MULTIPLE CHOICE QUESTIONS

1. Which of the following lights deviates the most when it passes through a prism?
   a. Red Light **b. Violet Light** c. Neither (a) nor (b) d. Both (a) and (b)

2. Which of the following phenomena of light results in a mirage?
   a. Refraction of light b. Reflection of light
   c. Total internal reflection d. Diffraction of light

3. For which of the following is the field of view maximum?
   a. Concave mirror **b. Convex mirror** c. Plane mirror d. Cylindrical mirror

4. What happens when the light is refracted into a medium?
   a. Both frequency and wavelength of the light increase
   b. The wavelength increases but the frequency remains unchanged
   c. Both wavelength and frequency decrease
   d. The wavelength decreases but the frequency remains constant

5. If a glass prism is dipped in water, what happens to its dispersive power?
   a. Increases **b. Decreases** c. Does not change d. No effect

6. What should be increased to increase the angular magnification of a simple microscope?
   a. **The power of the lens** b. The focal length of the lens
   c. Lens Aperture d. Object Size

7. Which of the following phenomenon is used in optical fibre?
   a. Refraction b. Diffraction c. Scattering **d. Total Internal Reflection**

8. Which of the following statements is true for total internal reflection?
   a. Light travels from rarer medium to denser medium
   b. Light travels from denser medium to rarer medium
   c. Light travels in water only
   d. Light travels in the air only

9. A convex lens is dipped in a liquid whose refractive index is equal to the refractive index of the lens. Then what is its focal length?
   a. Focal Length will become zero **b. Focal Length will become infinite**
   c. Focal length will reduce, but not become zero d. Remains unchanged

10. For a telescope, the larger the diameter of the objective lens
   a. **Greater the resolving power** b. Greater the magnifying power
   c. Smaller the resolving power d. Smaller the magnifying power

11. A ray of light is incident on a plane mirror at an angle of incidence 30°. The ray after reflection is deviated through
(a) 30° (b) 90° (c) 60° **(d) 120°**

12. A spherical mirror forms a real image of a point object placed in front of it. The distance of the image and object from the mirror is 30 cm and 20 cm respectively. The focal length and nature of the mirror is:
(a) 120 cm; convex (b) 60 cm convex
(c) 60 mm, concave **(d) 120 mm; concave.**

13. A diver in a swimming pool wants to signal his distress to a person standing on the edge of the pool by flashing his water proof flash light:
(a) He has to direct the beam horizontally.
(b) He has to direct the beam at an angle to the vertical which is slightly less than the critical angle of incidence for total internal reflection.
(c) He has to direct the beam at angle to the vertical which is slightly more than the critical angle of incidence for total internal reflection.
(d) He must direct the beam vertically upward.

14. When light rays are incident on a prism at an angle of 45°, the minimum deviation is obtained. If the refractive index of the material of prism is $\sqrt{29}$ the angle of prism will be
(a) 30° (b) 40° (c) 50° **(d) 60°**

15. If the refractive index for water is 4/3 and the velocity of light in vacuum is 3×10^{10} cm s^{-1}, the time taken by light in travelling a distance of 500 m in water is
(a) 2.22×10^{-1} s **(b) 2.22×10^{-6} s** (c) 2.22×10^{-8} s (d) 2.22×10^{-10} s.

16. A beam of monochromatic blue light of wavelength 4,200 A° in air travels in water ($\mu = 4/3$). Its wavelength in water will be
(a) 2800 Å (b) 5600 Å **(c) 3150 Å** (d) 4000 Å

17. A lens has a power of 10 D when placed in air. When it is immersed in water, ($\mu = 1.333$), the change in power is (R.I. of lens material is 1.5):
(a) 2.55 D (b) + 7.45 D **(c) – 7.5 D** (d) 5.0 D

18. A person can see objects only at a distance greater than 40 cm. He is avised to use lens of power:
(a) – 2.5 D (b) + 2.5 D (c) -6.25 D **(d) +1.5 D**

19. A person cannot see clearly at distance less than 2m from the eye. The power of the lens needed by him to see clearly at a distance of 0.25 m will be
(a) +1 D (b) -1 D **(c) +3.5 D** (d) -3.5 D

20. For a telescope, larger the diameter of the objective lens,
(a) smaller is the resolving power **(b) greater is the resolving power**
(c) greater is the magnifying power (d) smaller is the magnifying power.

21. If a glass rod is immersed in a liquid of the same refractive index, then it will:
(a) look bent (b) look longer **(c) disapper** (d) none of these

22. The objective of an astronomical telescope has a large aperture to:
(a) reduce spherical aberration. (b) increase span of observation.
(c) have high resolution. (d) have low dispersion.

23. Which of the following is used in optical fibres?
(a) total internal reflection (b) scatterring
(c) reflection (d) interference.

24. The rays which are incident at points close to the pole P of the mirror and make small angles with the principal axis are called
(a) paraxial rays (b) parallel rays (c) perpendicular rays (d) non parallel rays

25. Suppose that the lower half of the concave mirror's reflecting surface is covered with an opaque (non-reflective) material. What effect will this have on the image of an object placed in front of the mirror?
(a) only half of the image will produce (b) no image produced
(c) it is depends in the mirror **(d) The intensity of the image will be low.**

26. In refraction, the refracted ray bends away from the normal this is the case when
(a) Incident ray in a denser medium refracts into a rarer medium.
(b) Incident ray in a rarer medium refracts into a rarer medium.
(c) Incident ray in a denser medium refracts into a dencer medium.
(d) Incident ray in a denser medium refracts into a dencer medium.

27. laws of refraction fails if angle of incidence is
(a) $> 0^0$ (b) $< 0^0$ (c) $< 90^0$ **(d) $= 90^0$**

28. When light gets reflected by a surface, the reflected ray is always
(a) Less intense than the incident ray (b) More intense than the incident ray
(c) no change in intensity (d) frequency of refracted ray changes

29. Light from a point source in air falls on a spherical glass surface (n = 1.5 and radius of curvature = 20 cm). The distance of the light source from the glass surface is 100 cm. At what position the image is formed?
(a) 200cm (b) 300cm **(c) 100cm** (d) 50cm

30. A magician during a show makes a glass lens with n = 1.47 disappear in a trough of liquid then refractive index of liquid is
(a) 1 **(b) 1.47** (c) 2 (d) less than 1.47

31. If f = 0.5 m for a glass lens, the power of the lens is
(a) 0.5D (b) 1D **(c) 2D** (d) 1.5D

33. In prism the angle of deviation depends on the angle of
(a) incidence (b) refraction (c) both (a) and (b) (d) none of the above

32. A simple microscope has a limited maximum magnification
(a) more than 10 **(b) less than or equal to 9** (c) equal to 10 (d) less than 10

33. The distance between the second focal point of the objective and the first focal point of the eyepiece is called the ..... of the compound microscope.(tube length)

34. To achieve a large magnification of a small object, the objective and eyepiece should have .....
(small focal lengths)

34. An objective with fo = 1.0 cm, and an eyepiece with focal length fe = 2.0 cm, and a tube length of 20 cm, the magnification is
(a) 100 (b) 200 **(c) 250** (d) 1000

35. The telescope is used to provide ..... magnification of distant objects
(angular)

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

38. An under-water swimmer cannot see very clearly even in absolutely clear water because of
(a) absorption of light in water (b) scattering of light in water
(c) reduction of speed of light in water (d) change in the focal length of eye lens

39. When light is refracted into a medium,
(a) its wavelength and frequency both increase
(b) its wavelength increases but frequency remains unchanged
(c) its wavelength decreases but frequency remains unchanged
(d) its wavelength and frequency both decrease

40. The objective of a telescope must be of large diameter in order to
(a) remove chromatic aberration
(b) remove spherical aberration and high magnification
(c) gather more light and for high resolution
(d) increase its range of observation

41. 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 its end closer to the pole is 20 cm away from the mirror. The length of the image is
(a) 10 cm (b) 15 cm (c) 2.5 cm (d) 5 cm

42. To increase the angular magnification of a simple microscope, one should increase
(a) the focal length of the lens (b) the power of the lens
(c) the aperture of the lens (d) the object size

43. A convex lens is dipped in a liquid whose refractive index is equal to the refractive index of the lens. Then what is its focal length?

a. Focal Length will become zero

b. Focal Length will become infinite
c. Focal length will reduce, but not become zero
d. Remains unchanged

44. If a glass prism is dipped in water, what happens to its dispersive power?

a. Increases
b. Decreases
c. Does not change
d. No effect

45. Magnifying power of a simple microscope is …….

(a) inversely proportional to the focal length of the lens

(b) inversely proportional to the square focal length of the lens

(c) inversely proportional to the cube focal length of the lens

(d) directly proportional to the square focal length of the lens

2 MARKS QUESTIONS

1. Define power of lens. How does power of lens vary with focal length.
2. State the laws of refraction.
3. State the laws of reflection.
4. Write lens maker's formula and explain the terms.
5. What is the SI unit of power? Define the SI unit of power of a lens.
6. What is a thin prism? Write the expression for the deviation produced by a thin prism. Explain the symbols.
7. Write mirror equation and explain the terms
8. Write two uses of optical fibre.
9. Write a relation between object and image distance in terms of refractive index of the medium and the radius of curvature of the curved spherical surface. And explain the terms.

3 MARKS QUESTIONS

1. Obtain the relation between focal length (f) and radius of curvature(R) of a mirror.
2. Define critical angle and write the two conditions for total internal reflection to occur.
3. Obtain the relation between refractive index and critical angle for a medium.
4. What is total internal reflection? Give its condition.
5. Write the Cartesian sign convention for reflecting surfaces.
6. Write principle of optical fibre and briefly explain the construction of optical fibre.

5 MARKS

1. An object is placed at (i) 10 cm, (ii) 5 cm in front of a concave mirror of radius of curvature 15 cm. Find the position, nature, and magnification of the image in each case.
2. Suppose while sitting in a parked car, you notice a jogger approaching towards you in the side view mirror of R = 2 m. If the jogger is running at a speed of 5 m s–1, how fast the image of the jogger appear to move when the jogger is (a) 39 m, (b) 29 m, (c) 19 m, and (d) 9 m away.

3. (i) If f = 0.5 m for a glass lens, what is the power of the lens? (ii) The radii of curvature of the faces of a double convex lens are 10 cm and 15 cm. Its focal length is 12 cm. What is the refractive index of glass? (iii) A convex lens has 20 cm focal length in air. What is focal length in water? (Refractive index of air-water = 1.33, refractive index for air-glass = 1.5.)
4. A small candle, 2.5 cm in size is placed at 27 cm in front of a concave mirror of radius of curvature 36 cm. At what distance from the mirror should a screen be placed in order to obtain a sharp image? Describe the nature and size of the image. If the candle is moved closer to the mirror, how would the screen have to be moved?
5. A 4.5 cm needle is placed 12 cm away from a convex mirror of focal length 15 cm. Give the location of the image and the magnification. Describe what happens as the needle is moved farther from the mirror
6. A tank is filled with water to a height of 12.5 cm. The apparent depth of a needle lying at the bottom of the tank is measured by a microscope to be 9.4 cm. What is the refractive index of water? If water is replaced by a liquid of refractive index 1.63 up to the same height, by what distance would the microscope have to be moved to focus on the needle again?
7. A small bulb is placed at the bottom of a tank containing water to a depth of 80cm. What is the area of the surface of water through which light from the bulb can emerge out? Refractive index of water is 1.33. (Consider the bulb to be a point source.)
8. A prism is made of glass of unknown refractive index. A parallel beam of light is incident on a face of the prism. The angle of minimum deviation is measured to be 40°. What is the refractive index of the material of the prism? The refracting angle of the prism is 60°. If the prism is placed in water (refractive index 1.33), predict the new angle of minimum deviation of a parallel beam of light.
9. A beam of light converges at a point P. Now a lens is placed in the path of the convergent beam 12cm from P. At what point does the beam converge if the lens is (a) a convex lens of focal length 20cm, and (b) a concave lens of focal length 16cm?
10. A compound microscope consists of an objective lens of focal length 2.0 cm and an eyepiece of focal length 6.25 cm separated by a distance of 15cm. How far from the objective should an object be placed in order to obtain the final image at (a) the least distance of distinct vision (25cm), and (b) at infinity? What is the magnifying power of the microscope in each case?
11. A person with a normal near point (25 cm) using a compound microscope with objective of focal length 8.0 mm and an eyepiece of focal length 2.5cm can bring an object placed at 9.0mm from the objective in sharp focus. What is the separation between the two lenses? Calculate the magnifying power of the microscope
12. A small telescope has an objective lens of focal length 144cm and an eyepiece of focal length 6.0cm. What is the magnifying power of the telescope? What is the separation between the objective and the eyepiece?
13. (a) A giant refracting telescope at an observatory has an objective lens of focal length 15m. If an eyepiece of focal length 1.0cm is used, what is the angular magnification of the telescope? (b) If this telescope is used to view the moon, what is the diameter of the image of the moon formed by the objective lens? The diameter of the moon is 3.48 × 106m, and the radius of lunar orbit is 3.8 × 108m.