CHAPTER 11

LIGHT

2-mark questions:

1. Explain the concept of a real image. Give an example.

Answer:

A real image is formed when light rays converge to a point and can be captured on a screen. An example is the image formed by a concave mirror.

2. Differentiate between a concave and a convex mirror based on their characteristics.

Answer:

Concave mirrors can form real and inverted images, while convex mirrors produce erect and virtual images. Concave mirrors converge light, and convex mirrors diverge light.

3. How does a plane mirror form an image, and what are its characteristics?

Answer:

A plane mirror forms a virtual and erect image that is of the same size as the object. The image cannot be obtained on a screen, and left-right reversal occurs.

4. Explain the role of convex mirrors in vehicles.

Answer:

Convex mirrors are used as side mirrors in vehicles. They provide a wider field of view, allowing drivers to see more of the surrounding traffic.

5. Describe the image formed by a convex lens.

Answer:

A convex lens can form both real and inverted images. When the object is close

the image is virtual, erect, and magnified. It is commonly used as a magnifying glass.

6. State the characteristics of the image formed by a plane mirror.

Answer:

Characteristics of the image formed by a plane mirror are as follows:

- Image distance and object distance are equal.
- The size of the object and image are equal.
- The image formed is erect and virtual.
- Images are laterally inverted.

7. Find out the letters of the English alphabet or any other language known to you in which the image formed in a plane mirror appears exactly like the letter itself. Discuss your findings.

Answer:

A, H, I, M, O, T, U, V, W, X, and Y alphabets form images in a plane mirror exactly like the letter itself because these alphabets are laterally symmetric.

8. What is a virtual image? Give one situation where a virtual image is formed.

Answer:

The image that cannot be obtained on a screen is called a virtual image. The image formed by a plane mirror is virtual.

9. State two differences between a convex and a concave lens.

Answer:

Convex Lens	**Concave Lens**
Thick in the middle and thin at the edge.	Thin in the middle and thick at the edge.

The image formed is real or virtual.	The image formed is virtual.

10. Give one use each of a concave and a convex mirror.

Answer:

Concave mirrors are used in the headlights of cars and scooters.

Convex mirrors are used as side-view mirrors in vehicles.

12. Which type of mirror can form a real image?

Answer:

The **concave mirror** can form a real image.

13. Which type of lens always forms a virtual image?

Answer:

A **concave lens** forms a virtual image.

5-mark questions:

1. Explain the phenomenon of dispersion. Provide examples and discuss its implications.

Answer:

Dispersion is the separation of light into its component colors when it passes through a prism. This occurs due to the variation in the speed of different colors of light. An example is a rainbow, where sunlight disperses into its spectral colors. The implications include the use of prisms in optics, as well as the understanding of the colors in natural phenomena.

2. Discuss the formation of images by lenses. Compare and contrast the images formed by convex and concave lenses.

Answer:

Lenses can form real or virtual images depending on the object's position. Convex lenses produce real, inverted images for objects beyond the focal point, while concave lenses always produce virtual, erect images. The magnification and size of the image depend on the object's distance from the lens.

3. Explain the working principle of a camera. Include details about the role of lenses, the formation of images, and the capturing of photographs.

Answer:

Cameras use lenses to focus light onto a photosensitive surface, such as film or a digital sensor. The aperture controls the amount of light

entering. Images are formed based on the principles of lens optics, and the process involves capturing light patterns to create photographs.

4. Elaborate on the applications of total internal reflection. Provide examples and discuss how this phenomenon is utilized in various optical devices.

Answer:

Total internal reflection occurs when light traveling in a denser medium is incident on a less dense medium at an angle greater than the critical angle. This phenomenon is applied in fiber optics for communication, endoscopy, and in devices like prisms and binoculars.

5. Describe the functioning of the human eye as an optical system. Discuss the roles of different components such as the cornea, lens, and retina.

Answer:

The human eye functions like a camera. Light enters through the cornea, passes through the lens, and forms an inverted image on the retina. The retina contains photoreceptor cells that convert light into electrical signals sent to the brain through the optic nerve. The brain interprets these signals as images.

1. Fill in the blanks.

(a) An image that cannot be obtained on a screen is called a _____.

(b) Image formed by a convex _____ is always virtual and smaller in size.

(c) An image formed by a _____ mirror is always of the same size as that of the object.

(d) An image which can be obtained on a screen is called a _____ image.

(e) An image formed by a concave _____ cannot be obtained on a screen.

Answer:

(a) An image that cannot be obtained on a screen is called a **virtual image**.

(b) Image formed by a convex **mirror** is always virtual and smaller in size.

(c) An image formed by a **plane** mirror is always of the same size as that of the object.

(d) An image which can be obtained on a screen is called a **real** image.

(e) An image formed by a concave **lens** cannot be obtained on a screen.

2. Mark 'T' if the statement is true and 'F' if it is false.

(a) We can obtain an enlarged and erect image by a convex mirror. (T/F)

(b) A concave lens always forms a virtual image. (T/F)

(c) We can obtain a real, enlarged and inverted image by a concave mirror. (T/F)

(d) A real image cannot be obtained on a screen. (T/F)

(e) A concave mirror always forms a real image. (T/F)

Answer:

a) False

b) True

c) True

d) False

e) False

3. Match the items given in Column I with one or more items in Column II.

Column-I	Column-II
(a) A plane mirror	(i) Used as a magnifying glass.
(b) A convex	(ii) Can form images of objects spread over a

mirror	**large area.**
(c) A convex lens	**(iii) Used by dentists to see an enlarged image of teeth.**
(d) A concave mirror	**(iv) The image is always inverted and magnified.**
(e) A concave lens	**(v) The image is erect and of the same size as the object.**
	(vi) The image is erect and smaller in size than the object.

Answer:

Column-I	**Column-II**
(a) A plane mirror	(v) The image is erect and of the same size as the object.
(b) A convex mirror	(ii) Can form an image of objects spread over a large area.
(c) A convex lens	(i) Used as a magnifying glass.

(d) A concave mirror	(iii) Used by dentists to see an enlarged image of teeth.
(e) A concave lens	(vi) The image is erect and smaller in size than the object.

11. A virtual image larger than the object can be produced by a

(I) concave lens (ii) concave mirror

(iii) convex mirror (iv) plane mirror

Answer:

The correct answer is option (ii) concave mirror.

12. David is observing his image in a plane mirror. The distance between the mirror and his image is 4 m. If he moves 1 m towards the mirror, then the distance between David and his image will be

(I) 3 m (ii) 5 m

(iii) 6 m (iv) 8 m

Answer:

The answer is option (iii) 6 m

13. The rearview mirror of a car is a plane mirror. A driver is reversing his car at a speed of 2 m/s. The driver sees in his rearview mirror the image of a truck parked behind his car. The speed at which the image of the truck appears to approach the driver will be

(I) 1 m/s (ii) 2 m/s

(iii) 4 m/s (iv) 8 m/s

Answer:

The correct answer is option (iii) 4 m/s.

Summary:

Light exhibits various phenomena, including dispersion, where a prism separates it into different colors, as seen in a rainbow. Lenses play a crucial role in forming images; convex lenses produce real, inverted images, while concave lenses create virtual, erect images. Cameras utilize lenses to focus light onto photosensitive surfaces, with aperture controlling light entry. Total internal reflection finds applications in fiber optics for communication and devices like endoscopes and prisms. The human eye functions as a biological camera, with light entering through the cornea, forming images on the retina, and translating into electrical signals for interpretation by the brain via the optic nerve. These principles underlie fundamental concepts in optics and vision.