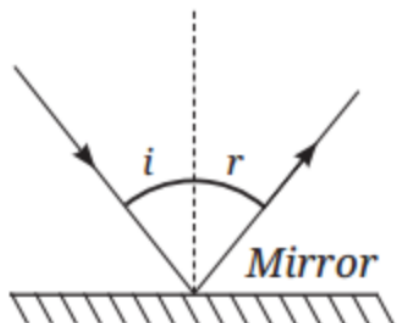


* Choose the correct alternative from those given below question

[24]

1. A light ray is incident on a mirror and gets reflected by it (Figure). The angle made by the incident ray with the normal to the mirror is 40° . What is the angle made by the reflected ray with the mirror?



- (A) 40° (B) 50° (C) 45° (D) 60°

Ans. : (B) 50° ,

(ii) If the incident ray makes a 40° angle with the normal, then:

Angle of incidence (i) = 40°

According to the law of reflection,

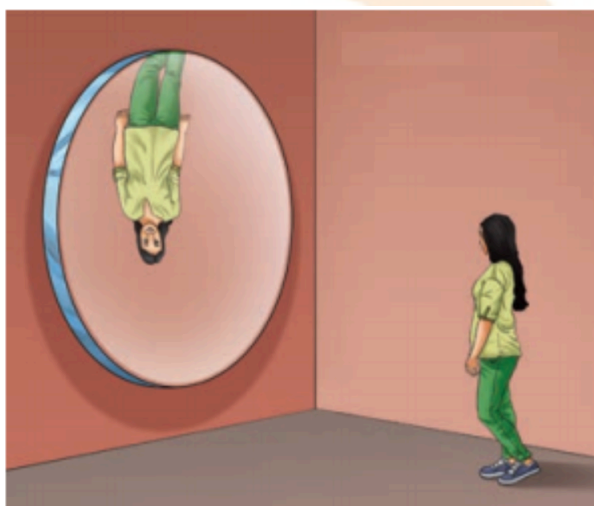
Angle of reflection (r) = Angle of incidence (i) = 40°

Now, Angle between reflected ray and mirror = 90° – angle of reflection

= $90^\circ - 40^\circ$

= 50°

2. In a museum, a woman walks towards a large convex mirror (Figure). She will see that:



- (A) Her erect image keeps decreasing in size.
 (B) her inverted image keeps decreasing in size.
 (C) her inverted image keeps increasing in size, and eventually it becomes erect and magnified.



(D) Her erect image keeps increasing in size.

Ans. : (A) her erect image keeps decreasing in size. Because a convex mirror always forms a virtual, erect, and diminished image.

3. **Assertion:** Convex mirrors are preferred for observing the traffic behind us.

Reason: Convex mirrors provide a significantly larger view area than plane mirrors.

(A) Both Assertion and Reason are correct, and Reason is the correct explanation for Assertion.

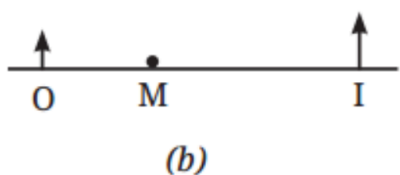
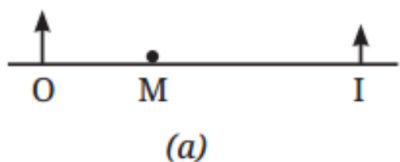
(B) Both Assertion and Reason are correct, but Reason is not the correct explanation for Assertion.

(C) Assertion is correct, but Reason is incorrect.

(D) Both Assertion and Reason are incorrect.

Ans.: (A) Both Assertion and Reason are correct, and Reason is the correct explanation for Assertion.

4. In the Figure, note that O stands for object, M for mirror, and I for image.



Which of the following statements is true?

(A) Figure (a) indicates a plane mirror, and Figure (b) indicates a concave mirror.

(B) Figure (a) indicates a convex mirror and Figure (b) indicates a concave mirror.

(C) Figure (a) indicates a concave mirror and Figure (b) indicates a convex mirror.

(D) Figure (a) indicates a plane mirror, and Figure (b) indicates a convex mirror.

Ans. : (B) Figure (a) indicates a convex mirror and Figure (b) indicates a concave mirror.

5. What makes objects visible?

(A) Absorption of light

(B) Emission of heat

(C) Reflection of light

(D) Refraction of light

Ans. : (C) Reflection of light

6. The angle between the incident ray and the normal is called:

(A) Angle of reflection

(B) Angle of incidence

(C) Critical angle

(D) Reflected angle

Ans. : (B) Angle of incidence

7. What type of reflection occurs from rough surfaces?

(A) Regular reflection

(B) Diffused reflection

(C) Total internal reflection

(D) Multiple reflection

Ans. : (B) Diffused reflection

8. Which mirror always forms a virtual, diminished image?

(A) Plane mirror

(B) Concave mirror

(C) Convex mirror

(D) None of the above

Ans. : (C) Convex mirror

9. What is lateral inversion?

(A) Upside-down image

(B) Enlargement of image

(C) Left and right reversal

(D) Reduction of image size

Ans. : (C) Left and right reversal

10. What kind of image is formed by a plane mirror?

(A) Real and inverted

(B) Virtual and erect

(C) Magnified and real

(D) Reduced and virtual

Ans. : (B) Virtual and erect

11. Which lens converges light rays?

(A) Concave lens

(B) Convex lens

(C) Plane lens

(D) Cylindrical lens

Ans. : (B) Convex lens

12. What is the bending of light called when it passes from one medium to another?

(A) Reflection

(B) Refraction

(C) Dispersion

(D) Absorption

Ans. : (B) Refraction

13. Which lens is used to correct myopia (short-sightedness)?

(A) Convex lens

(B) Concave lens

(C) Plane mirror

(D) Prism

Ans. : (B) Concave lens

14. A lens that is thicker at the center than at the edge is:

(A) Concave lens

(B) Convex lens

(C) Diverging lens

(D) Flat lens

Ans. : self

15. A concave lens is also known as:

(A) Converging

(B) Positive

(C) Diverging

(D) Real lens



Ans. : self

16. The focus of a convex lens is a point where:
- (A) Diverging rays appear to come from
 - (B) Parallel rays diverge after passing through the lens
 - (C) Parallel rays converge after passing through the lens
 - (D) Rays reflect back

Ans. : self

17. Which lens can form a real image?
- (A) Concave lens
 - (B) Convex lens only
 - (C) Both (a) and (b)
 - (D) None of the above

Ans. : self

18. Which mirror is used in the Washroom or the dressing Table?
- (A) Convex Mirror
 - (B) Concave Mirror
 - (C) Plane Mirror
 - (D) Transparent

Ans. : self

19. The Angle between the incident ray and the normal is called
- (A) Angle of reflection
 - (B) Angle of incidence
 - (C) Angle of deviation
 - (D) Focal angle

Ans. : self

20. If for any plane mirror the angle of incidence is 45° , what will be the angle of reflection?
- (A) 30°
 - (B) 45°
 - (C) 60°
 - (D) 90°

Ans. : self

21. The direction of the angle of incidence is
- (A) Towards the mirror
 - (B) Away from the mirror
 - (C) Parallel to the surface of the mirror
 - (D) None of the above

Ans. : self

22. A Concave mirror is ground in
- (A) Outward
 - (B) Inward
 - (C) Flat
 - (D) Zig-Zag

Ans. : self

23. The laws of reflection state that

- (A) Angle of incidence \neq Angle of reflection
- (B) Angle of incident $>$ Angle of reflection
- (C) Angle of incident $<$ Angle of reflection
- (D) Angle of incident = Angle of reflection

Ans. : self

24. A mirror is made by polishing glass from:

- (A) One Surface
- (B) Two Surfaces
- (C) No Surface
- (D) Multiple Surface

Ans. : self

* Give two points of differences

[4]

25. Differentiate between a concave mirror and a convex mirror based on shape, nature of the image formed, and their two uses.

Ans. :

Feature	Concave Mirror	Convex Mirror
Shape	Curved inward, like the inside of a spoon	Curved outward, like the back of a spoon.
Nature of Image	It can form both real and virtual, inverted and erect, and magnified, diminished, or same-sized images, depending on object position It can form both real and virtual, inverted and erect, and magnified, diminished, or same-sized images, depending on object position	Always forms virtual, erect, and diminished images.
Two Uses	- Shaving mirrors/Dentists' mirrors. - Headlights of cars/Searchlights.	- Rear-view mirrors in vehicles. - Security mirrors in shops

26. Differentiate between a concave lens and a convex lens based on their shape, the nature of the image formed, and their two primary uses.

Ans. :

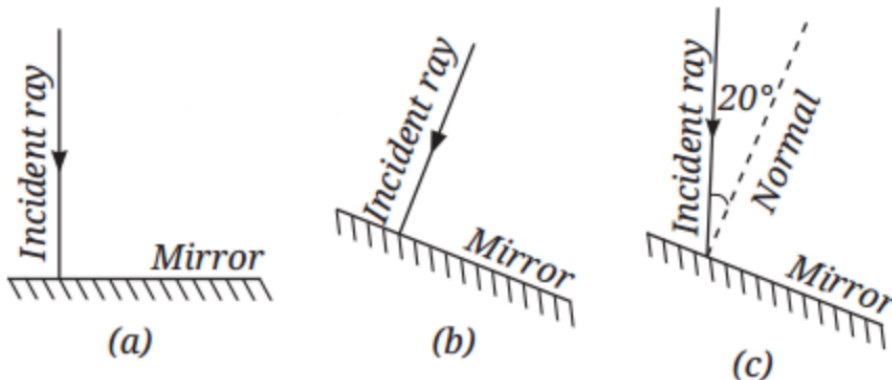
Feature	Concave Lens	Convex Lens
Shape	Thinner in the middle and thicker at the edges. (Diverging lens)	Thicker in the middle and thinner at the edges. (Converging lens)
Nature of Image	Always forms virtual, erect, and diminished images.	It can form both real and virtual, inverted and erect, and magnified, diminished, or unchanged-sized images, depending on the object's position.

Two Uses	- Correcting short-sightedness - (Myopia)Peepholes in doors	- Magnifying glass - Used in cameras, microscopes, and telescopes
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* Answer the following as requested in detail.

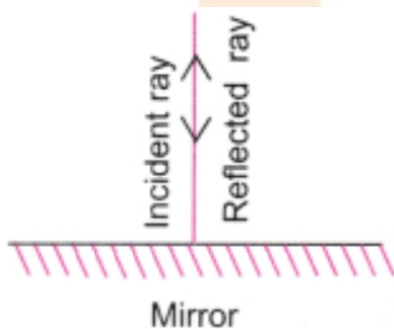
[10]

27. The figure shows three different situations where a light ray falls on a mirror:



1. The light ray falls along the normal.
 2. The mirror is tilted, but the light ray still falls along the normal to the tilted surface.
 3. The mirror is tilted, and the light ray falls at an angle of 20° from the normal.
- Draw the reflected ray in each case (Use a ruler and protractor for accurate drawing). What is the angle of reflection in each case?

Ans. : 1. Light ray falls along the normal



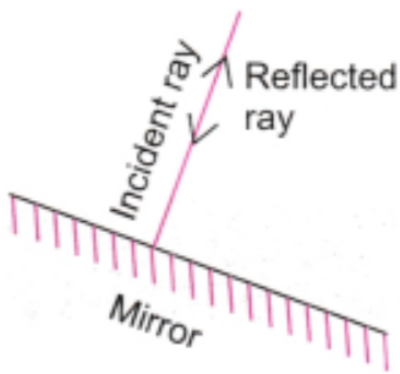
Angle of incidence = 0°

Angle of reflection = 0°

The ray retraces its path. It reflects straight back along the same line.

2. The mirror is tilted, but the light ray still falls along the normal to the tilted surface

Student Bro



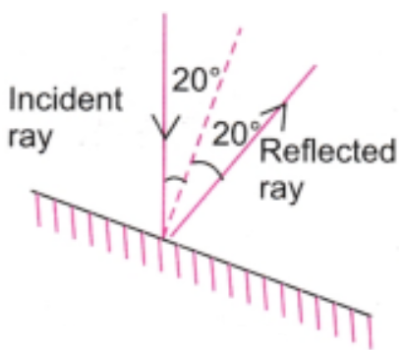
Even though the mirror is tilted, the ray is still perpendicular to the surface.

Angle of incidence = 0°

Angle of reflection = 0°

The ray again retraces its path — the tilt doesn't affect the reflection if the ray is normal to the surface.

3. The mirror is tilted, and the light ray falls at 20° from the normal



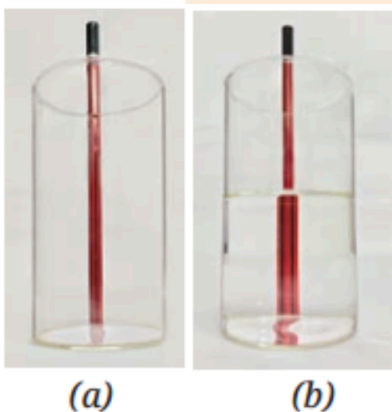
Angle of incidence = 20°

By the law of reflection:

Angle of reflection = 20°

The reflected ray will make a 20° angle with the normal, on the opposite side.

28. Place a pencil behind a transparent glass tumbler (Figure a). Now fill the tumbler halfway with water (Figure b). How does the pencil appear when viewed through the water? Explain why its shape appears changed.



Ans. : When we place a pencil behind a transparent glass tumbler and fill the tumbler halfway with water, the pencil will appear to be bent or broken at the point where it enters the water. The submerged portion of the pencil might also appear slightly thicker or shifted from its actual position. This phenomenon is called refraction of light.

Why it Happens

Change in medium: Light travels at different speeds in different materials (media). Air is an optically rarer medium, meaning light travels faster in it, compared to water, which is an optically denser medium where light travels more slowly.

Bending of Light (Refraction): When light rays from the pencil travel from the water (denser medium) into the air (rarer medium) and then into our eyes, their speed changes. This change in speed causes the light rays to bend or deviate from their original path. Specifically, when light goes from a denser medium to a rarer medium, it bends away from the normal (an imaginary line perpendicular to the surface at the point where light enters the new medium).

Apparent Position: Because our brains interpret light rays as traveling in straight lines, the bending of light at the water-air interface makes the submerged part of the pencil appear to be at a different location than its actual position, creating the illusion of a bent or broken pencil. The extent of this bending depends on the angle at which we view the pencil and the difference in optical density between the two media (water and air). If we view the pencil straight from above, we won't observe the bending as the light rays would be traveling perpendicular to the surface, and refraction would be minimal.

*** Fill in the blanks:**

[18]

29. A plane mirror has a flat _____ surface.

Ans. : Reflecting

30. The angle between the normal and the incident ray is called the _____

Ans. : Angle of Incidence

31. The angle between the normal and the reflected ray is called the _____

Ans. : Angle of Reflection

32. The image formed in a plane mirror is Virtual, Erect, and _____

Ans. : Laterally Inverted

33. A _____ lens is thicker at the middle than at the edges.

Ans. : Convex

34. A _____ lens is thinner at the middle than at the edges.

Ans. : Concave

35. The human eye uses a _____ lens to form an image on the retina.



Ans. : Convex

36. A periscope uses _____ to reflect light and allow observation around corners or obstacles.

Ans. : Mirrors

37. A lens is a piece of transparent material bounded by _____ surfaces.

Ans. : self

38. A Convex lens is _____ in the middle and thinner at the edges.

Ans. : self

39. A Concave lens is _____ in the middle and thicker at the edges.

Ans. : self

40. A Convex lens is called _____ lens.

Ans. : self

41. A Concave lens is called _____ lens.

Ans. : self

42. The point where light rays meet after passing through a lens is called the _____

Ans. : self

43. The line passing through the optical center of the lens is called _____ axis.

Ans. : self

44. The real image is formed when rays _____ meet a point.

Ans. : self

45. Concave lenses form images that are always _____ and upright.

Ans. : self

46. Virtual image can only be seen by the _____

Ans. : self

*** Answer the following questions in short.**

[68]

47. Do lenses also converge or diverge the light beam?

Ans. : Yes, lenses can both converge and diverge light beams. Convex lenses converge (focus) light, while concave lenses diverge (spread out) light.

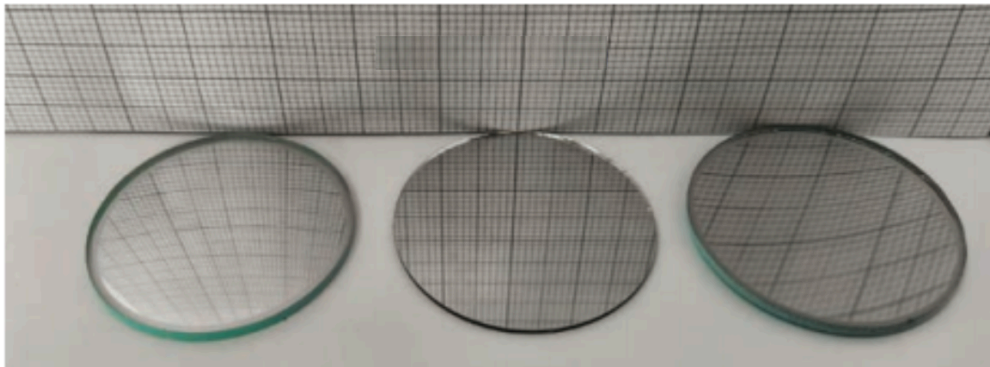
48. Since a convex lens converges a light beam, can it also burn a paper?

Ans. : Yes. In simple terms, the convex lens acts like a magnifying glass, focusing the sun's rays and intensifying the heat at a specific spot, which can be enough to ignite a flammable material like paper.

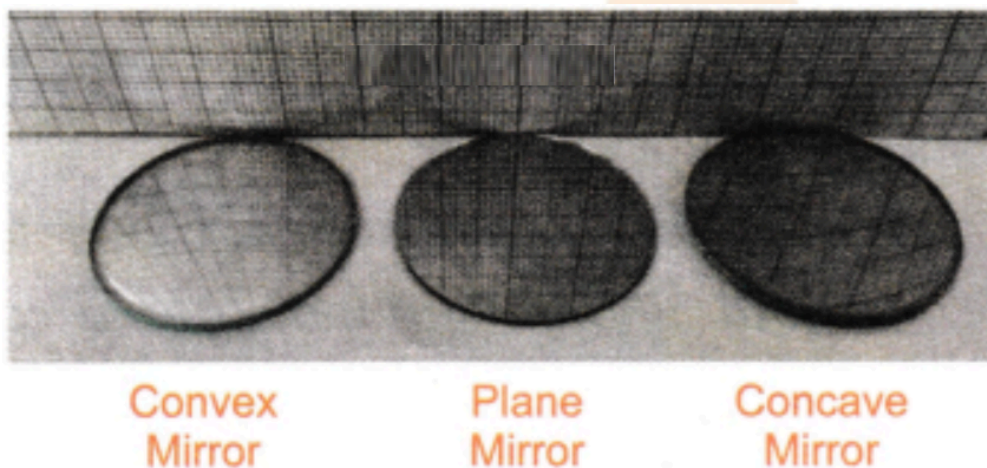
49. Where are all the lenses used?

Ans. : Lenses are used in a variety of applications, both in everyday life and in scientific instruments. These include eyeglasses, cameras, microscopes, telescopes, and projectors, as well as simple magnifying glasses and spyholes indoors.

50. Three mirrors-plane, concave, and convex, are placed in the Figure. Based on the images of the graph sheet formed in the mirrors, identify the mirrors and write their names above the mirrors.



Ans. :



51. State two uses of a concave mirror.

Ans. : Reflecting telescopes gather and focus light from distant objects.
Shaving or makeup mirrors because they magnify the face when held close.

52. State two uses of a convex lens.

Ans. : Magnifying glasses, to enlarge small objects for better visibility.
Cameras and microscopes focus light and form clear, sharp images.

53. What are the characteristics of the image formed by a plane mirror?

Ans. : Characteristics of images formed by a plane mirror are:

- The mirror forms an erect image.
- The image formed is of the same size as the object.
- The distance of the image from the mirror is equal to the distance of the object from the mirror.
- It is virtual; it can't be obtained on a screen.



54. What are the angles of incidence and reflection?

Ans. : - Angle of Incidence: The angle between the normal and the incident ray is called the angle of incidence.- Angle of Reflection: The angle between the normal and the reflected ray is called the angle of reflection.

55. Can we make mirrors that can give enlarged or diminished images?

Ans. : Yes, we can make mirrors that produce enlarged or diminished images. Specifically, concave mirrors can form both enlarged and diminished images depending on the object's distance from the mirror, while convex mirrors always produce diminished images.

56. Which lens converges the light rays?

Ans. : self

57. Which lens diverges the light ray?

Ans. : self

58. Which lens is used in a magnifying glass?

Ans. : self

59. Lenses are made up of which material?

Ans. : self

60. Lenses are also used in electronic devices.

Ans. : self

61. Lens that makes parallel rays of light meet at a point are called.

Ans. : self

62. On what principle does a lens work?

Ans. : self

63. Give the name of an optical instrument that uses a lens.

Ans. : self

64. In your classroom room which instrument uses a lens?

Ans. : self

65. Type of image formed by a Concave lens.

Ans. : self

66. What is a lens?

Ans. : self

67. Name the two main types of lenses?

Ans. : self

68. What is a Convex lens?



Ans. : self

69. What is a Concave lens?

Ans. : self

70. What kind of image does a Concave lens always form?

Ans. : self

71. Write down to everyday uses of a Convex lens.

Ans. : self

72. Can a lens form both virtual and real images?

Ans. : self

73. What is a Real Image?

Ans. : self

74. What is a Virtual Image?

Ans. : self

75. Why does a Concave lens never form a real image?

Ans. : self

76. Explain the difference between Convex and Concave lenses.

Ans. : self

77. How do lenses refract light?

Ans. : self

78. Describe how Concave lenses diverge light. What kind of image do they produce?

Ans. : self

79. Compare properties of lenses based on shape, behaviour, type of image formed, and uses.

Ans. : self

80. Define the principal axis, the optical centre, and the focal point of the lens.

Ans. : self

*** State whether the following sentences are true or false. Correct the false sentences and rewrite them.**

[14]

81. Light always travels in a straight line in a transparent medium.

Ans. : true

82. A virtual image formed by a plane mirror is erect and laterally inverted.

Ans. : true

83. A concave mirror is also known as a converging mirror.

Ans. : true

84. Mirrors help in the refraction of light.

Ans. : false

85. A convex lens is thicker at the edge than at the center.

Ans. : self

86. A concave lens is also called a diverging lens

Ans. : self

87. The focal point of a lens is the point where light rays meet or appear to meet.

Ans. : self

88. A magnifying glass uses a concave lens.

Ans. : self

89. A convex lens can form an inverted image.

Ans. : self

90. The principal axis is a straight line passing through the focal point and optical center.

Ans. : self

91. A concave lens is used in a camera to focus light.

Ans. : self

92. A convex lens can form a virtual image when the object is placed between the lens and its focal point.

Ans. : self

93. Concave lenses are used in flashlights to focus light.

Ans. : self

94. The curvature of a lens affects its focal length.

Ans. : self

*** Answer the following questions in short.**

[36]

95. When the light is incident along the normal on the mirror, which of the following statements is true:

(i) Angle of incidence is 90°

(ii) Angle of incidence is 0°

(iii) Angle of reflection is 90°

(iv) No reflection of light takes place in this case

Ans. : (ii) When light hits a surface at a 90° angle (perpendicular), it is considered to be incident normally.

Angle of incidence = Angle of reflection: In reflection, the angle of the reflected light is always equal to the angle of the incident light. Since the light is hitting the mirror normally (at a 0° angle), the reflected light will also be at a 0° angle.

96. On the side-view mirrors of vehicles, there is a warning that says "Objects in mirror are closer than they appear". Why is this warning written there?

Ans. : The warning "Objects in mirror are closer than they appear" is written on the side-view mirrors of vehicles because these mirrors are typically convex. Convex mirrors make objects appear smaller and farther away than they are, which can lead to misjudging distances. The warning is there to alert drivers to this effect and prevent accidents caused by inaccurate distance perception.

97. Why is there a curved line on some reading glasses?

Ans. : The curved line on reading glasses is due to the convex shape of the lens. These lenses are thicker in the middle and thinner at the edges, causing light rays to converge (bend inward) and improve near vision for individuals with presbyopia. This curvature is essential for correcting the vision by focusing light properly on the retina.

98. How can we distinguish between concave and convex mirrors?

Ans. : To distinguish between concave and convex mirrors, observe how they reflect light and the images they form. Concave mirrors curve inward, causing parallel light rays to converge at a focal point, and can form both real and virtual images. Convex mirrors curve outward, causing parallel light rays to diverge, and always form virtual, diminished images.

99. We have observed images formed by three types of mirrors - plane, concave, and convex. But are there any laws that govern the image formation?

Ans. : Yes, some laws govern image formation by mirrors, including plane, concave, and convex mirrors. These laws are based on the laws of reflection, which state that the angle of incidence (the angle at which light hits the mirror) is equal to the angle of reflection (the angle at which light bounces off the mirror). Additionally, the incident ray, the reflected ray, and the normal (an imaginary line perpendicular to the mirror's surface at the point of incidence) all lie in the same plane.

100. Are the laws of reflection applicable to spherical mirrors also?

Ans. : Yes, the laws of reflection apply to spherical mirrors. These laws state that the angle of incidence is equal to the angle of reflection, and the incident ray, reflected ray, and normal all lie in the same plane. These laws hold for all types of reflecting surfaces, including spherical mirrors like concave and convex mirrors.

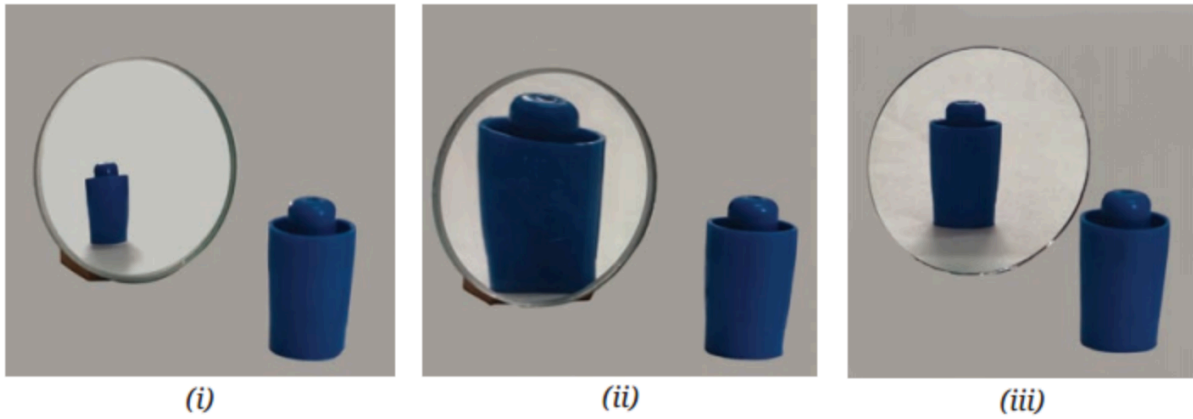
101. What changes can be seen in the objects when viewed through lenses?

Ans. : When an object is viewed through a lens, several changes can be observed in its image compared to the object itself. The most common changes include



alterations in size, orientation, and whether the image is real or virtual. Specifically, concave lenses typically produce diminished, virtual, and upright (erect) images.

102. In the Figure, the cap of a sketch pen is placed in front of three types of mirrors.



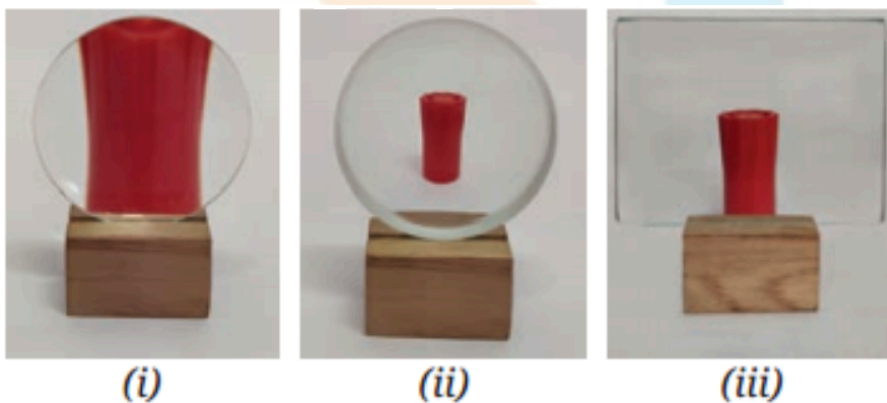
Match each image with the correct mirror.

Image	Mirror
(i)	Plane mirror
(ii)	Convex mirror
(iii)	Concave mirror

Ans. :

Image	Mirror
(i)	Convex mirror
(ii)	Concave mirror
(iii)	Plane mirror

103. In the Figure, the cap of a sketch pen is placed behind a convex lens, a concave lens, and a flat transparent glass piece—all at the same distance.



Match each image with the correct type of lens or glass.

Image	Lens/Glass Type
(i)	Flat transparent glass piece
(ii)	Convex lens
(iii)	Concave lens

Ans. :

Image	Lens/Glass Type
(i)	Convex lens
(ii)	Concave lens
(iii)	Flat transparent glass piece

104. Hold a magnifying glass over the text and identify the distance at which you can see the text bigger than they are written. Now move it away from the text. What do you notice? Which type of lens is a magnifying glass?

Ans. : A magnifying glass uses a convex lens to make text appear larger. When we hold the magnifying glass close to the text and then slowly move it away, the image of the text will first appear larger and sharper, then progressively get larger and more blurred, and finally invert and appear smaller again.

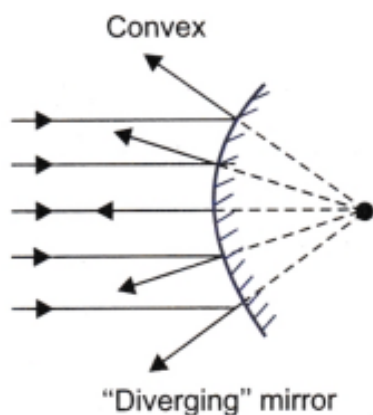
105. Describe the nature of the image formed by:

- A plane mirror.
- A convex mirror.
- A concave mirror.

Ans. : - Plane Mirror: Forms a virtual, upright, same-sized image behind the mirror.
- Convex Mirror: Forms a virtual, upright, diminished image behind the mirror.
- Concave Mirror: Forms a real or virtual image depending on the object's position. Generally, the image is inverted and magnified if real; upright and magnified if virtual.

106. Explain why a convex mirror always forms a virtual and diminished image, irrespective of the object's position.

Ans. : A convex mirror is a diverging mirror, meaning it spreads out parallel light rays after reflection. Its focus (F) and center of curvature (C) are behind the mirror, hence virtual.



When light rays from an object strike a convex mirror, they diverge. These diverging rays, when extended backward, appear to meet at a point behind the mirror, forming a virtual image. Due to this divergence and the geometry, the virtual image

is always formed between the pole and the principal focus, and it is always erect and diminished compared to the object.

* Answer the following questions in one sentence

[12]

107. What makes things visible?

Ans. : When light from an object reflects and enters our eyes, then we see that object.

108. Do we see all objects due to reflected light?

Ans. : Almost everything we see around us can be seen due to reflected light. Moon, for example, receives light from the sun and reflects it. That's why we see the moon.

109. What happens when light falls on a mirror?

Ans. : The mirror is silvered on one side, so it does not allow the light to pass through it. It reflects almost the whole of the light that falls on it.

110. What change in the path of light takes place when light falls on a shiny surface? What is this called?

Ans. : The light reflects in the same plane when light falls on a shiny surface. This is known as the reflection of light.

111. What is a reflected ray?

Ans. : The ray that gets reflected from the surface of a shiny object is known as the reflected ray.

112. What is an incident ray?

Ans. : The ray of light that strikes any surface is called the incident ray.

113. How many reflected rays can there be for a given single incident ray falling on a plane mirror?

Ans. : For one incident ray, there is one and only one reflected ray.

114. How many times is a ray of light reflected by two plane mirrors placed parallel and facing each other?

Ans. : An infinite number of times.

115. The angle between the incident ray and the reflected ray is 60° . What is the value of the angle of incidence?

Ans. : 30°

116. The distance between the object and its image formed by a plane mirror appears to be 24 cm. What is the distance between the mirror and the object?

Ans. : 12 cm

117. Can a real image be obtained on a screen? Explain briefly.

Ans. : Yes, a real image can be obtained on a screen. Real images are formed by the actual convergence of light rays, allowing them to be projected onto a surface.

118. Why is a convex mirror called a diverging mirror?

Ans. : A convex mirror is called a diverging mirror because it reflects light rays outward, making them spread apart and appear to come from a point behind the mirror.

* Match the Following.

[8]

119.

Column I	Column II
(i) Concave mirror	(a) Spherical mirror with a reflecting surface that curves inwards.
(ii) Convex mirror	(b) It forms an image which is always erect and diminished in size.
(iii) Convex lens	(c) Object placed behind it may appear inverted at some distance.
(iv) Concave lens	(d) Object placed behind it always appears diminished in size.

Ans. :

Column I	Column II
(i) Concave mirror	(a) Spherical mirror with a reflecting surface that curves inwards.
(ii) Convex mirror	(b) It forms an image which is always erect and diminished in size.
(iii) Convex lens	(c) An object placed behind it may appear inverted at some distance.
(iv) Concave lens	(d) The object placed behind it always appears diminished in size.

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Column I	Column II
Q.1. Convex lens	(a) Diverges light ray
Q.2. Concave lens	(b) Used in a magnifying glass
Q.3. Convex mirror	(c) Forms a real and inverted image
Q.4. Concave mirror	(d) Used in the rear view mirror
	(e) Can be projected on screen

Ans. : self
