

Physics Master Academy

Class XII

RAY OPTICS AND OPTICAL INSTRUMENTS

Maximum marks: 30

Duration: 75 minutes

1 mark Questions:

1. A biconvex lens of focal length f is cut into two identical plano convex lenses. What will be the focal length of each part?
2. The radius of curvature of the curved surface of a plano-convex lens is 20cm. If the refractive index of the material of the lens be 1.5, it will
 - (a) act as a convex lens only for the objects that lie on its curved side.
 - (b) act as a concave lens for the objects that lie on its curved side.
 - (c) act as a convex lens irrespective of the side on which the object lies.
 - (d) act as a concave lens irrespective of side on which the object lies.
3. Assertion: The diamond shines due to multiple total internal reflections.
Reason: The critical angle for diamond is 24.4° .
 - (a) If both assertion and reason are true and reason is the correct explanation of assertion.
 - (b) If both assertion and reason are true but reason is not the correct explanation of assertion.
 - (c) If assertion is true but reason is false
 - (d) If both assertion and reason are false
4. Define critical angle for total internal reflection.
5. A ray of light is incident normally on a glass slab. What is angle of refraction?
6. What is the power of the combination of a convex lens and concave lens of the same focal length?
7. In which direction relative to the normal does a ray of light bend, when it enters obliquely a medium in which its speed is increased?
8. Why do the objective and eyepiece of a compound microscope have short focal lengths?

2 marks Questions:

9. A convex lens is held in water. What would be the effect on the focal length of the lens?
10. Why are mirrors used in search lights parabolic in shape and not concave spherical?

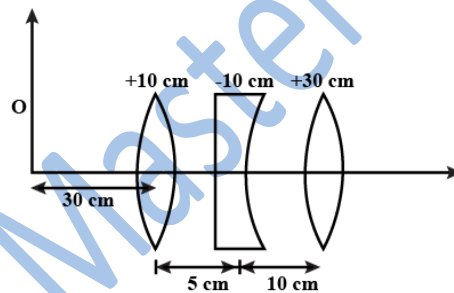
11. You are given three lenses. Which of the two lenses will you use as an eyepiece and as an objective to construct an astronomical telescope?

Lenses	Power (D)	Aperture(cm)
L ₁	3	8
L ₂	6	1
L ₃	10	1

12. What is pure spectrum? Sketch the experimental arrangement for obtaining a pure spectrum.

3 marks Questions:

13. Establish the mirror formula for a concave mirror.
14. Derive following formula for convex surface $\frac{n_2}{v} - \frac{n_1}{u} = \frac{(n_2 - n_1)}{R}$.
15. Three lenses of focal lengths +10cm, -10cm and +30cm are arranged coaxially as in the figure given below. Find the position of the final image formed by the combination.



5 marks questions:

16. A telescope has an objective of focal length 50cm and eyepiece of focal length 5cm. The least distance of distinct vision is 25cm. The telescope is focused for distinct vision on a scale 200cm away from the object. Calculate (a) the separation between the objective and eyepiece and (b) the magnification produced.

OR

Derive Lens Maker formula and determine the focal length of equiconvex lens of radius of curvature 10cm and refractive index of glass 3.2.