erect image of twice the size of the object is obtained. The lens must then be a convergent lens.

**Reason (R):** Erect image of a real object can be produced by a concave lens and also by a convex lens.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**88. Assertion (A):** A real object is placed on the optic axis of a lens such that magnification of the image is +0.5. The lens must then be a divergent lens.

**Reason (R):** A concave lens always produces a virtual image of a real object.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**89. Assertion (A):** A lens L (shown in the figure) kept in a surrounding medium X has a power + 10D. If the same lens is kept in a surrounding medium Y, its power is found to be +12.5D. Also if the same lens is placed in a surrounding medium Z, its power is now measured to be -3.5D, then  $m_z > m_x > m_y$ .





**Reason (R):** In different surroundings, power of a given lens has different values but the same sign.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**90. Assertion (A):** Minimum distance between a real object and its real image formed by a convex lens is three times the focal length of lens.

**Reason (R):** Distance between an object and its real image formed by convex lens is minimum when magnification produced by the lens has minimum value.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**91. Assertion (A):** Resolving power of a microscope is different for different colours of illuminating light.

**Reason (R):** Resolving power of a microscope is directly proportional to the wavelength of illuminating light.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**92. Assertion (A):** A concave mirror and a concave lens have the same focal length in air. When dipped in water, the focal length of the two are equal.

**Reason (R):** The focal length depends only on the radii of curvature.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**93. Assertion (A):** Light of wavelength 5500 Å travelling in medium 1 is incident on an interface and gets refracted into medium 2. Due to refraction, if it deviates by an angle 15°, then its wavelength in medium 2 could be greater than or smaller than 5500 Å but never the same.

**Reason (R):** As light is refracted, its colour changes.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**94. Assertion (A):** If an air bubble is trapped in a glass slab will not produce any lens action.

**Reason (R):** Behaviour of a shape like a lens is in dependent of surrounding medium.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

**95. Assertion (A):** A prism of refracting angle 60° is made of a material of refractive index  $\sqrt{2}$  for a certain wavelength. As light of this wavelength passes through the prism, angle of minimum deviation is 30°.

**Reason (R):** At minimum deviation, angle of refraction of the first face is

$$r_1 = \frac{A}{2} = 30^\circ.$$

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

96. **Assertion (A):** When a glass prism is immersed in water, the deviation caused by prism decrease.

**Reason (R):** Refractive index of glass prism relative to water is less than relative to air.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

97. **Assertion (A):** When a light wave travels from a rarer to a denser medium, it loses energy.

**Reason (R):** When a light wave travels from a rarer to a denser medium, it loses speed and energy carried by the wave is proportional to its speed.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

98. **Assertion (A):** When a monochromatic beam of light is incident from one medium to another, the frequency of incident, reflected and refracted rays are equal.

**Reason (R):** The incident, reflected and refracted rays are co-planar.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

99. **Assertion (A):** The refractive index of diamond is  $\sqrt{6}$  and that of liquid is  $\sqrt{3}$ . If the light travels from diamond to the liquid, it will totally reflected when the angle of incidence is  $30^\circ$ .

**Reason (R):** For total internal reflection, angle of incidence should be less than critical angle  $\theta_c = \sin^{-1}\left(\frac{1}{\mu}\right)$ .

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

100. **Assertion (A):** The speed of light in an optically rarer medium is greater than that in an optically denser medium.

**Reason (R):** One light year equals to  $9.5 \times 10^{12}$  km

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

101. **Assertion (A):** Consider a prism A of refracting angle  $5^\circ$  and another prism B of refracting angle  $10^\circ$ . Both prisms are made of crown glass, If white light is incident on each prism, angular dispersion caused by prism B will be more.

**Reason (R):** Dispersive power depends on the nature material.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false



### ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	2	1	4	2	3	3	2	1	4	4	4	1	3	1	3	4	1	4	3	3
Que.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	3	2	3	3	2	4	3	2	1	2	2	4	4	2	1	2	3	2	3	4
Que.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	3	2	2	1	4	4	1	3	1	2	2	2	2	3	3	3	3	3	2	3
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Ans.	1	2	4	3	2	2	4	2	1	4	1	2	2	3	1	4	3	1	2	1
Que.	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Ans.	2	4	3	3	4	2	2	2	3	4	3	4	3	4	2	1	4	2	4	2
Que.	101																			
Ans.	2																			