Physics Standard X: Lenses MCQ Questions

Comprehensive Question Bank for Examinations

1 Multiple-Choice Questions and Answers

1. **What distinguishes a convex lens from a glass sheet?**

   a) It has flat surfaces

   b) It converges light rays

   c) It does not refract light

   d) It is opaque

   Answer: b) It converges light rays
   Explanation: A convex lens converges light to a focal point, unlike a glass sheet, which does not significantly bend light.

2. **Which device uses a convex lens to magnify objects?**

   a) Thermometer

   b) Microscope

   c) Barometer

   d) Ammeter

   Answer: b) Microscope
   Explanation: Microscopes use convex lenses to form magnified images of small objects.

3. **What is the shape of a concave lens?**

   a) Thicker in the middle

   b) Thinner in the middle

   c) Uniform thickness

   d) Cylindrical

   Answer: b) Thinner in the middle
   Explanation: Concave lenses are thinner at the center, causing light to diverge.

4. **How do letters appear to move when a convex lens is shifted sideways?**

   a) Same direction

   b) Opposite direction

   c) No movement

   d) Circular motion

   Answer: b) Opposite direction
   Explanation: Convex lenses invert the image, causing letters to move oppositely.

5. **What are the refracting surfaces of a lens part of?**

   a) Cylinders

   b) Spheres

c) Cones

d) Planes

Answer: b) Spheres
Explanation: Lens surfaces are parts of spheres, causing refraction.

6. **What is the optic centre of a lens?**

a) Edge of the lens

b) Midpoint of the lens

c) Focal point

d) Centre of curvature

Answer: b) Midpoint of the lens
Explanation: The optic centre (O) is the lens's midpoint, where rays pass undeviated.

7. **What is the optic axis?**

a) Line through focal points

b) Line through optic centre and centres of curvature

c) Lens surface

d) Aperture boundary

Answer: b) Line through optic centre and centres of curvature
Explanation: The optic axis connects the optic centre and centres of curvature.

8. **What is the aperture of a lens?**

a) Lens thickness

b) Light-passing area

c) Focal length

d) Optic centre

Answer: b) Light-passing area
Explanation: The aperture is the lens area through which light passes, adjustable in cameras.

9. **Where do parallel rays converge in a convex lens?**

a) Same side

b) Opposite side

c) At optic centre

d) At infinity

Answer: b) Opposite side
Explanation: Parallel rays converge at the principal focus on the opposite side, real for convex lenses.

10. **What type of principal focus does a concave lens have?**

    a) Real

    b) Virtual

    c) At optic centre

    d) At infinity

    Answer: b) Virtual
    Explanation: Concave lenses diverge rays, appearing to originate from a virtual focus on the same side.

11. **How can the focal length of a convex lens be measured? (Application)**

    a) Measure lens thickness

    b) Project a distant object's image

    c) Measure aperture

    d) Use a thermometer

    Answer: b) Project a distant object's image
    Explanation: The distant object method measures lens-to-screen distance for a clear image.

12. **What happens to sunlight passed through a convex lens at a specific distance? (Application)**

    a) Disperses

    b) Converges to burn paper

    c) Remains unchanged

    d) Reflects back

    Answer: b) Converges to burn paper
    Explanation: At the focal point, sunlight converges, increasing intensity to burn paper.

13. **What type of image does a concave lens always form?**

    a) Real, inverted

    b) Virtual, erect

    c) Real, erect

    d) Virtual, inverted

    Answer: b) Virtual, erect
    Explanation: Concave lenses diverge light, forming virtual, erect, diminished images.

14. **Where is the image formed when an object is beyond 2F in a convex lens?**

a) At F

b) Between F and 2F

c) Beyond 2F

d) Same side

Answer: b) Between F and 2F
Explanation: The image is real, inverted, diminished, as in camera lenses.

15. **What is the image position when an object is at F in a convex lens?**

a) At 2F

b) At infinity

c) Between F and O

d) Beyond 2F

Answer: b) At infinity
Explanation: Rays become parallel, forming a highly magnified image at infinity.

16. **What type of image is formed when an object is between F and the optic centre of a convex lens? (Application)**

a) Real, inverted

b) Virtual, erect

c) Real, erect

d) Virtual, diminished

Answer: b) Virtual, erect
Explanation: Used in magnifying glasses, the image is magnified and virtual.

17. **What is the lens equation?**

a) $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

b) $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

c) $f = v + u$

d) $f = \frac{v}{u}$

Answer: b) $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$
Explanation: Relates focal length (f), image distance (v), and object distance (u).

18. **In the Cartesian sign convention, what is the sign of object distance (u)?**

a) Positive

b) Negative

c) Zero

d) Variable

Answer: b) Negative
Explanation: Object distance is measured opposite to the incident ray direction.

19. **What is the sign of focal length for a concave lens?**

    a) Positive

    b) Negative

    c) Zero

    d) Infinite

    Answer: b) Negative
    Explanation: Concave lenses have a virtual focus, assigned a negative sign.

20. **An object is 60 cm from a convex lens ($f = 20\,\text{cm}$). Where is the image? (Application)**

    a) 30 cm

    b) 60 cm

    c) 15 cm

    d) 40 cm

    Answer: a) 30 cm
    Explanation: Using $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$, $\frac{1}{20} = \frac{1}{v} - \frac{1}{-60}$, so $v = 30\,\text{cm}$.

21. **What is the magnification if an object is 90 cm from a convex lens and the image is 30 cm away? (Application)**

    a) -1/3

    b) 1/3

    c) -3

    d) 3

    Answer: a) -1/3
    Explanation: $m = \frac{v}{u} = \frac{30}{-90} = -\frac{1}{3}$, indicating an inverted, diminished image.

22. **What does a negative magnification indicate?**

    a) Erect image

    b) Inverted image

    c) Virtual image

    d) Diminished image

    Answer: b) Inverted image
    Explanation: Negative magnification indicates an inverted, typically real image in convex lenses.

23. **What is the power of a lens with a focal length of 25 cm? (Application)**

    a) +4 D

b) -4 D

c) +0.25 D

d) -0.25 D

Answer: a) +4 D
Explanation: $f = 0.25\,\text{m}$, $P = \frac{1}{f} = \frac{1}{0.25} = +4\,\text{D}$, for a convex lens.

24. **What is the power of a concave lens with a focal length of 50 cm? (Application)**

a) +2 D

b) -2 D

c) +0.5 D

d) -0.5 D

Answer: b) -2 D
Explanation: $f = -0.5\,\text{m}$, $P = \frac{1}{-0.5} = -2\,\text{D}$.

25. **What does a +2.00 D spectacle prescription indicate? (Application)**

a) Concave lens, 50 cm focal length

b) Convex lens, 50 cm focal length

c) Concave lens, 2 m focal length

d) Convex lens, 2 m focal length

Answer: b) Convex lens, 50 cm focal length
Explanation: $P = +2\,\text{D}$, $f = \frac{1}{2} = 0.5\,\text{m} = 50\,\text{cm}$, indicating a convex lens.

26. **Which lens is used as the objective in a compound microscope?**

a) Concave, long focal length

b) Convex, short focal length

c) Concave, short focal length

d) Convex, long focal length

Answer: b) Convex, short focal length
Explanation: The objective forms a magnified real image, requiring a short focal length convex lens.

27. **Where is the object placed in a compound microscope? (Application)**

a) At F_o

b) Beyond $2F_o$

c) Between F_o and $2F_o$

d) Between F_o and O

Answer: c) Between F_o and $2F_o$
Explanation: This position produces a real, magnified image for the eyepiece.

28. **What is the role of the eyepiece in a telescope? (Application)**

    a) Collects light

    b) Forms real image

    c) Magnifies objective's image

    d) Diverges light

    Answer: c) Magnifies objective's image
    Explanation: The eyepiece, a convex lens, forms a virtual, magnified image of the objective's image.

29. **Why is the objective's aperture larger in a telescope? (Application)**

    a) To reduce magnification

    b) To collect more light

    c) To diverge light

    d) To shorten focal length

    Answer: b) To collect more light
    Explanation: A larger aperture enhances image brightness for distant objects.

30. **Why should you not look at the sun through a telescope? (Application)**

    a) Lens breaks

    b) Image is blurred

    c) Eye damage

    d) No image forms

    Answer: c) Eye damage
    Explanation: Focused sunlight can burn the retina, causing permanent damage.