St John Baptist De La Salle Catholic School, Addis Ababa
Grade 12 Physics
Optics Practice Questions

December 16, 2024

Q1. When a ray of light strikes a plane mirror at an angle of $30°$ to the normal, the angle of reflection is:

(A) $30°$

(B) $60°$

(C) $0°$

(D) $90°$

Q2. A convex mirror always forms an image that is:

(A) Real and inverted.

(B) Virtual and upright.

(C) Virtual and inverted.

(D) Real and upright.

Q3. The focal length of a concave mirror is 15 cm. An object is placed at a distance of 10 cm from the mirror. The image formed will be:

(A) Real, inverted, and larger.

(B) Virtual, upright, and smaller.

(C) Virtual, upright, and larger.

(D) Real, inverted, and smaller.

Q4. Which of the following statements about the law of reflection is true?

(A) The angle of reflection is always greater than the angle of incidence.

(B) The angle of reflection is always less than the angle of incidence.

(C) The angle of reflection is equal to the angle of incidence.

(D) Reflection does not depend on the angle of incidence.

Q5. A ray of light passes through the focal point of a concave mirror and strikes the mirror. After reflection, the ray:

(A) Becomes parallel to the principal axis.

(B) Passes through the center of curvature.

(C) Reflects back along its original path.

(D) Diverges away from the principal axis.

Q6. Which of the following best describes the image formed by a plane mirror?

(A) Virtual, inverted, and smaller.

(B) Virtual, upright, and the same size.

(C) Real, inverted, and the same size.

(D) Real, upright, and magnified.

Q7. A ray parallel to the principal axis of a concave mirror passes through:

(A) The focal point.

(B) The center of curvature.

(C) The mirror's vertex.

(D) A point behind the mirror.

Q8. The magnification of a convex mirror is always:

(A) Greater than 1.   (C) Exactly 1.

(B) Less than 1.   (D) Negative.

Q9. If an object is placed at the center of curvature of a concave mirror, the image formed will be:

(A) Real, inverted, and the same size as the   (C) Real, upright, and reduced.
object.

(B) Virtual, upright, and magnified.   (D) Virtual, inverted, and reduced.

Q10. The radius of curvature of a concave mirror is 30 cm. The focal length of the mirror is:

(A) 15 cm.   (C) 60 cm.

(B) 30 cm.   (D) 90 cm.

Free Response Problems

P1. An object is placed 20 cm in front of a concave mirror with a focal length of 10 cm.

    a. Use the mirror equation to find the image distance.

    b. Determine the nature (real or virtual) and orientation (inverted or upright) of the image.

P2. A convex mirror has a radius of curvature of 40 cm. An object is placed 30 cm from the mirror. Calculate:

    a. The focal length of the mirror.

    b. The position and magnification of the image.

P3. A makeup mirror is a concave mirror with a focal length of 25 cm. If the image formed is twice the size of the object:

    a. Find the object distance.

    b. Verify the result by calculating the image distance.

P4. Using ray diagrams, illustrate the image formation for an object placed:

    a. Beyond the center of curvature of a concave mirror.

    b. At the focal point of a concave mirror.

    c. In front of a convex mirror.

P5. A spherical mirror is used to focus sunlight onto a pipe. The pipe is located at the mirror's focal point, 50 cm away. Calculate the radius of curvature of the mirror. Explain why this setup is effective for heating.

P6. A 5 cm tall object is placed 25 cm in front of a concave mirror with a focal length of 20 cm.

    a. Use the mirror equation to calculate the position of the image.

    b. Determine the size and nature of the image (real or virtual, upright or inverted).

P7. A convex mirror has a focal length of -10 cm. An object is placed 15 cm in front of the mirror. Calculate:

    a. The position of the image.

    b. The magnification and the characteristics of the image.

P8. A concave mirror produces an upright image that is 3 times the height of the object. The focal length of the mirror is 10 cm. Determine the position of the object and image.

P9. A dentist uses a concave mirror with a focal length of 4 cm to examine a tooth. The tooth is located 3 cm from the mirror. Find the position and magnification of the image.

P10. Draw ray diagrams for the following scenarios:

      a. An object placed at infinity for a concave mirror.

      b. An object placed at the focal point of a convex mirror.

      c. An object placed at the center of curvature of a concave mirror.