# CHAPTER – 4 LIGHT ENERGY [EXERCISE SOLUTIONS]

## A. Choose the correct option :

**1. The angle of incidence on a plane mirror is $30^0$. The angle of reflection will be :**
(a) $30^0$ (b) $60^0$
(c) $15^0$ (d) $0^0$
**Answer : (a)** $30^0$

**2. Which of the following will produce diffuse reflection of light?**
A. Plane mirror B. Piece of paper
C. Still water in lake D. Leather bag
(a) A and B (b) B and C
(c) A and D (d) B and D
**Answer : (d)** B and D

**3. If you stand 1 m in front of a plane mirror, how far away would you see yourself in the mirror?**
(a) 1 m (b) 2 m
(c) 3 m (d) 4 m
**Answer : (b)** 2 m

**4. The images formed on the plane mirror is :**
(a) real (b) virtual
(c) diverging (d) converging
**Answer : (b)** Virtual

**5. Which one of the following is the best reflector of light?**
(a) Plastic plate (b) Plane mirror
(c) Wall (d) Paper
**Answer : (b)** Plane mirror

**6. The plane mirror forms a :**
(a) virtual image (b) real image
(c) inverted image (d) magnified image
**Answer : (a)** virtual image

**7. The interchange of left and right between an object and its image is called :**
(a) lateral inversion (b) refraction
(c) reflection (d) scattering
**Answer : (a)** lateral inversion

**8. The primary colours are :**
(a) red, blue and yellow
(b) magneta, yellow and cyan
(c) red, blue and red
(d) blue, green and red
**Answer : (d)** blue, green and red

## B. Write T for true and F for False statements :

**1. The bouncing back of light into its original medium after striking a surface is called refraction of light.**
**Answer :** False.

**2. When a parallel beam of light strikes a rough surface, the light rays reflects in different directions producing diffused reflection.**
**Answer :** True.

**3. The angle of incidence is always equal to angle of reflection.**
**Answer :** True.

**4. The image of the right hand in a plane mirror looks like left hand.**
**Answer :** True.

**5. A virtual image may be inverted or erect.**
**Answer :** False.

**6. The image formed by a plane mirror is a real image.**
**Answer :** False.

**7. In irregular reflections, we can see objects clearly.**
**Answer :** False.

**8. The image formed by a plane mirror is diminished.**
**Answer :** False.

**9. A ray of light obtained as a result of reflection from a surface is called an incident ray.**
**Answer :** False.

**10. In reflection, the angle of incidence is always greater than the angle of reflection.**
**Answer :** False.

**11. The image formed by a plane mirror is of the same size as the object.**
**Answer :** True.

## C. Fill in the blanks :

**1. A black surface reflects almost……light.**
**Answer :** no

**2. The polished, shiny and smooth surfaces reflect light in a…….way.**
**Answer :** regular

**3. A narrow beam of light is called a……**
**Answer :** ray

**4. The perpendicular to the surface at the point of incidence is called the…….**
**Answer :** Normal.

**5. ……mirrors are used in making periscopes.**
**Answer :** Plane

**6. The……image is just an illusion.**
**Answer :** virtual

**7. The retina of the human eye has…….. receptors for coloured light.**
**Answer :** photoreceptors

**8. Any three colours that produce white light when combined with the correct intensity are called……colours of light.**
**Answer :** primary

**9. The production of various colours of light by the mixing of the three primary colours of light is known as……**
**Answer :** colour addition

**10. A rainbow is always formed in the direction opposite to the position of the…….**
**Answer :** sun

## D. Match the following :

| | |
|---|---|
| 1. Incident ray | (a) A line drawn perpendicular to the reflecting surface at the point of incidence |
| 2. Point of incidence | (b) A light ray falling on a reflecting surface |
| 3. Normal | (c) Angle between the normal and the incidence ray |
| 4. Reflected ray | (d) The point where the incident ray strikes |
| 5. Angle of incidence | (e) Angle between the normal and reflected rays |
| 6. Angle of reflection | (f) A polished surface which can reflect back the rays of light |
| 7. Reflecting surface | (g) Ray of light that returns back |

**Answer : 1 – (b)** A light ray falling on a reflecting surface
**2 – (d)** The point where the incident ray strikes
**3 – (a)** A line drawn perpendicular to the reflecting surface at the point of incidence
**4 – (g)** Ray of light that returns back
**5 – (c)** Angle between the normal and the incidence ray
**6 – (e)** Angle between the normal and reflected rays
**7 – (f)** A polished surface which can reflect back the rays of light

## E. Answer the following questions in short.

**1. What is reflection?**
**Answer :** The process of sending back the light rays which fall on the surface of an object, is called reflection of light.

**2. What are the uses of plane mirror?**
**Answer : (i)** Plane mirrors are used at home to view ourselves.
**(ii)** Plane mirrors are used in making periscopes.
**(iii)** Plane mirrors are fixed on the walls of certain shops (like jewellery shops) to make the shops look bigger.

**3. State the difference between real and virtual images.**
**Answer :** Difference between virtual image and real image are :

| | Real Image | Virtual Image |
|---|---|---|
| **1.** | A real image is formed by actual intersecting of the reflected light rays. | A virtual image is formed when reflected rays appear to meet when produced in backdward direction. |
| **2.** | It can be obtained on screen. | It cannot be obtained on screen. |
| **3.** | A real image is always inverted. | A virtual image is always erect. |
| **4.** | It is formed on the same side of the mirror. | It is formed on the backside of the mirror. |

**4. State the characteristics of the image formed by a plane mirror.**
**Answer : (i)** The image formed in a plane mirror is virtual (or unreal). It cannot be obtained on a screen.
**(ii)** The image formed in a plane mirror is at the same distance behind the mirror as the object is in front of it.
**(iii)** The image in a plane mirror is of the same size as the object. It is neither enlarged nor diminished.
**(iv)** The image in a plane mirror is erect. It is the same side up as the object.
**(v)** The image in a plane mirror is laterally inverted (sideways reversed) with respect to the object.

**5. Define dispersion.**
**Answer :** Dispersion is defined as the splitting of light in different colours.

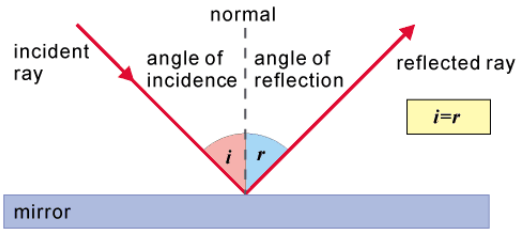
**6. What are primary colours? Name them.**
**Answer :** Any three colours that produce white light when combined with the correct intensity are called primary colours of light.

**7. What is a pure pigment? Which colour's light do the green pigments absorb?**
**Answer :** A pigment that absorbs a single frequency or colour of light is known as a pure pigment.
Green pigments absorb Magneta light.

**8. What is a rainbow?**
**Answer :** A band of colours in the sky extending from violet to red is called a rainbow.

## F. Answer the following questions in detail.

**1. Draw a diagram and explain the laws of reflection.**
**Answer :** When a ray of light is reflected from a surface, the reflected ray obeys certains laws. These are called the laws of reflection.




**(i) First law of reflection :** The angle of incidence is always equal to the angle of reflection.
Angle of incidence = Angle of reflection

**(ii) Second law of reflection :** The incidence ray, the reflected ray and the normal to the mirror at the point of incidence, all lie in the same plane.

**2. Explain the characteristics of the image formed by a plane mirror with the help of an example.**
**Answer :** Characteristics of the image formed by a plane mirror :
**(i)** The image formed in a plane mirror is virtual (or unreal). It cannot be obtained on a screen.
**(ii)** The image formed in a plane mirror is at the same distance behind the mirror as the object is in front of it.
**(iii)** The image in a plane mirror is of the same size as the object. It is neither enlarged nor diminished.
**(iv)** The image in a plane mirror is erect. It is the same side up as the object.
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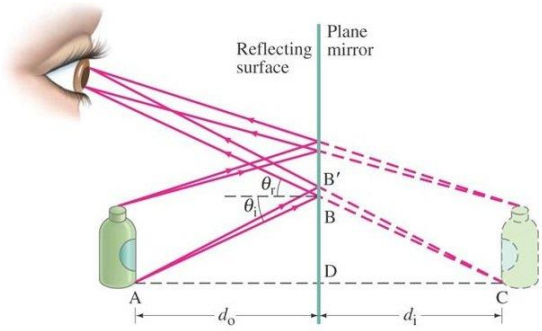


**3. Explain the importance of colour subtraction with an example.**

**Answer :** The process of color subtraction is a useful means of predicting the ultimate color appearance of an object if the color of the incident light and the pigments are known. By using the complementary color scheme, the colors of light that will be absorbed by a given material can be determined.

These colours are subtracted from the incident light colours (if present) and the colours of reflected light (or transmitted light) can be determined. Then the color appearance of the object can be predicted.

**4. Explain the formation of rainbow.**

**Answer :** A rainbow is formed by the refraction, reflection and dispersion of the sunrays through raindrops. A rainbow is a natural spectrum which appears in the sky after rain. The sunrays are dispersed by the water droplets present in the atmosphere. The water droplets act as small prisms which refract and disperse the sunrays falling on them. The sunrays emerging out of the water droplets are refracted again. A rainbow is always formed in the direction opposite to the position of the sun.