

परमाणु ऊर्जा शिक्षा संस्था , मुंबई

Atomic Energy Education Society, Mumbai

Session : 2023 – 24

Class: X
MATHEMATICS

Subject:

WORKSHEET NO.- 1

Name of the Chapter : LIGHT – REFLECTION AND REFRACTION

General Instructions:

1. There are 5 sections in this worksheet.
2. Section – A has 10 multiple choice questions of 1 mark each.
3. Section – B has 10 very short answer questions of 1 mark each.
4. Section – C has 10 short answer questions of 2 marks each.
5. Section – D has 5 short answer questions of 3 marks each.
6. Section – E has 5 long answer questions of 5 marks each.
7. Draw neat diagrams wherever necessary.
8. Use of calculator is not permitted.

SECTION – A

- 1 The angle of incidence for a ray of light passing through the centre of curvature of a concave mirror is: [1]
 - a) 45 degree
 - b) 90 degree
 - c) 180 degree
 - d) 0 degree
- 2 On which of the following, the efficient working of optical fibre works upon? [1]
 - a) Scattering of light
 - b) Reflection of light
 - c) Refraction of light
 - d) Total internal reflection
- 3 The image of a distant object is obtained on a screen by using a concave mirror. The focal length of the mirror can be determined by measuring the distance between [1]

- a) the mirror and the screen
 - b) the object and the screen
 - c) the object and the mirror
 - d) None of these
- 4 The angle between an incident ray and the plane mirror is 30° . The total angle between the incident ray and reflected ray will be: **[1]**
- a) 120°
 - b) 90°
 - c) 60°
 - d) 30°
- 5 The lateral displacement of an incident ray passing out of a rectangular glass slab **[1]**
- a) independent of the thickness of the glass slab.
 - b) None of these
 - c) is directly proportional to the thickness of the glass slab.
 - d) inversely proportional to the thickness of the glass slab.
- 6 What is not a characteristic of a rearview mirror in a car? **[1]**
- a) They give a virtual image
 - b) Convex in nature
 - c) Concave in nature
 - d) They have wider field of coverage
- 7 A convex lens has a focal length of 40 cm. Calculate its power. **[1]**
- a) 2.5 D
 - b) 3.5 D
 - c) 6.6 D
 - d) 4.5 D
- 8 A ray of light passes from glass into air. The angle of refraction will be: **[1]**
- a) greater than the angle of incidence
 - b) equal to the angle of incidence
 - c) smaller than the angle of incidence
 - d) 45 degrees

- 9 Refractive indices of water, sulphuric acid, glass, and carbon disulphide are 1.33, 1.43, 1.53, 1.63 respectively. The light travels slowest in: [1]
- a) sulphuric acid
 - b) water
 - c) glass
 - d) carbon disulphide
- 10 In which of the following, the image of an object placed at infinity will be highly diminished and point sized? [1]
- a) Concave mirror only
 - b) Convex lens only
 - c) Concave mirror, convex mirror, concave lens and convex lens
 - d) Convex mirror only

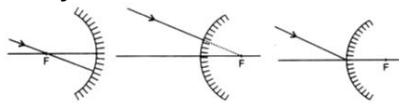
SECTION - B

- 11 Which kind of mirrors are used in the headlights of a motor - car and why? [1]
- 12 List four precautions which a student should observe while determining the focal length of a given convex lens by obtaining image of a distant object on a screen. [1]
- 13 What is meant by magnification? Write its expression [1]
- 14 What is absolute refractive index? [1]
- 15 Light travels from a rarer to a denser medium. How will [1]
- 1. the energy carried, and
 - 2. the wavelength of the light wave, be affected?
- 16 Name a point inside a lens such that a ray of light passing through it goes undeviated. [1]
- 17 Define the term angle of refraction. [1]
- 18 Which type of mirror is usually used as a rear - view mirror in motor cars? [1]
- 19 The radius of curvature of a spherical mirror is 20 cm. What is its focal length? [1]
- 20 Name two types of spherical mirrors. [1]

SECTION - C

- 21 If the image formed by a lens for all positions of an object placed in front of it is always erect and diminished, what is the nature of this lens? Draw a ray diagram to justify your answer. If the numerical value of the power of this lens is 10 D, what is its focal length in the Cartesian system? [2]

- 22 What is the relationship between the refractive index of two media? [2]
- 23 Velocity of light in diamond is $1.2 \times 10^8 \text{ ms}^{-1}$ and in vacuum, it is $3 \times 10^8 \text{ ms}^{-1}$, what is refractive index of diamond? [2]
- 24 Where should an object be placed in case of a convex lens to form an image of same size as of the object? Show with the help of ray diagram the position and the nature of the image formed. [2]
- 25 What is mirror formula? Does this formula hold good for a plane mirror? [2]
- 26 State and explain the factors on which lateral shift depends. [2]
- 27 Draw the following diagram, in which a ray of light is incident on a concave/convex mirror, on your answer sheet. Show the path of this ray, after reflection, in each case. [2]



- 28 What are the laws of refraction of light? How can these be verified experimentally? [2]
- 29 In what S.I unit is the power of lens stated? A convex lens has a focal length of 50 cm. calculate its power? [2]
- 30 State the laws of refraction of light. Explain the term **absolute refractive index of a medium** and write an expression to relate it with the speed of light in vacuum. [2]

SECTION - D

- 31 One - half of a convex lens is covered with a black paper. Will this lens produce a complete image of the object? Verify your answer experimentally. Explain your observations. [3]
- 32
1. Define focal length of a divergent lens. [3]
 2. A divergent lens of focal length 30 cm forms the image of an object of size 6 cm on the same side as the object at a distance of 15 cm from its optical centre. Use lens formula to determine the distance of the object from the lens and the size of the image formed.
 3. Draw a ray diagram to show the formation of image in the above situation.
- 33 A pencil when dipped in water in a glass tumbler appears to be bent at the interface of air and water. Will the pencil to be bent to the same extent, if instead of water we use liquids like, kerosene or turpentine? Support your answer with reasons. [3]
- 34 Sudha finds out that the sharp image of window pane of her science laboratory is formed at a distance of 15 cm from the lens. She now tries to focus the building visible of her outside the window instead of the window pane without disturbing the lens. In which direction will she move the screen to obtain a sharp image of the building? What is the approximate focal length of this lens? [3]
- 35 The refractive indices 1.0003, 1.31 1.5 respectively of Air, Ice and Benzine in [3]

which of these does the light travels fastest?Why?

SECTION – E

- 36 Under what condition in an arrangement of two plane mirrors, incident ray and reflected ray will always be parallel to each other, whatever may be angle of incidence. Show the same with the help of diagram. [5]
- 37 A student wants to project the image of a candle flame on the walls of the school laboratory by using a mirror. [5]
1. Which type of mirror should he use and why?
 2. At what distance, in terms of focal length f of the mirror, should he place the candle flame to get the magnified image on the wall?
 3. Draw a ray diagram to show the formation of the image in this case.
 4. Can he use this mirror to project a diminished image of the candle flame on the same wall State 'how' , if your answer is 'yes' and why not', if your answer is 'no'.
- 38 1. Define optical centre of spherical lens. [5]
2. A divergent lens has a focal length of 20 cm. At what distance should an object of height 4 cm from the optical centre of the lens be placed, so that its image is formed 10 cm away from the lens. Find the size of the image also.
 3. Draw a ray diagram to show the formation of image in above situation.
- 39 It is desired to obtain an erect image of an object, using concave mirror of focal length of 12 cm. [5]
1. What should be the range of distance of an object placed in front of the mirror?
 2. Will the image be smaller or larger than the object? Draw ray diagram to show the formation of image in this case.
 3. Where will the image of this object be, if it is placed 24 cm in front of the mirror? Draw ray diagram for this situation also to justify your answer. Show the positions of pole, principal focus and the centre of curvature in the above ray diagrams.
- 40 How are the images formed in convex mirror when object is moved from infinity to the mirror? [5]
