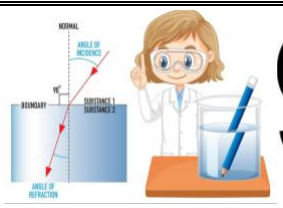
LIGHT
REFLECTION
REFRACTION



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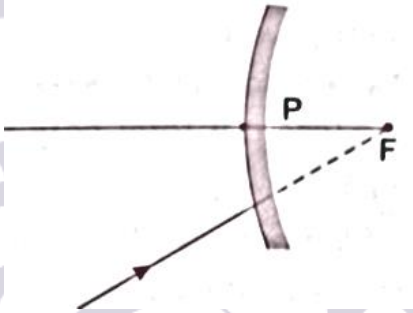
Reflection of light

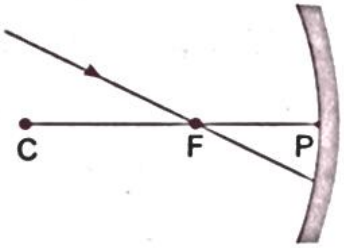
1. List four characteristics of the images formed by clean mirror?
2. What is the magnification of the images formed by plane mirror and why?
3. State the two laws of reflection of light.
4. The angle of incidence for a ray of light having zero reflection angle is
   (a) 90° (*b*) 45° (*c*) 30° (*d*) 0°
5. A ray of light is incident on a plane reflecting surface at angle of incidence of 30°. Then the reflected ray

is deviated by an angle equal to (*a*) 30° (*b*) 150° (*c*) 60° (*d*) 120°

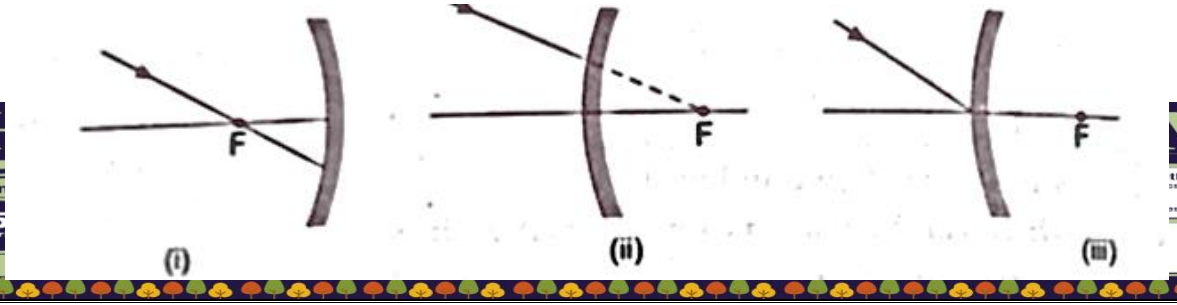
Spherical Mirror

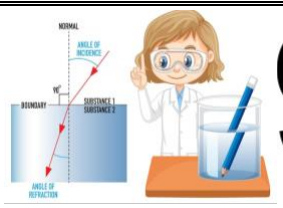
1. State any three difference between real image and virtual image formed by a spherical mirror.
2. Define the following terms in the context of spherical mirrors: (*i*) Pole (*ii*) Centre of curvature (*iii*) Principal axis (*iv*) Principal focus
3. A Ray of light moving along the principal axis is falling on concave mirror. in which direction is it reflected.
4. At what position the object be placed in front of concave mirror to form a real image of the same size 2011
5. What is the minimum distance between an object and its real image in case of concave mirror? 20





6. Complete the path of Ray of light after reflection at the mirror in a given diagram
7. Copy the figure in your answer notebook and show the following of light ray after reflection11
8. If the image formed by a spherical mirror for all position of object placed in front of it is always erect and diminished what type of mirror it is?
9. Name the mirror that is used by a dentist in examining teeth
10. A ray of light is incident on a convex mirror as shown in figure redraw the diagram after completing the path of light ray after reflection from the mirror.
11. Draw ray diagram to show the principal focus of a concave mirror and convex mirror
12. Draw the following diagram figure 10.42 in which a ray of light is incident on a concave or convex mirror on your answer sheet show the path of this ray after reflection in each case.



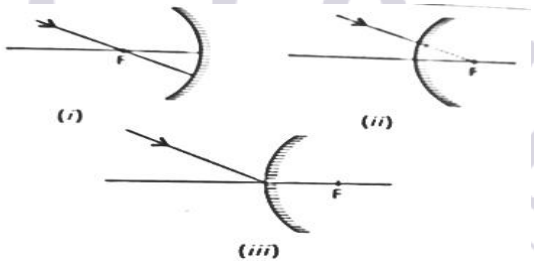


13. **Draw the ray diagram And state the position, The relative size and the nature of image formed by a concave mirror when the object is placed at the centre of curvature of the mirror.**
14. **State two positions in which a concave mirror produces a magnified image of a given object. Two differences between the two images**
15. **Draw ray diagrams to show the all formation of images when the object is placed in front of concave mirror**
    - **A. Between its pole and focus B. Between its centre of curvature and focus**
16. **An concave mirror of focal length 10 centimetre can produce a magnified real as well as virtual image of an object in front of it. Draw a diagram to justify this statement.**
17. **If the image formed by a mirror of all position of the object placed in front of it is always a rat and diminish what type of mirror is it? Draw a red diagram to justify your answer. Where and why do we generally use this type of mirror?**
18. **Neha visited a dentist in his clinic. She observed that the dentist was holding an instrument fitted with a mirror. stated the nature of this mirror and reason for it use in instrument used by dentist**
19. **State the type of mirrors preferred as A. rear view mirror in vehicle B. shaving mirror. Justify your answer giving to reason in each case?**
20. **How can you identify the three type of mirror without touching them?**
21. **Draw re diagrams for the following case when a ray of light**
    - **a) Passing through centre of curvature of a concave mirror is incident on it**
    - **b) Parallel to principle axis is incident On convex mirror**
    - **c) He's passing through of a concave mirror incident on it**
22. **It is desired to obtain an erect Image of an object using concave mirror of Focal length of 12 centimetre**
    - **a) What should be the range of distance of an object placed in front of the mirror?**
    - **b) Will the image be smaller or larger than the object? Chennai Chhoti Baltimore to show the formation of image in this case**
    - **c) Where will the image of this object be , If it is placed 24 centimetre in front of mirror, Draw Ray diagram for this situation also to justify your answer**
23. **To construct a ray diagram we use two ray of light which are so chosen that it is easy to determine the direction after reflection from the mirror. Choose these two rays and state the path of these ray after reflection from concave mirror. Use these two ray to find the nature and position of image of an object placed at a distance of 15 centimetre from a concave mirror of focal length 10 centimetre.**
24. **A student, Holding a mirror in his hand, Directed the Reflecting surface of the mirror towards the sun. He then directed the reflected light on the sheet of a paper held close the mirror.**
    - **a) What should he do to burn the paper?**
    - **b) Which type of mirror does he use?**
    - **c) Will he able to determine the approximate value of focal length of this mirror from this activity? Give reason and draw ray diagram to justify your answer in this case.**
25. **Draw new diagrams to show changes in images formed by a concave mirror, As an object is brought closer to its form infinity to just Near its pole. Write the nature and size of the image in each case.**
26. **Name the type of mirror used by A. dentist And B. in solar furnace give to reason why such mirror are used in each case.**
27. **An object is placed at a distance of 30 centimetres in front of a convex mirror of focal length 15 centimetre write four characteristics of the image found by the mirror.**

28. The magnification produced by a spherical mirror is minus 3. List four information you obtain from this statement about the mirror/ image

29. List two possible way in which a concave mirror can produce a magnified image of an object please in front of it. State the difference if any between these two images

30. 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



31. A concave mirror of focal length 'f' Can form a magnified is erect as well as an inverted image of an object placed in front of it. justify this statement stating the position of an object with respect to the mirror in each case for obtaining these image

32. A student wants to project the image of a candle flame on a screen 48CM in front of a mirror by keeping the flame at a distance of 12 centimetre from its pole .

- **a) Suggest the type of mirror he should use'**
- **b) Find the linear magnification of the image produced**
- **c) How far the image from its object**
- **d) Draw re diagram to show the image formation in this case**

33. To construct a re diagram we use two light ray which are so chosen that it is easy to know their direction after reflection from the mirror. List these two rays and state the path of these rays after reflection. Use this to re to locate the image of an object place between Infinity and centre of curvature of a concave mirror

34. A spherical mirror "A" always form an erect image of an object and others spherical mirror "B" forms erect as well as inverted image of an object. State with reason the type of Spherical Mirror A and B and draw ray diagram showing formation of these images to justify your answer

35. A student wants to project the image of candle flame on the wall of school laboratory by using a mirror.

- **a) Which type of mirror should he use and why**
- **b) At what distance in terms of focal length f of the mirror should he placed the candle flame so as to get the magnified image on the wall**
- **c) Can he use this mirror to project a diminish image of the candle flame on the same wall? State how if your answer is yes and why not if your answer is not**

36. It is desire to obtain an erect image of an object using concave mirror or focal length of 12 centimetre

- **a) What should be the range of distance of an object place in front of mirror?**
- **b) Will the image be smaller or larger than the object?**
- **c) Where will the image of this object be, If it is place 24 centimetre in front of mirror?**

State the position of the pole, The principal focus and the centre of curvature in above ray diagram

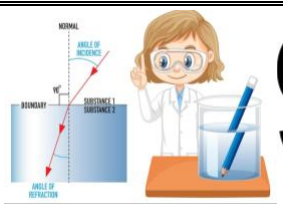
37. Draw a ray diagram to show the path of the reflected ray In each of the following case
A ray of light incident on a convex mirror

- **a) Parallel to its principal axis**

b) Is directed towards the principal focus

NUMERCIAL

1. A concave mirror used for rear view on an automobile has radius of curvature of three metre. If a bus is located at 5 metre from the mirror, Find the position nature and size of image.
2. An object is placed perpendicular to the principal axis of a convex mirror of focal length 10 centimetre. The distance of the object from the pole of the mirror is 10CM find the position of image formed.
3. An object for centimetre Height, Is placed at 15 centimetre in front of concave mirror of a focal length 10 centimetre. At what distance from the mirror should be screen be placed to obtain a sharp image of object. Calculate the height of the image.
4. A concave mirror has a focal length of 20 centimetre. At what distance from the mirror should A four centimetre tall object be placed so that it forms an Image at a distance of of 30 centimetre from the mirror? Also calculate the size of image formed
5. A security mirror used in a big showroom has radius of curvature 5 metre. If a customer is standing at a distance of 20 metre from the cash counter, Find the position, Nature and size of image formed in the security mirror .
6. The magnification produced when an object is placed at a distance of 20 centimetre from a spherical mirror is +1/2 where should the object be placed to reduce the magnification +1/3
7. A spherical mirror produce an image of magnification minus 1 on the screen placed at a distance of 50 centimetre from the mirror.
   a) Write the type of the mirror
   b) Find the distance of the image from the object
   c) What is the focal length of the mirror.
8. The image of an object formed by a mirror is real , inverted and is of magnification -1. If the image is at a distance of 40 centimetre from the mirror where is the object placed? Where would the image be if the object is moved 20 centimetre towards the mirror? State the reason and also draw ray diagram for new position of the object to justify your answer
9. An object 4 centimetre in size is placed 25 centimetre in front of a concave mirror of a focal length 15 centimetre
   a) At what distance from the mirror should a screen be placed in obtain a sharp image
   b) Find the size of the image
10. A Concave mirror produce 3 times magnified image on a screen. If the object is placed 20 centimetre in front of mirror how far is screen from the object?
11. The linear magnification produced by a spherical mirror is –1/5. Analysing this value state the (*i*) type of spherical mirror and (*ii*) the position of the object with respect to the pole of the mirror. Draw ray diagram to justify your answer.
12. A student has focussed the image of an object of height 3 cm on a white screen using a concave mirror of focal length 12 cm. If the distance of the object from the mirror is 18 cm, find the values of following:
    (*i*) Distance of the image from the mirror
    (*ii*) Height of the image [CBSE 2023]
13. Draw a diagram and apply Cartesian sign conventions for calculating the focal length and nature of a spherical mirror which forms a 1/3 times magnified virtual image of an object placed 18 cm in front of it.



14. "The linear magnification produced by a spherical mirror is +1/3. Analysing this value state the (*a*) type of mirror and (*b*) position of the object with respect to the pole of the mirror. Draw ray diagram, to justify your answer.

15. An object 4 cm in height, is placed at 15 cm in front, of a concave mirror of focal length 10 cm. At what distance from the mirror should a screen be placed to obtain a sharp image of the object. Calculate the height of the image.

16. A real image,1/5 th the size of object is formed at a distance of 18 cm from a mirror. What is the nature of mirror? Calculate its focal length. [DoE]

17. An object of height 4 cm is kept at a distance of 30 cm from the pole of a diverging mirror. If the focal length of the mirror is 10 cm, the height of the image formed is [CBSE 2021]

(*a*) + 3.0 cm (*b*) + 2.5 cm (*c*) + 1.0 cm (*d*) + 0.75 cm

CASE-BASED QUESTIONS

1. Study the data given below showing the focal length of three concave mirror A B and C and the respective distance of object plays in front of mirror

Case	Mirror	Focal length in cm	Object distance
1	A	20	45
2	B	15	30
3	C	30	30

a) In which of the following case the mirror will form a diminished image of object justify your answer?

b) List two property of image formed in case 2

c) What is the nature and size of image formed by mirror c? Draw re diagram to justify your answer

d) An object is placed at a distance of 18 cm from the pole of a concave mirror of a focal length 12 centimetres. Find the position of the image formed in this case.

2. With the help of mirrors, we can form a variety of images. For example, in plane mirrors, images are the same size as the object and are located behind the mirror. Dental mirrors may produce a magnified image while security mirror in shops, on the other hand, form images that are smaller than the object. These images can be either real or virtual depending upon the position of object. The real image can be obtained on the screen only when the reflected rays meet actually. Virtual image does not form on the screen because after reflection, the reflected rays appear to meet.

(*a*) What are the advantages and disadvantages of using a convex mirror for seeing traffic at the rear?

(*b*) Name the mirror that can give an erect and enlarged image of the object.

(*c*) An object is placed at the distance of 10 cm, 20 cm, 30 cm and 40 cm respectively from a concave mirror of focal length 15 cm. Which position of the object will produce (*i*) virtual image and (*ii*) an image of same size?

Or

(b) **What does the negative sign in the value of magnification produced by a mirror indicate about a image?**

3. **Hold a concave mirror in your hand and direct its reflecting surface towards the sun. Direct the light reflected by the mirror on to a white card-board held close to the mirror. Move the card-board back and forth gradually until you find a bright, sharp spot of light on the board. This spot of light is the image of the sun on the sheet of paper; which is also termed as "Principal Focus" of the concave mirror. [CBSE 2023]**

(*a*) List two applications of concave mirror.

(*b*) If the distance between the mirror and the principal focus is 15 cm, find the radius of curvature of the mirror.

(*c*) Draw a ray diagram to show the type of image formed when an object is placed between pole and focus of a concave mirror. *Or*

(*c*) An object 10 cm in size is placed at 100 cm in front of a concave mirror. If its image is formed at the same point where the object is located, find:

(*i*) focal length of the mirror, and (*ii*) magnification of the image formed with sign as per Cartesian Sign convention.

4. **Read and answer questions from Q. 1 to Q. 5:**

any four Rear view mirror is a device that allows the driver to see rear ward. It usually finds its place at the top of windscreen in side the cabin. This device is one of the most basic but essential safety devices in the vehicle. It provides assistance the driver during overtaking, parking in reverse gear etc. Generally, vehicles also have a pair of mirrors attached to the body from outsider They are popular as 'side mirrors' or Outer Rear View Mirrors (ORVM) which serve the same purpose. Almost all modern cars mount their side mirrors on the doors-normally at A-pillar rather than the wings (the portion of the body above the wheel well)

i. **A real image of an object is to be obtained. The mirror required for this purpose is:**
(a) convex mirror (b) concave mirror (c) plane mirror (d) either convex or concave mirror

ii. **A boy is standing in front of and close to a special mirror. He finds the image of his head bigger than normal, the middle part of his body of the same size, and his legs smaller than normal. The special mirror is made up of three types of mirrors in the following order from top downwards:**
(a) Convex, Plane, Concave (b) Plane, Convex, Concave (c) Concave, Plane, Convex (d) Convex, Concave, Plane

ii. **A convex mirror is used:**
(a) by a dentist. (b) for shaving.(c) as a rear view mirror in vehicles. (d) as a light reflector for obtaining a parallel beam of light.

v. **Linear magnification (m) produced by a rear view mirror fitted in vehicles:**
(a) is equal to one (b) is less than one (c) is more than one (d) can be more or less than one depending on the position of object.

v. **A concave mirror cannot be used as:**
(a) a magnifying mirror (b) a torch reflector (c) a dentist's mirror (d) a rear view mirror

5. **Read the following and answer any four questions from Q. 6 to Q. 10:**

An Overhead Projector (OHP), like a film or slide projector; uses light to project an enlarged image on a screen. In the OHP, the source of the image is a page-sized sheet of transparent plastic film (also known as foils) with the image to be projected either printed or hand-written/ drawn. These are

placed on the glass surface of the projector, which has a light source below it and a projecting mirror and lens assembly above it as shown in the figure.

i. Based on the diagram shown, what kind of lens is used to make the overhead projector.
(a) concave lenses (b) convex lenses (c) bifocal lenses (d) flat lenses

ii. The image obtained will be erect and real. How?
(a) The image when passed through the lens was erect and was directly obtained on the screen.
(b) The image when passed through the lens was inverted and then it gets reflected on the mirror to be obtained on the screen.
(c) The screen used automatically makes the image erect and real.
(d) Both (b) and (c)

ii. Why is concave mirror used and not convex mirror in this projector?
(a) because concave mirror can give real image.
(b) because convex mirror can give real image.
(c) because concave mirror cannot give real image.
(d) because convex mirror cannot give virtual image.

v. If the radius of curvature of concave mirror is 12 cm. Then, the focal length will be:
(a) 12 cm (b) 6 cm (c) -24 cm (d) -6 cm

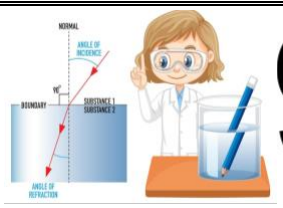
v. The power of a convex lens is that of a concave lens is and
(a) positive, negative (b) positive, positive (c) negative, positive (d) negative, negative

III. Read the following and answer any four questions from Q. 11 to Q. 15:
A mirror is a surface that reflects a clear image. Images can be of two types: Real image and virtual image. An image that can be formed on the screen is known as a real image and the one which cannot be formed on the screen is known as a virtual image. These images are formed when light falls on a mirror from the object and is reflected back by the mirror on the screen.
One useful tool that is frequently used to depict this idea is known as a ray diagram. A tay diagram is a diagram that traces the path than light takes in order for a person to view a point on the image of an object. On the diagram, rays (lines with arrows) are drawn for the incident ray and the reflected ray.

1.A ray diagram used arrow type lines to represent incident ray and the reflected ray. It also helps to trace the direction in which light travels.
Convex mirror always forms, an image:
(a) Virtual, erect and enlarged. (b) Virtual, inverted and enlarged. (c) Virtual, erect and diminished. (d) Real, erect and diminished.

2. A convex lens forms the image of sun at:
(a) C (b) focus (c) pole (d) between focus and pole

3. A concave lens can form a real and inverted image, when:
(a) Object is placed at 2F. (b) Object is placed beyond 2F. (c) Object is placed between f and 2F.
(d) It can never form a real and inverted image.

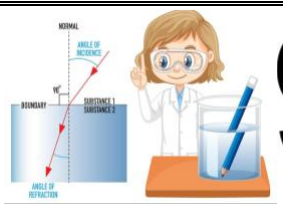


4. An object is placed beyond 2F, in front of a convex lens, image will be formed:
(a) between F and 2F (b) at focus (c) at the centre of curvature (d) between focus and Optical centre.

5. An object is placed at focus of a concave mirror, image will be formed at:
(a) focus (b) between F & C (c) beyond C (d) at infinity

Refraction of light

1. **Give a formula to fine refractive index of a glass lab in term of angle of incident and angle of refraction.**
2. **The radius of curvature of a concave mirror is 50 centimetre. Will shoot an object be placed from the mirror so as to form it image at Infinity?**
3. **Define refractive index of a medium.**
4. **Refractive index of water with respect to air is 1.33. What is the reflective index of air with respect to water**
5. **Why does a ray of light band from its bath when its travels from one medium to another?**
6. **What happens to a ray of light when it's travel from one medium to another having equal refractive index?**
7. **For the same angle of incident of 45 degree, The refraction angle in the transparent medium P and Q his 20 degree and 30 degree respectively. Which medium is optically denser out of P and Q and why?**
8. **Array of light travelling from medium X enters obliquely into another medium Y. If it bends away from the normal then state which One of the two is relatively optical denser ?why?**
9. **Draw a ray diagram showing refraction of a light ray from a refracting glass slab?**
10. **what is the lateral displacement of the light ray passing through a glass slab?**
11. **What are the two factors on which the lateral displacement of an emergency from a class lab depends?**
12. **For the same angle of incident of 45 degree, The refraction angle is three transparent medium A,B,C Are 25 degree 30 degree and 35 degree respectively. In which medium is the speed of the light minimum and in which medium maximum**
13. **The refractive index of glass is 1.5. What is meant by this statement?**
14. **What do you mean by refractive index of one transparent medium with respect to another? How is it related to absolute refractive indices of two media?**
15. **The refractive index of diamond is 2.42 what is the meaning of this statement.**
16. **Name a liquid whose mass density is less than that of water but it is optically denser than water**
17. **The absolute refractive indices of benzene and kerosene are 1.50 and 1.44 respectively what is the respect what is the Refractive index of benzene with the respect to kerosene?**
18. **Calculate the refractive index of the material of a glass slab. Given that the speed of light through the glass slab is 2 x 10^8metre per second and in air 3x 10^8m/s**



19. State the law of refraction of light.

20. Explain the term absolute reflective index of a medium Android and expression to relate it with the speed of light in vacuum

21. Light enters from air into water which has a refractive index of 1.33. Calculate the speed of light in water. The speed of light in air is $3x\ 10^8 m/s$

22. Draw a ray diagram to show refraction through a rectangular glass lab. How is the emergent ray related to incident ray ? What is the lateral displacement

23. The refractive index of Medium X with the respect of medium Y is 2/3 And the refractive index of medium y with respect to medium Z is 4/3 . Find the refractive index of Medium Z with respect to medium X. If the speed of light in X $3x\ 10^8 m/s$ the medium calculate the speed of light in medium Y

24. The absolute refractive indices of two media A and B are 2 and 1.5 respectively. If the speed of light in medium B is $2x\ 10^8 m/s$, Calculate the speed of light in vacuum and medium A

25. Refractive indices of media A B C and D are given below
In which of these four media is the speed of light minimum and maximum
Find the refractive index of medium C with respect to medium B

Media	A	B	C	D
Refractive index	1.33	1.44	1.52	1.65

26. Differentiate between a glass slab and glass prism. What happens when a narrow beam of A. monochrome light B. white passes through glass lab and glass prism

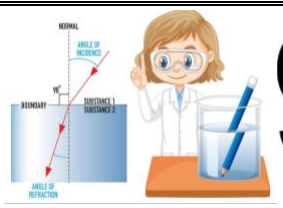
- **Glass slab is a transparent object having six rectangular faces. Glass prism is a transparent object made of glass having two triangular ends and three rectangular sides.**
- **The light emerges from a parallel-sided glass In refraction through a glass prism, the emergent slab in a direction parallel with that in which it ray is not parallel to the incident ray. enters the glass slab.**
- **The angle of emergence is equal to the angle of incidence. The incident ray, when produced, cuts the emergent ray at an angle called angle of deviation**

(i) When a narrow beam of <u>mono- chromatic light passes through a glass slab</u>, the emergent ray coming out of the glass slab is parallel to the incident ray and laterally displaced.

(ii) When a narrow beam of <u>white light travelling in a glass slab comes out into air obliquely</u> then the part of light wave on the left side of beam of light emerges out into the air first and right side of beam of light emerges out into air little later

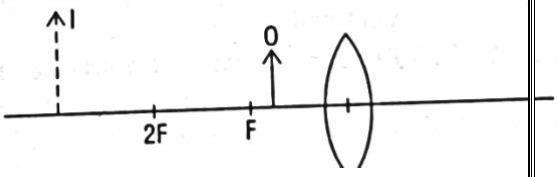
(iii) When a ray of <u>monochromatic light passes through a prism</u>, it bends towards the base of the prism (thicker part).

(iv) If a narrow beam <u>of white light is passed through a prism</u>, the white light splits to form a band of seven Colour



Refraction By Spherical lens

1. **Define a lens.**
2. **Define power of a lens and write it SI unit**
3. **Write the relationship between the si unit of the power of a lens and si unit of focal length**
4. **An image of the same size of an object is formed in convex lens. where is the object situated and where is the image formed.**
5. **Name the type of lenses used to obtain(1) an erect enlarged and virtual image of an object (2)an erect diminished and virtual image of an object**
6. **State the condition under which a light ray passes undeviated through a lens**
7. **Name the lens which can be used as a magnified glass**
8. **Which type of lenses has a negative power**
9. **To thin lenses of power P1 and P-2 are placed in contact .what is the power of the combination?**
10. **What is the difference between virtual image of an object formed by a concave lens and that formed by a convex lens**
11. **During its passage from one medium to another where does a light ray changes its path?**
12. **What do you mean by positive and negative sign of magnification?**
13. **Define optical centre of a lens. What happens when a ray of light passes through the optical centre of the lens?**
14. **Define principle focus and focal length of a lens. Draw ray diagram to show the position of principal focus of a lens.**
15. **Show the path of reflected ray form on reflection through a spherical lens (1)when incident is parallel to the principal axis of lens (2) Incident Ray passes through principal focus of lens**
16. **Draw a ray diagram to show the formation of image by a convex lens when an object is placed in front of lens between its optical centre and principal focus**
    In the above ray diagram mark the object distance and the image distance with their proper sign and state how these distances were related to focal length of the convex lens in this case.
17. **Write the relationship among the object distance, image distance and focal length of a spherical lens and spherical mirror**
18. **Draw a ray diagram to show the formation of image an object plays between Infinity and optical centre of a concave lens. State the characteristics of image formed**
19. **Rishi went to Palmist to show his palm. The palmist used a spherical lens for this purpose(1) State the nature of the lens and reason for it use(2) State showed the palmist placed or or hold the lens as to have a real and magnified image of object.**
20. **The diagram given below show an object O and image I**

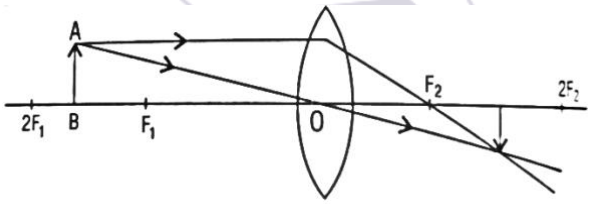


Without actually drawing the ray diagram state the follow

A. Type of lens converging or diverging

B. Name two optical instrument Where such an image is obtained
C. List three characteristics of the image formed if the lenses is placed by a concave mirror of focal length F and the object is placed at a distance F/2 in front of mirror.

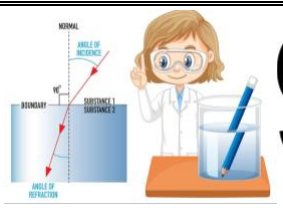
21. An object is placed at a distance of 10 centimetre from optical centre of a convex lens of a focal length 15CM Draw and labelled Ray diagram to show the information of image in this case
22. Draw an ray diagram in each of following case to show the information of image, When the object is placed
    A. Between optical sector and principal focus of a convex lens
    B. Anywhere in front of concave lens
    C. At 2F of convex length
23. An object is placed at a distance of 30 centimetre from a concave lens of a focal length 15CM list 4 characteristics
24. You are provided with two convex lenses of focal length 15 centimetre and 25 cm respectively which of the 2 is of larger power give your reason.
25. What is a lens? List two main categories of lenses. In which category is double concave length placed?



26. Study the following ray diagram and list 2 mistakes committed by the student while tracing it rectify these mistakes by drawing the correct ray diagram to show the real position and the size of image corresponding to the position of the object AB
27. A student places a candle flame at a distance of 60 centimetre from a convex lens of focal length 10 centimetre and focuses the image of the flame on the screen. After that he gradually moves the flame towards the lens and each time focus the image on the screen
    A. In which direction toward or away from the lens does he move the screen to focus the image?
    B. How does the size of the image changes?
    C. How does the intensity of image changes as the flame moves towards the lens?
    D. Approximately four watt distance between the flame and the lens, the image formed on the screen is inverted and of the same size
28. A student wants to project the image of A candle flame on the wall of school laboratory by New using lens
    a. Which type of the lens should he use and why
    b. At what distance in term of focal length F of the lens should he place the candle flame as so to get 1. A magnified 2. A diminished image respectively on the wall

NUMERICAL

1. A concave lens of focal length 15 centimetre forms an image 10CM from the lens calculate the object distance ,the nature and magnification of imaged formed



2. **A 5 centimetre tall object is placed perpendicular to the principal axis of convex lens of focal length 20 centimetre. The distance of the object from the lens is 30CM find the position nature and the size of the image**
3. **All lens produce a magnification of minus 0.5. Is this a convergent or diverging lens? If the focal length of the lens is 6CM, Draw a ray diagram showing the image information in this case**
4. **What is meant by Power of lens ? A student uses a lens of focal length 40 centimetre and another of -20 centimetre write the nature and power of each case.**
5. **Find the power of a convex lens which form a real and inverted image of magnification -1 of an object placed at a distance of 20 centimetre from its optical centre**
6. **An object placed on a metre scale of 8 centimetre marked was focussed on the white screen at placed at 92 centimetre mark using a converging lens placed on the scale of at 50 centimetre**
   a. **Find the focal length of the converging lens**
   b. **Find the position of the image formed if the object is shifted towards the lens at the position of 29 centimetre**
   c. **State the nature of the image from if the object is further shifted towards the lens**
7. **A divergent lens has a focal length of 20 centimetre. At what distance should an object of height 4 centimetre from the optical centre of the lens be place so that its image is formed 10 Centimetre away from the lens find the size of the image also**
8. **A convex lens of focal length 15 centimetre forms a real image at a distance of 20 centimetre from its optical centre. Find the position on the object. Is the image formed by the lens magnified or diminished?**
9. **Draw a diagram of the focal length of a spherical mirror which form a three time magnified real image of the object placed 16 centimetre in front of it.**
10. **List the new cartesian sign convention for the reflection of light by Spherical Mirror. Draw a ray diagram and apply this convention for calculating the focal length and nature of Spherical Mirror which forms a 1/3 times magnified virtual image of an object placed 18 centimetre in front of it.**
11. **An object is placed at a distance of 60 centimetre from a concave lens of focal length 30 centimetre**
    a. **Use the lens formula to find the distance of image from the lens**
    b. **List four characteristics of the image**
    c. **Draw a ray diagram to justify your answer of a part B**
12. **List four characteristics of the image formed by a convex lens win an object is placed between its optical centre and principal focus**

    The size of image of an object by a concave lens of focal length twenty centimetre is observed to be reduced 1/3rd of its size. Find the distance of object from the lens
13. **A convex lens of a focal length 25 centimetre and a concave lens of focal length10 cm are placed in close contact with each other calculate the lens power of this combination**
14. **You have two lenses A and B a focal length +10cm and -10 cm respectively. State the Nature and the power of each lens. Which of the two lenses will form a virtual and magnified image of an object placed at eight centimetre from lens and draw a ray diagram to justify your answer**

15. **If the image formed by a lens for all position of an object plays 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 minus 10 D, What is its focal length in the cartesian system?**
16. **The image of a candle flame placed at a distance of 45 centimetre from a spherical lens is formed on a screen placed at a distance of 90 centimetre from the lens. Identify the type of lens and calculate its focal length. If the height of the flame is two centimetre find the height of its image.**
17. **The image of a candle flame placed at a distance of 30 centimetre from a spherical lens is formed on a screen placed on the other side of lens at distance of 60 centimetre from the optical centre of the lens. Identify the type of lens and calculate its focal length if the height of the flame is 3CM find the height of the image**

CASE-BASED QUESTIONS

1. **Analyse the following observation table showing variation of image distance with object distance in the case of convex lens and analyse the question that follows without doing any calculation**

S.NO	Object distance	Image distance
1.	-1OO	+25
2.	-60	+30
3.	-40	+40
4.	-30	+60
5.	-25	+100
6.	-15	+120

(A) What is the focal length of convex lens? Give reason to justify your answer
(B) Write the serial number of the observation which is not correct. on what basis have you arrived this conclusion
(C) Select an appropriate scale and draw a red diagram for the observation at S.NO 2 and also find the approximate value of the magnification