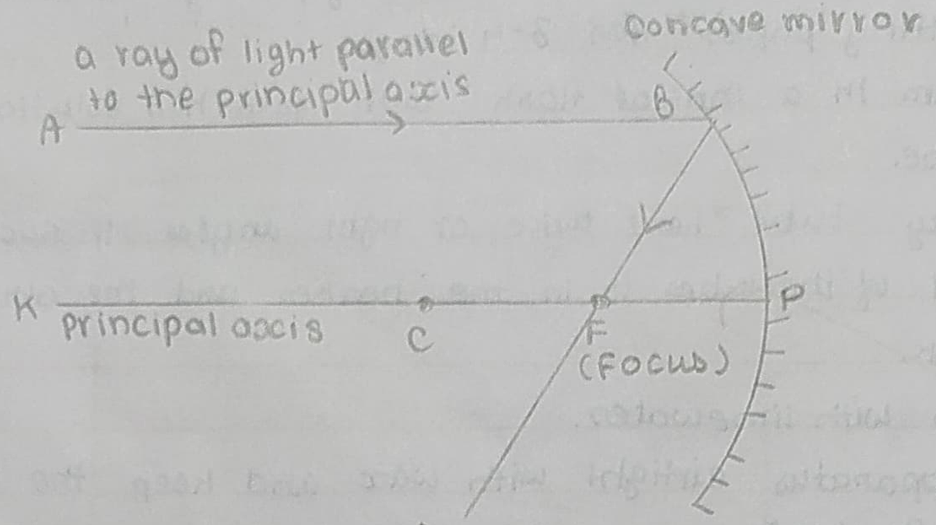
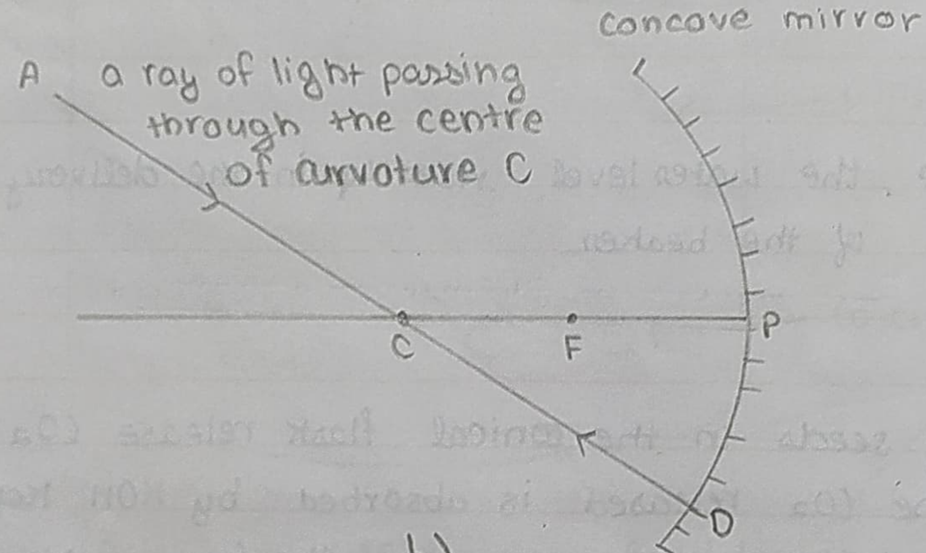
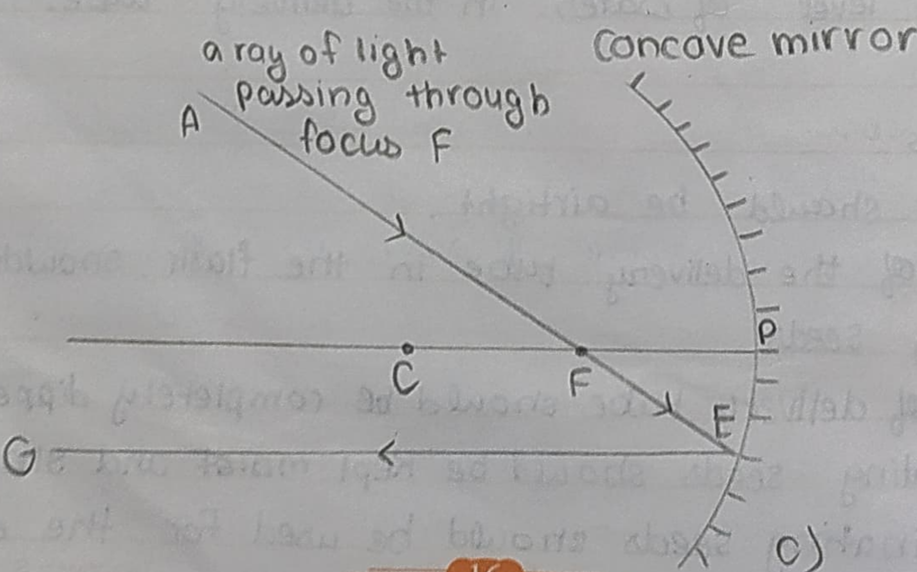
AIM - To determine the focal length of a concave mirror by obtaining the image of a distant object.



a)



b)



c)

Experiment - 2

AIM - To determine the focal length of a concave mirror by obtaining the image of a distant object.

Materials required

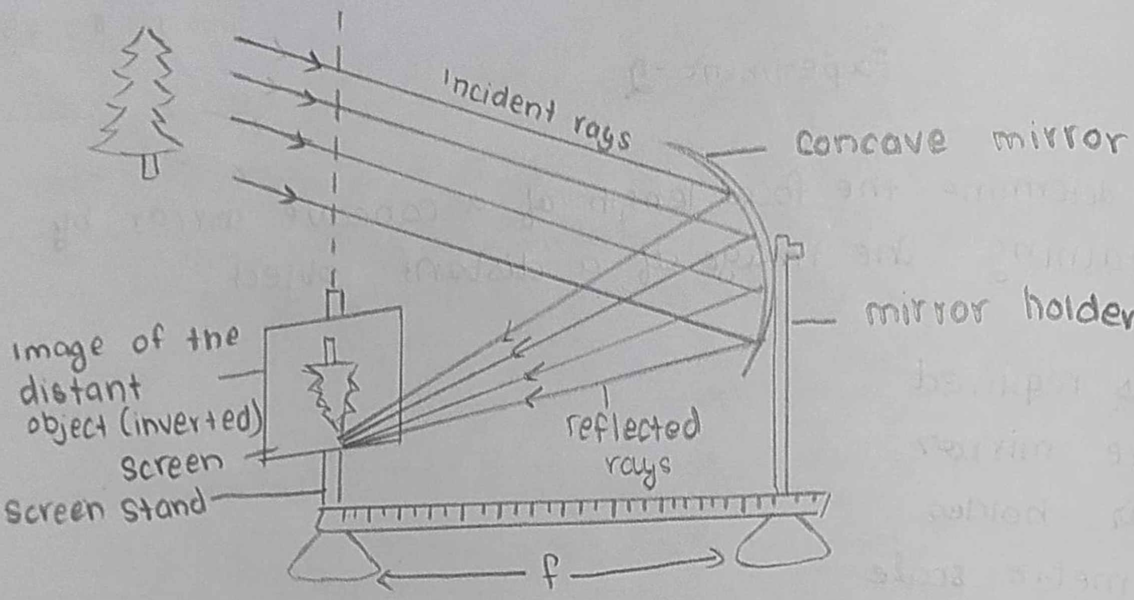
i) A concave mirror
ii) A mirror holder
iii) A half metre scale
iv) Screen

Theory

In a concave mirror, the image of a distant object is formed at the focus of the mirror. If image of distant object is obtained on a screen, the distance between the mirror and screen will be the focal length of the mirror. The rays coming from an object at infinity are considered to form a set of parallel rays. Parallel rays from the object at infinity after reflection meet at the focal point of the mirror and form a real, inverted and diminished image of the object. The distance between the pole of the mirror and the object gives the focal length of the mirror

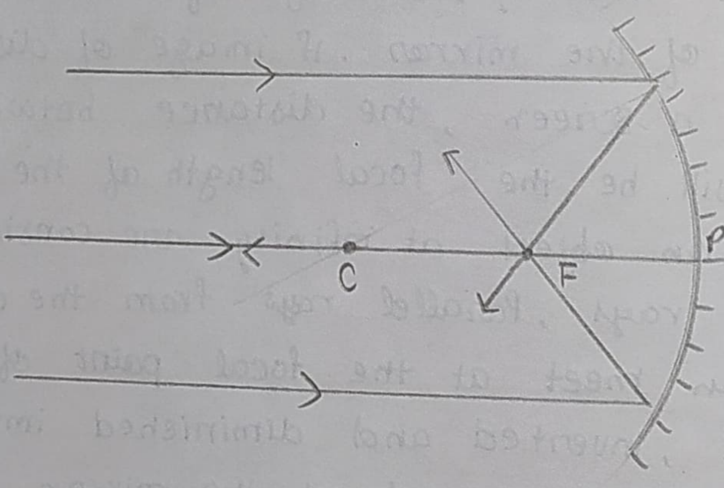
Rules for obtaining image formed by concave mirror

i) A ray of light which is parallel to the principal axis of a concave mirror, passes through its focus after reflection from the mirror.
ii) A ray of light passing through the centre of curvature of a concave mirror is reflected back along the same path.
iii) A ray of light passing through the focus of a concave



f = distance between the mirror and the screen
= focal length of the mirror

a)



b)

Result -

the focal length of the given concave mirror is   cm mirror becomes parallel to the principal axis after reflection from the mirror.

Procedure

1. Mount the concave mirror as shown in diagram.
2. Select a distant tree outside the laboratory (as a distinct object), and the tree should be easily visible with naked eyes.
3. Adjust the concave mirror in such a way that it forms a clear image of tree on white wall of the laboratory which is a screen.
4. Measure the distance between wall and concave mirror with metre scale. Repeat the experiment at least for three more time.

Observation

Least count of scale : ___ cm

focal length : i) f_1 = cm , ii) f_2 = cm , iii) f_3 = cm

The focal length of the given concave mirror is

$$f\,(\text{mean}) = \frac{f_1 + f_2 + f_3}{3} = \quad \text{cm} = \quad \text{m}$$

Result

The focal length of the given concave mirror = cm

or

m

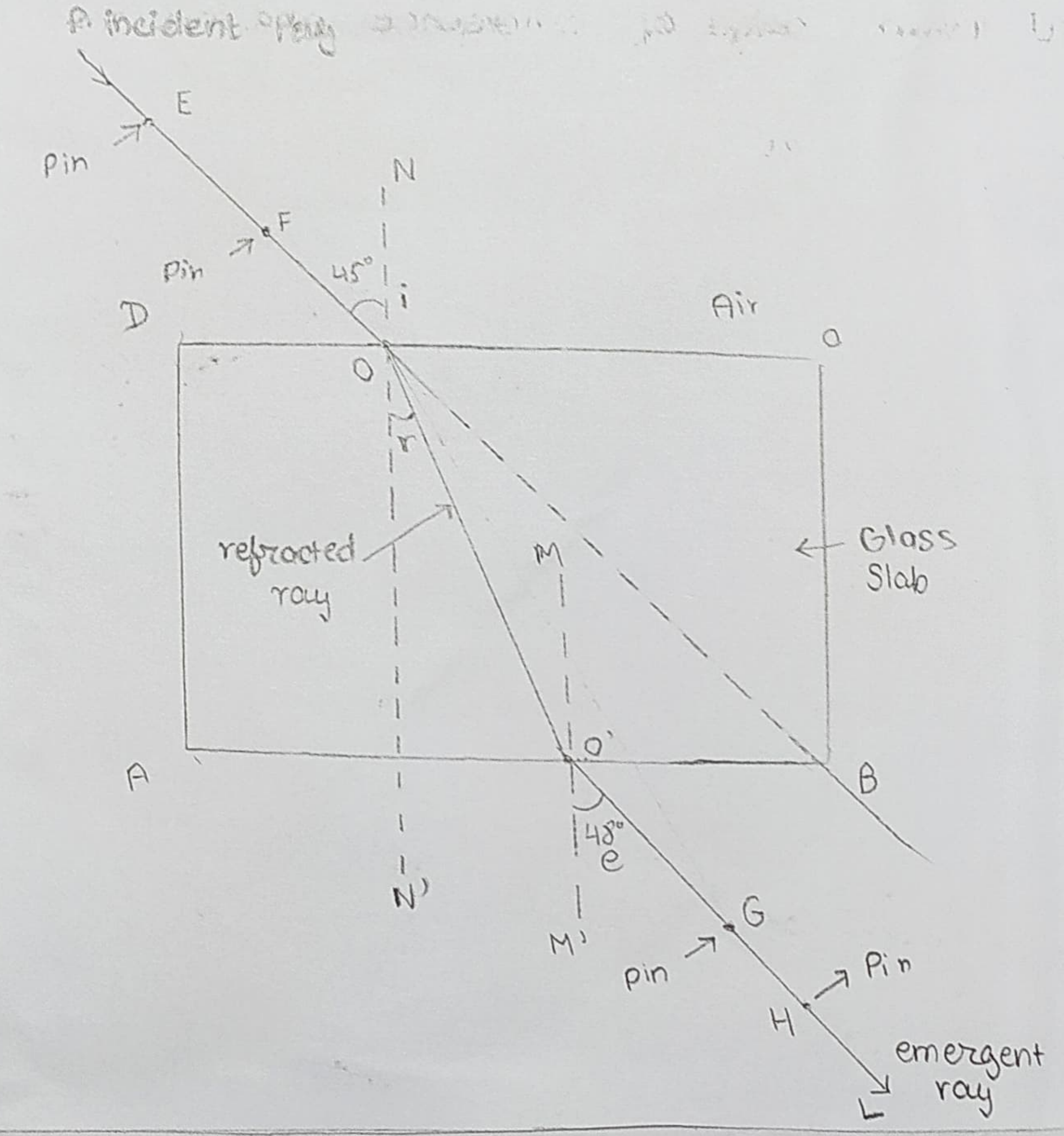
Precautions

1. The distant object should be clearly visible with naked

eyes.

2. A clear image of the distant object should be obtained on the wall.
3. The distance between the pole of the mirror and the wall should be measured by metre scale.
4. While measuring the distance, the metre scale should be kept parallel to the ground.
5. Metre scale should be correctly positioned.
6. Least count of the metre scale should be correctly noted.

AIM - To trace the path of a ray of light passing through a rectangular glass slab for different angles of incidence. Also measure the angle of incidence, angle of refraction, angle of Emergence and interpret the results



Experiment 11

AIM - To trace the path of a ray of light passing through a rectangular slab for different angles of incidence. Also, to measure the angle of incidence, angle of refraction, angle of emergence and interpret the result.

Materials Required

- A drawing board
- Glass slab
- Drawing pin
- Drawing sheet
- Geometry box
- Scale, protractor

Theory

- Refraction : Refraction is the phenomenon in which a ray of light travelling from one transparent medium to another bends from the surface of seperation and follows a different course in the second medium.
- Angle of incidence : The angle which the incident ray makes with the normal is known as angle of incidence. In fig. ∠PON is the angle of incidence (denoted as ∠i).
- Angle of refraction : The angle ~~with~~ with which the refracted ray makes with the normal is known as angle of refraction. In fig. ∠N'OO' is the angle of refraction (denoted as ∠r).
- Angle of emergence : The angle which the emergent ray makes with the normal at the point of emergence is known as angle of emergence. In Fig. ∠M'O'L is the angle of emergence (denoted as ∠e).

Observation

S.no	Angle of incidence $\angle i$	Angle of refraction $\angle r$	Angle of emergence $\angle e$	Difference $(\angle i - \angle e)$ degree
1.	45°	20°	48°	3°

A ray of light travelling in air strikes the surface DC of rectangular glass slab ABDC at point O. As NON' is normal to the surface, the angle PON is called angle of incidence ($\angle i$).
The ray PO, bends towards the normal as it passes through glass slab and takes path OO' inside the glass slab. N'OO' is the angle of refraction ($\angle r$). The refracted ray OO' moves towards the ON' inside the glass slab. After refraction again at the face AB, the refracted ray O'L moves away from normal (O'M'). Then, angle M'O'L is called angle of emergence ($\angle e$).

Procedure
Fix a drawing sheet on the drawing board with four drawing pins. Now place a glass slab on this paper and draw its boundary ABCD. Take point O on the side CD towards the left and draw normal NON' using protractor. Then draw a straight line PO at any angle, the angle; NOP is the angle of incidence ($\angle i$).
Fix two pins E and F on line PO at a distance 2-3 cm from each other. Observe these two pins from side AB of slab and fix a pin G on this side such that this coincides the image of pin E and F. Then fix another pin H in such a way that it completely coincides the pins G, E and F. Remove all pins and encircle marks made by the pencil. Join the marks made by G and H. E, F, G, H should be in a straight line. Produce it to meet the side AB at O'. Draw normal MO'M'. Join O' and O.
Then OO' is the refracted ray and O'GH is emergent ray. Measure $\angle NOP$ (i.e. $\angle i$) and $\angle M'O'L$ (i.e., $\angle e$) and record.

Teacher's Signature ....

Result -

- The path of the ray of light through the glass slab is shown. The ray of light bends towards the normal as it passes from air to glass and away from normal as it emerges from glass to air. The emergent ray is parllel to the incident ray
- The angle of incidence ($\angle i$) is nearly equal to the angle of emergence ($\angle e$).
- The angle of refraction ($\angle r$) is found to be less than $\angle i$ so ($\angle i - \angle r$) is called angle of deviation.

Result

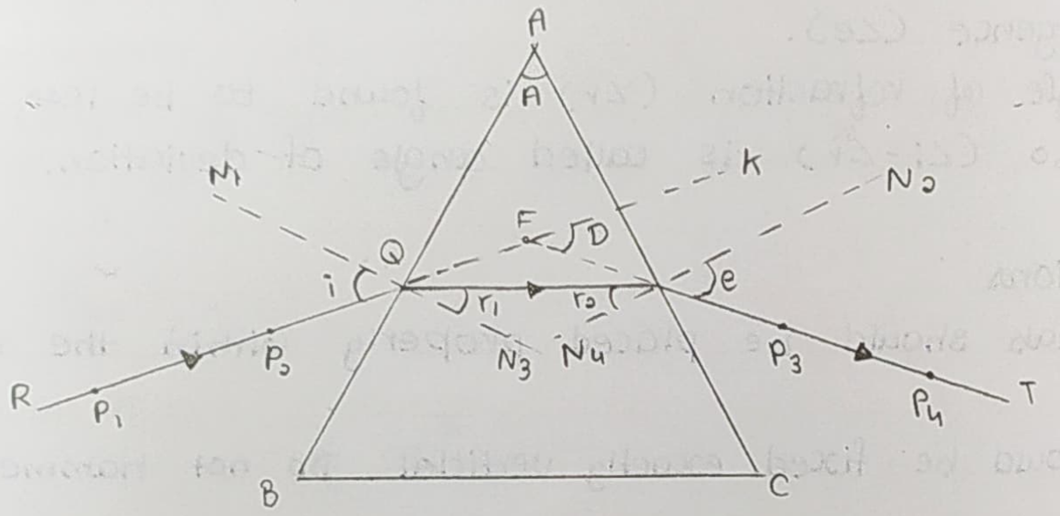
1. The path of the ray of light through the glass slab is shown. The ray of light bends towards the normal as it passes from air to glass and away from the normal as it emerges from glass to air. The emergent ray is parallel to the incident ray.
2. The angle of incidence ($\angle i$) is nearly equal to the angle of emergence ($\angle e$).
3. The angle of refraction ($\angle r$) is found to be less than $\angle i$, so ($\angle i - \angle r$) is called angle of deviation.

Precautions

1. Glass slab should be placed properly within the marked outline.
2. Pins should be fixed exactly vertical. Do not hammer the pins.
3. The foot of the pins (on the paper) should be placed in a straight line.
4. Use of protractor in finding angle should be accurate.
5. Angle should be fixed between 30° and 50° for incident ray.
6. A sharp pencil should be used for drawing the incident ray, refracted ray, emergent ray and normals.

Teacher's Signature ....

AIM - To trace the path of the rays of light through a glass prism



Experiment - 12

AIM - To trace the path of the rays of light through a glass prism

Materials requiqed

- Drawing board
- Drawing sheet
- Drawing pins
- prism
- pencil
- half - metre scale
- paper pins

Theory

Prism : It is a piece of transparent medium bounded by three rectangular surfaces forming a triangle. One surface is called base. Other two surfaces are transparent and are called refracting surfaces. The line along which the refracting surfaces meet is called the edge of the prism. The angle between two refracting surfaces, is called the angle of prism ($\angle A$).

Refraction of light through a prism.

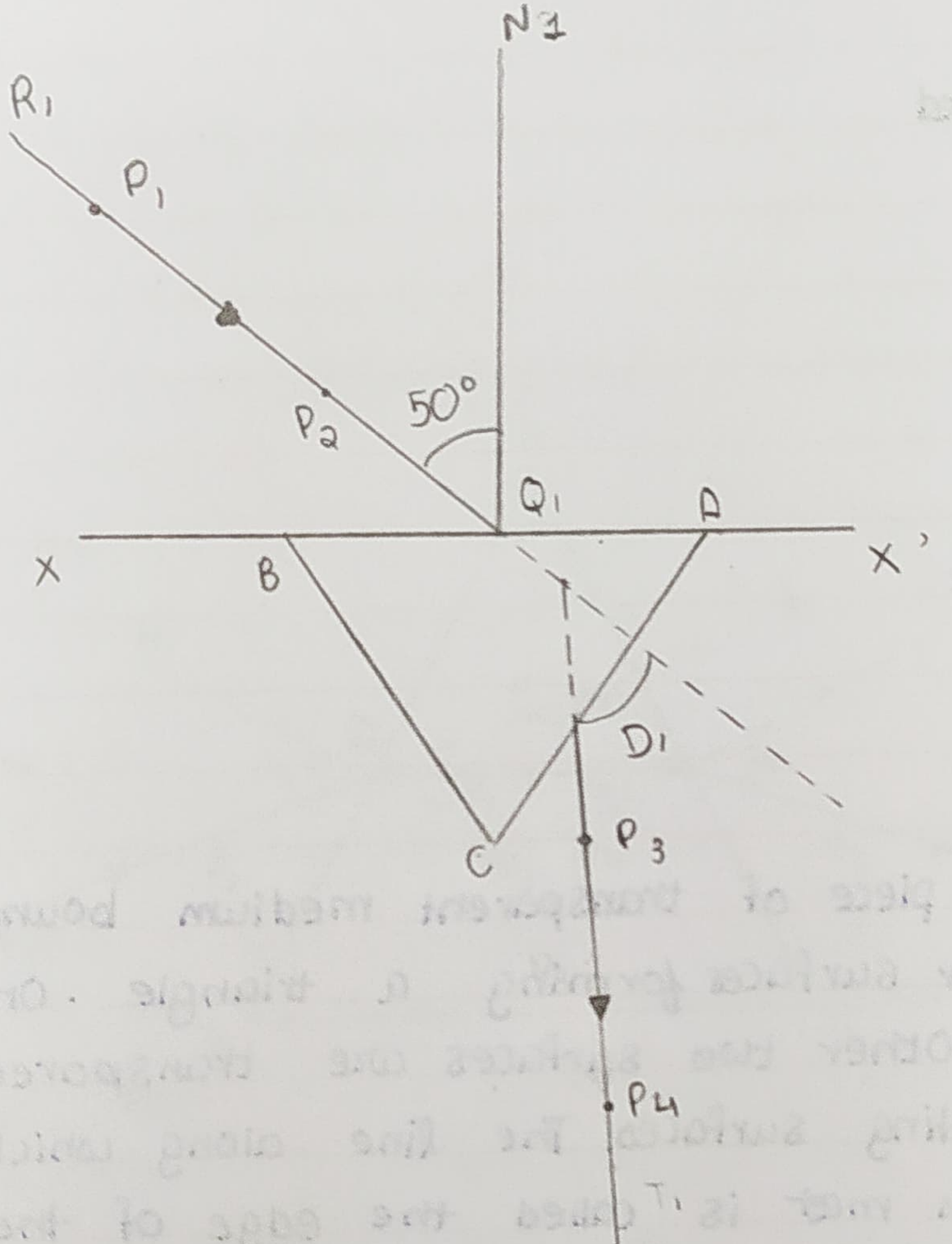
Figure shows section ABC of a prism taken by a vertical plance perpendicular to the edge. BC is the base of the prism, and AB and AC are its two refracting surfaces.

RQ is the incident ray

QS is the refracted ray

ST is the emergent ray

$\angle RQN_1 = \angle i =$ angle of incidence



Refraction through prism

$\angle SQN_3 = \angle r_1 =$ angle of refraction inside prism
$\angle QSN_4 = \angle r_2 =$ angle of incidence inside prism
$\angle TSN_2 = \angle e =$ angle of emergence
$\angle BAC = \angle A =$ angle of prism
$\angle SFK = \angle D =$ angle of deviation
$N_1N_3 =$ Normal at the point of incidence
$N_2N_4 =$ Normal at the point of emergence

Procedure

- Fix a white sheet of paper on the drawing board with the help of drawing pins.
- Draw a straight line XX' parallel to the length of the paper nearly in the middle of the paper.
- Mark points $Q_1, Q_2, Q_3, \ldots$ on the straight line XX' at suitable distances of about 5 cm.
- Draw normals $N_1Q_1, N_2Q_2, N_3Q_3, \ldots$ on points $Q_1, Q_2, Q_3 \ldots$ as shown in the diagram.
- Draw lines $R_1Q_1, R_2Q_2, R_3Q_3, \ldots$ making angles of 30°, 35°, 40°, ... 60° [write values of the angles on the paper) respectively with the normals.
- Mark one corner of the prism as A and take it as the edge of the prism for all the observations.
- Put the prism with its refractive face AB on the line XX' and point Q_1 in the middle of AB.
- Mark the boundary of the prism.
- Fix two office pins P_1 and P_2 vertically on the line R_1Q_1. The distance between the pins should be 2cm or more.
- Look the images of P_1 and P_2 through face AC.

- Close your one eye and keep in line with the two images.
- Fix two office pins P_3 and P_4 vertically, and 10 cm apart such that the open right eye sees P_4 and P_3, and images of P_2 and P_1 ~~ion ter~~ in one straight line.
- Remove pins P_3 and P_4 and encircle their pricks on the paper.

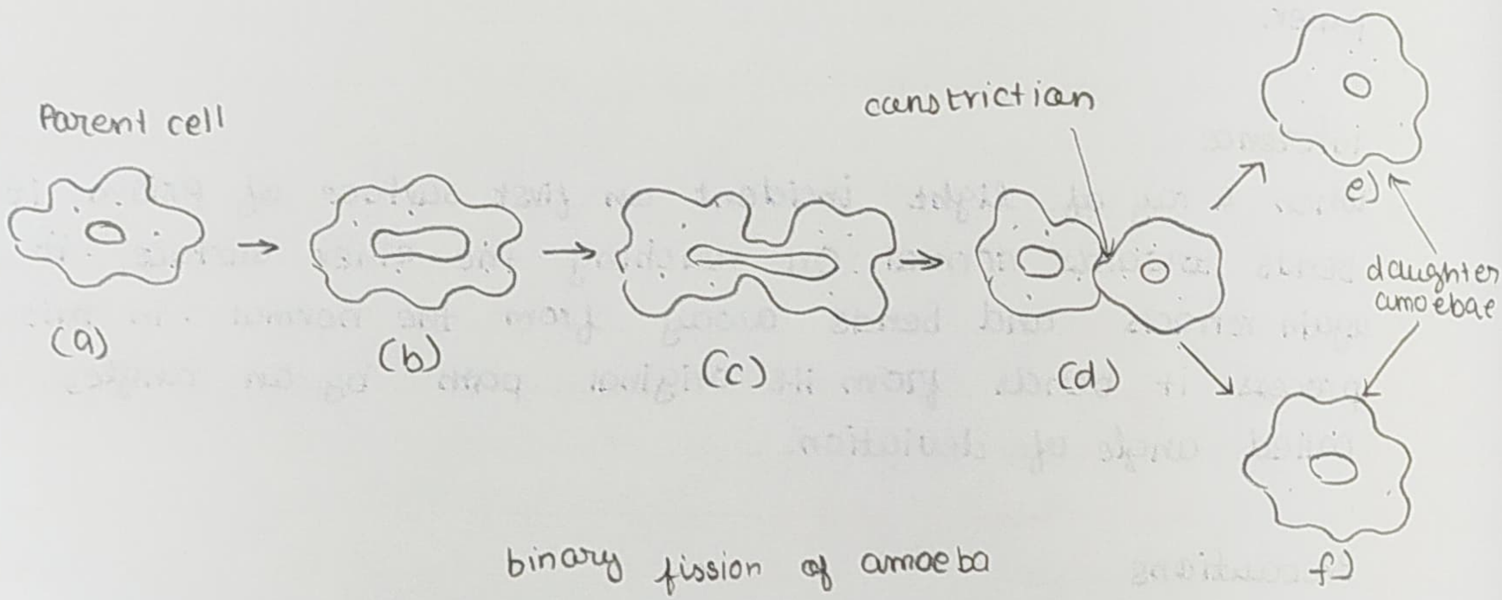
Inference

When a ray of light incident on first surface of prism, it bends towards normal. On reaching the other surface, it again refracts and bends away from the normal. In this process it bends from its original path by an angle, called angle of deviation.

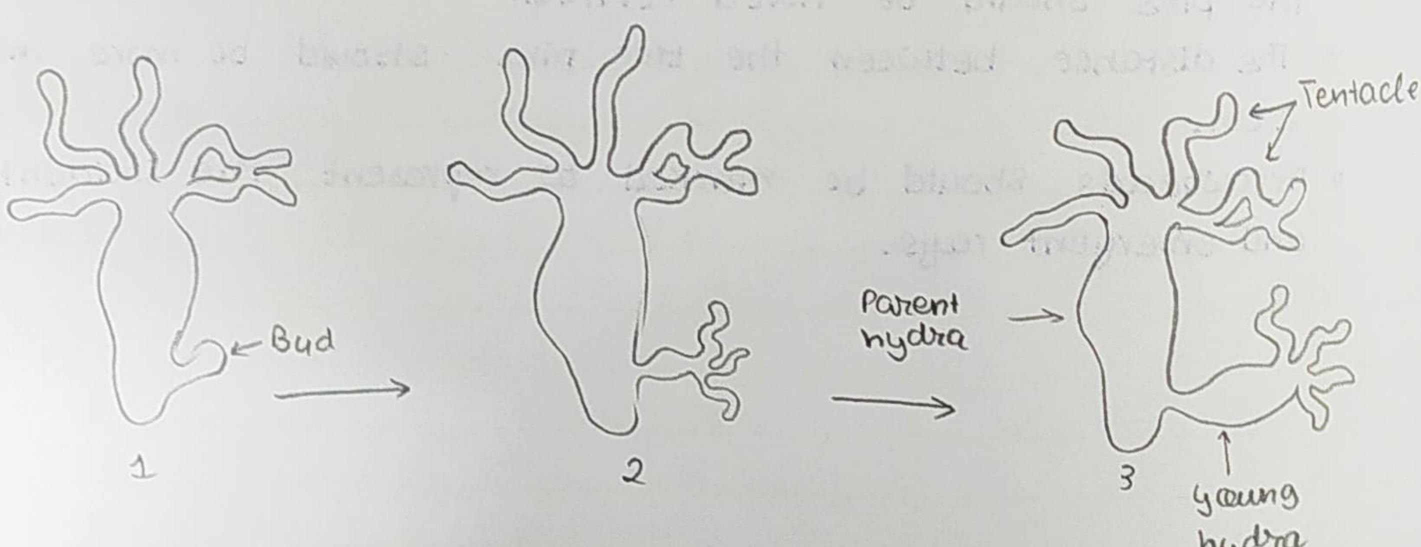
Precautions

- The angle of incidence should lie between 30° - 60°.
- The pins should be fixed vertical.
- The distance between the two pins should be more than 2 cm.
- Arrowheads should be marked to represent the incident and emergent rays.

AIM - To study :-
a) binary fission in amoeba
b) budding in yeast and hydra
with the help of prepared slides



binary fission of amoeba



Budding in hydra

Experiment - 13

AIM - To study
a) binary fission in amoeba
b) budding in yeast and hydra with the help of
prepared slides.

Materials required
- Compound microscope
- prepared slides of binary fission of amoeba
- yeast
- hydra
- pencil
- notebook

Theory
In binary fission, the parent cell divides to give rise to two daughter cells. Each daughter cell has a nucleus and gradually grows into an adult organism. During this fission, the nuclear division takes place first, followed by the division of the parent cell's cytoplasm.

- Binary fission in amoeba: The nucleus of adult amoeba divides into two nuclei amitotically and cytoplasm also divides into two parts to form two daughter amoebae.
- Budding in yeast: During favourable conditions, a small bud like outgrowth initiates at one end of the parent cell which gradually enlarges in size. The nucleus also enlarges and divides into two parts. One part goes into the bud and other remains in the parent cell. Gradually, the bud becomes almost of the Same size as the parent cell. The budding maybe repeated

, resulting in the formation of one or more chains of bud cells.

- Budding in hydra: Budding is a mode of reproduction in which one or more organism develop from the body of an organism which seperate to form new individuals. Hydra multiplies by budding under favourable condition.

Procedure

Set up the microscope and observe the slides of amoeba, yeast and hydra under microscope (low and high power)

Observation

A. Binary fission in Amoeba

- During fission, parent cell elongates, enlarges and nucleus divides into two daughter nuclei.
- Cytoplasm divides into two parts by transverse septum.
- Two cells seperate apart and behave as seperate cell.

B. Budding in yeast

- An outgrowth initiates at one end of parent cell.
- Nucleus enlarges and divides into two parts.
- One part of nucleus goes in bud and other part remains in parent cell.
- As constriction appears at the base and later a wall is laid down separating the bud from the parent cell.

C. Budding in hydra

- In hydra, bud generally develops from the lower half.
- It grows to full size.
- As soon as the bud becomes nutritionally, it constricts at the base

and seperates as a new individual

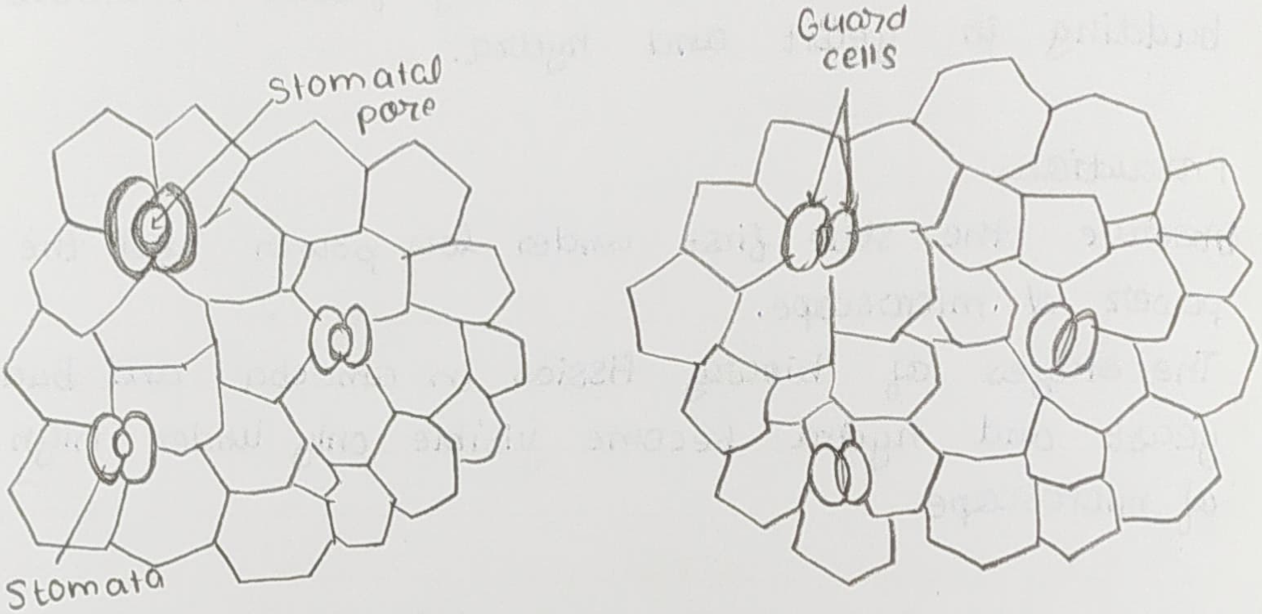
Inference

The prepared slides show binary fission in amoeba, budding in yeast and hydra.

Precautions

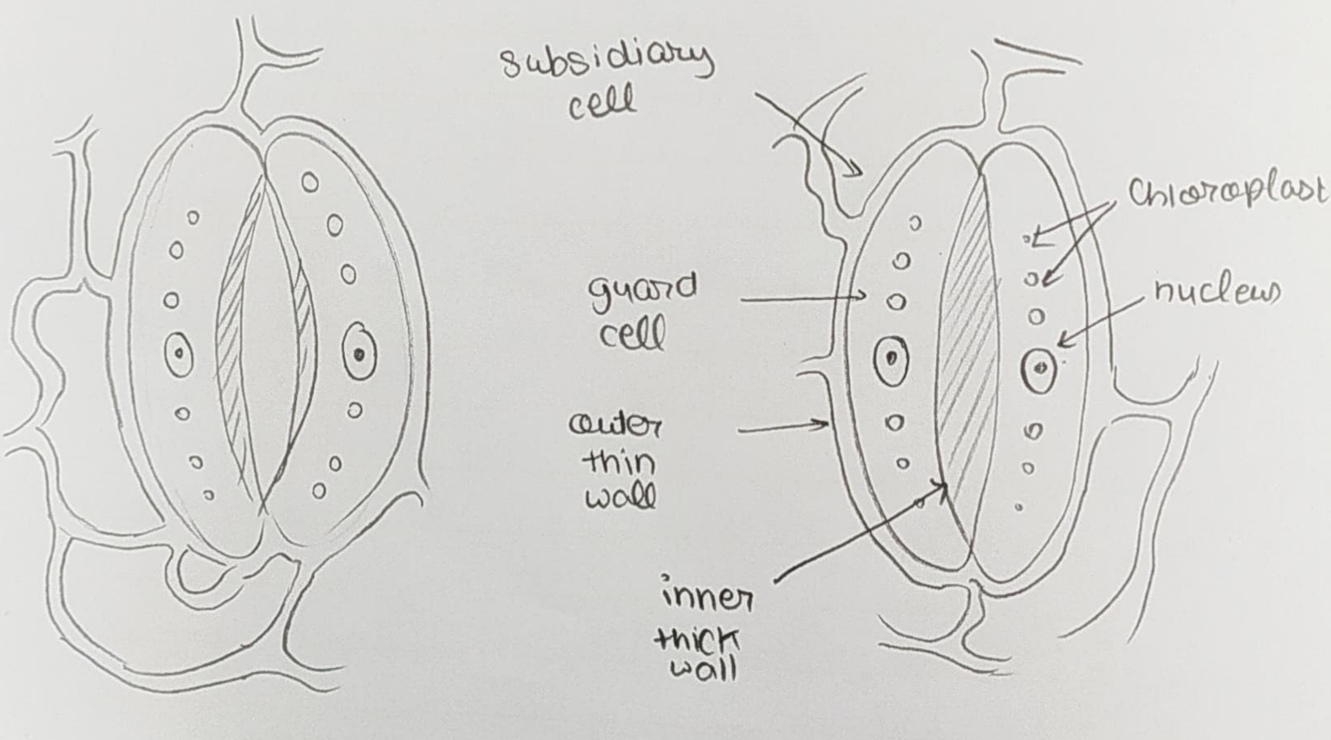
- Observe the slide first under low power and the high power of microscope.
- The stages of binary fission in amoeba and budding in yeast and hydra become visible only under high power of microscope.

AIM - To prepare a temporary mount of a leaf peel to show stomata



open stomata

closed stomata



Experiment - 14

AIM - To prepare a temporary mount of a leaf peel to show stomata.

Materials required

- Slides
- water dropper
- Safranine
- Glycerine
- watch glass
- microscope
- forceps
- brush
- needle
- potted plant of balsam or sadabahar
- beaker
- blade

Theory

Leaves are flattened green parts of the plants and arise from the nodes of stem or branches. The represent three parts, such as leaf base which is attached to the stem or branches, leaf stalk (middle part of leaf) and leaf lamina (last part of leaf). The epidermis of shoot and leaf contains numerous minute pores called stomata, each stomata is made up by two guard cells. Guard cells regulate the opening and the closing of the stomatal pore. In monocot plants, the stomata are present on both surfaces but dicot stomata are present more on lower surface. Stomata are responsible for the exchange of oxygen, carbon dioxide and water vapour with the air.

Procedure

- Select a plant of balsam or sadabahar and pluck a fresh leaf.
- Cut small pieces of leaf with the help of blade and put these pieces in watch glass containing water with the help of a brush and then add a few drops of safranine stain into the watch glass to stain the peel.
- After staining put the peel on a clean slide and put a drop of glycerine on it.
- Put the coverslip over it and observe the slide ~~to~~ under low power of the microscope.

Observation

- Epidermis consists of a single layer of cells which are irregular without intercellular spaces.
- Small opening called stomata are seen in epidermeal cells.
- each stomata consists of two guard cells (kidney shaped), each guard cell contains chloroplast and nucleus.

Inference

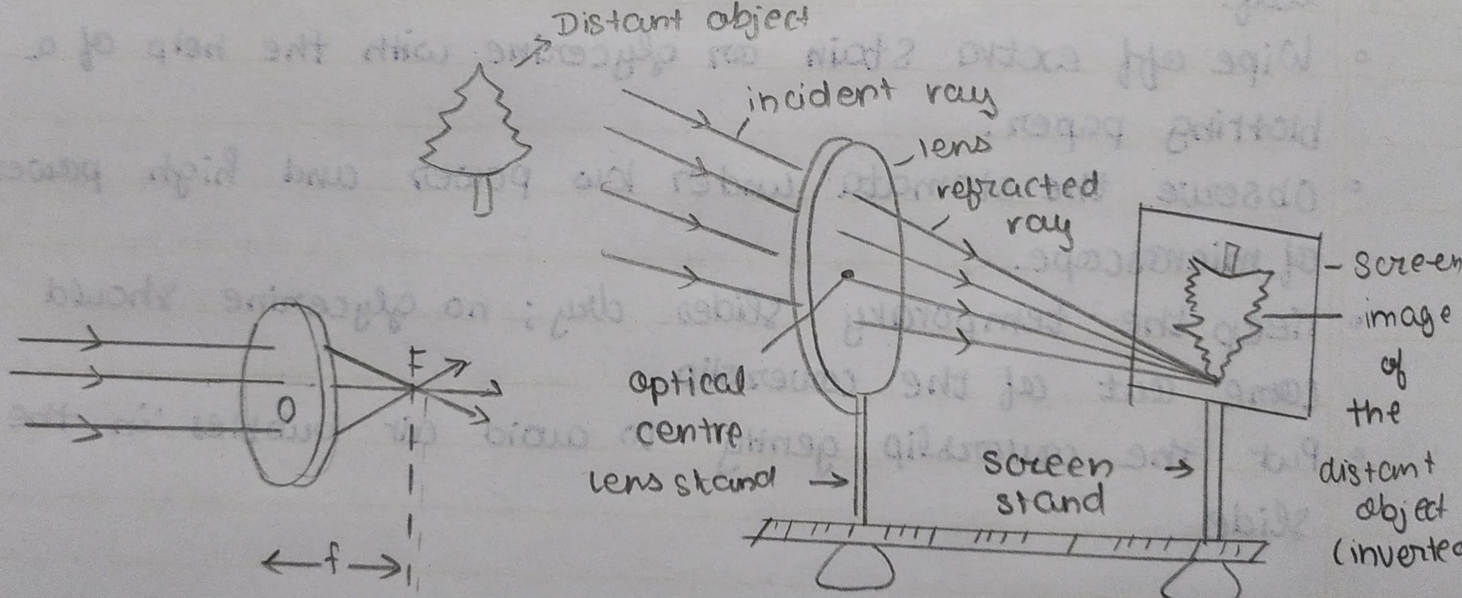
Each stomata consists of bean shaped or kidney shaped guard cells surrounding a stomatal opening

Precautions

- Always use the freshly plucked leaf.

- Select the thin and small pieces of leaf
- Select turgid leaf only
- cut the peel in an appropriate size.
- Carefully remove the peel from lower epidermis of the leaf.
- Wipe off extra stain or glycerine with the help of a blotting paper.
- Observe the stomata under low power and high power of microscope.
- Keep the temporary slides dry; no glycerine should come out of the cover slip.
- Put the coverslip gently to avoid air bubbles in the slide

AIM - To determine the focal length of a convex lens by obtaining the image of a distant object



Experiment - 15

AIM - To determine the focal length of cavex lens by obtaining the image of a distant object.

Apparatus used

- Covex lens
- White drawing sheet
- lens holder
- Metre scale
- Woodden stands for uprights

Theory

There are two types of lenses:

- Convex or double convex lens is a lens with both convex surfaces.
- Concave or double concave lens is a lens with both concave surfaces.

F (focus) is the point at which the rays incident parallel to the principal axis meet or appear to meet after refraction

O (optical centre) is the point in the lens from which light always passes without any ~~chain~~ change in direction.

OF = focal length (f).

Procedure

- First of all hold the lens with lens holden in such a manner that the lens aperture should not be obstructed.
- Now select a distance object like tree through the window of your laboratory.

Result -

The focal length of given convex lens as determined using a tree and screen is cm = m

- keep one of the faces of the lens towards the distant object such as outside tree.
- After that keep the screen on the opposite side of the face of the lens.
- For the sharp image of the distant tree, adjust the position of the lens.
- Finally repeat the experiment for at least three times and record the observations.
- Using metre scale measure the distance between lens and image.

Observation

Distances between lens and screen are $f_1 =$ cm, $f_2 =$ cm, $f_3 =$ cm.

The mean focal length of the lens is,

$$f = \frac{f_1 + f_2 + f_3}{3}$$

$=$ cm

Result

The focal length of given convex lens as determined using a tree and screen is cm = m

Precautions

- Distance should be accurately measured to mark position of O and F.
- Object, screen and lens should be at same love
- Sharp and well defined image should be obtained on screen.