

XII – Practical (2025 – 2026)

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Experiment no. 1

Isolation of DNA from given sample

Aim : To extract and isolate DNA from the given sample

Observation : DNA precipitates out into the alcohol layer. DNA has appearance of white stringy mucous.

Principle : All plants DNA extraction protocols, comprise of the basic steps of disruption of cell wall, cell membrane and nuclear membrane to release the DNA into solution followed by precipitation of DNA and ensuring removal of the contaminating biomolecules.

The function of the DNA extraction buffer ingredients are as follows:

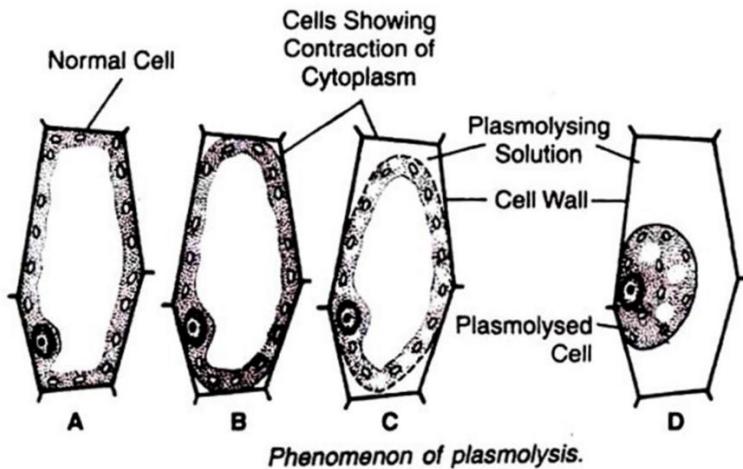
- (1) The soap helps to dissolve the phospholipid bilayers of the cell membrane and organelles.
- (2) The salt is used to break up protein chains that bind around the nucleic acids
- (3) The chilled ethanol is used to precipitate the DNA.

Experiment no. 2
Study of plasmolysis in epidermal peels

Aim : To study plasmolysis in epidermal cells of *Tradescantia* leaf

Observation :

1. The peel of leaf kept in water shows normal cell.
2. The peel of leaf kept in 20% sucrose solution shows the shrinkage of protoplasm of cells i.e., plasmolysis due to exosmosis
3. When plasmolysed cell is kept in hypotonic solution, it regains its shape and position i.e., deplasmolysis due to endosmosis.



Please note : Draw only 'A' and 'D' diagrams

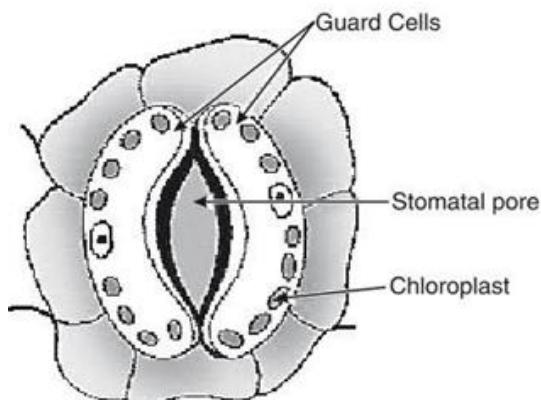
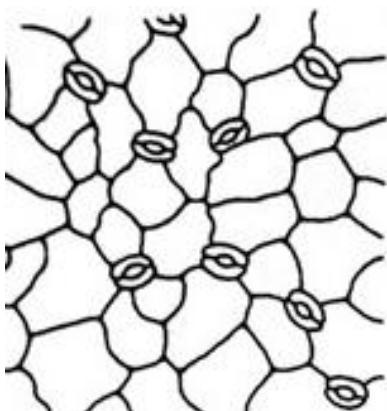
Experiment no. 3

Study of structure and distribution of stomata on upper and lower surfaces of leaf

Aim : To study structure and distribution of stomata in upper and lower epidermis of leaf

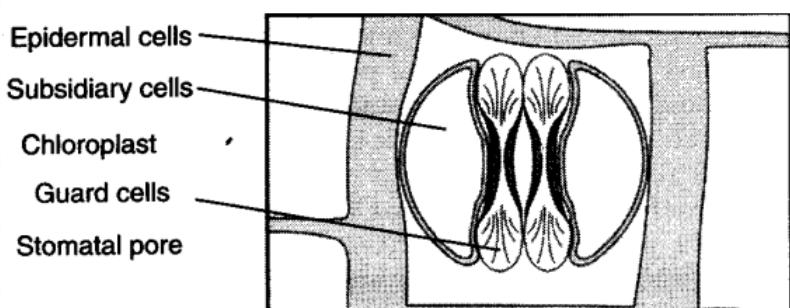
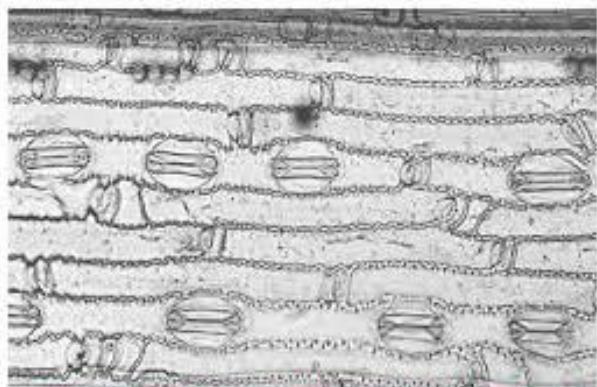
Observation :

1. Stomata are microscopic pores present in the epidermis of leaf.
2. Stoma are controlled or guarded by specially modified epidermal cells called guard cells.
3. These guard cells may be kidney shaped in dicot plant or dumbbell shaped in monocot plant.
4. The outer walls of guard cells are thin and the inner walls are highly thickened and elastic.
5. Guard cells have chloroplasts to carry out photosynthesis.
6. Guard cells change their turgor pressure causing the opening and closing of stoma; thus, they play a vital role in exchange of gases and water vapour.
7. Stomata are further covered by subsidiary cells.
8. Stoma, guard cells and subsidiary cells form a unit called stomatal apparatus.



Structure of Stomatal apparatus (Dicot plant)

(Draw only enlarged (2nd) diagram)



Stomatal Distribution in Monocot Leaf (Parallel)

Structure of Stomatal apparatus (Monocot plant)

(Draw only enlarged (2nd) diagram)

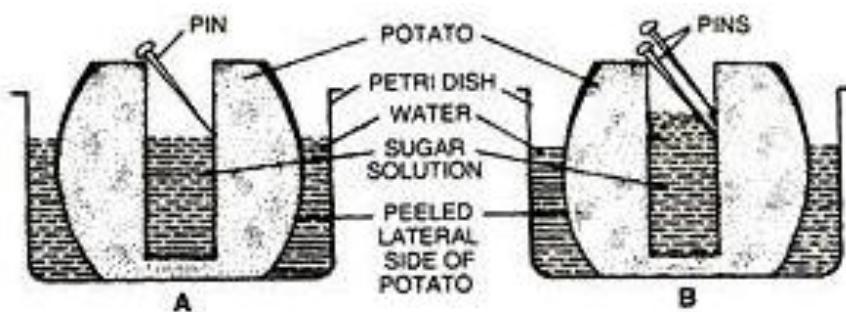
Experiment no. 4

Aim : To study the process of osmosis using potato osmoscope.

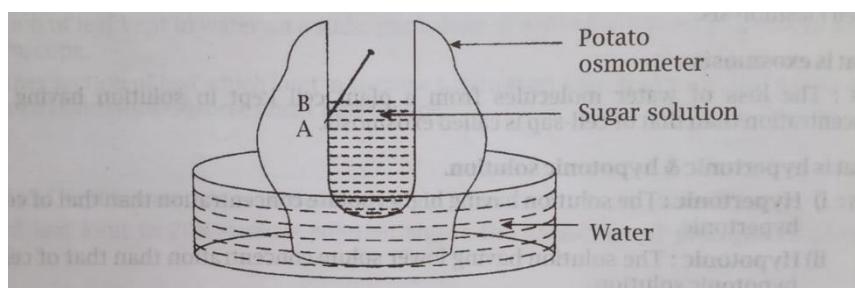
Observation: After some time, the level of sucrose solution rises in the potato osmometer.

Conclusion :

The level of sucrose solution increases in the potato osmoscope due to endosmosis, movement of water molecules takes from the region of lower solute concentration (dilute solution) to the region of higher solute concentration (concentrated solution) through a semipermeable membrane of potato.



Potato osmoscope experiment to demonstrate osmosis.
A. Original level; B. Final level.



$$\langle B_{\mu\nu} \rangle = -\frac{1}{4}\delta\delta^{\mu\nu} \langle B_{\alpha\beta} \rangle$$

Experiment no. 5
To detect adulterant (starch) in milk

Aim : To detect adulterant (starch) in milk

Observation Table

Sample	Observation (Colour change – if any)	Inference
Sample A	Blue	Starch present
Sample B	White	Starch absent

Conclusion:

- Milk Sample A shows blue colour, hence, it is adulterated with starch
- Milk Sample B show white colour, hence, it is not adulterated with starch

Aim : To detect the presence of excess water added to the milk by using lactometer

Observation Table

Sample	Milk Temperature	Lactometer Reading	Correction	Final Reading
Sample A				
Sample B				

Result:

- Specific gravity of Milk Sample A is :
- Specific gravity of Milk Sample B is :

Experiment no. 6
Dissect and display floral whorls and T.S. of ovary

Aim : To dissect given flower to study and display different whorls.

Observation :

Features of *Hibiscus rosasinensis* (Shoe flower)

Family : Malvaceae

Floral Characters:

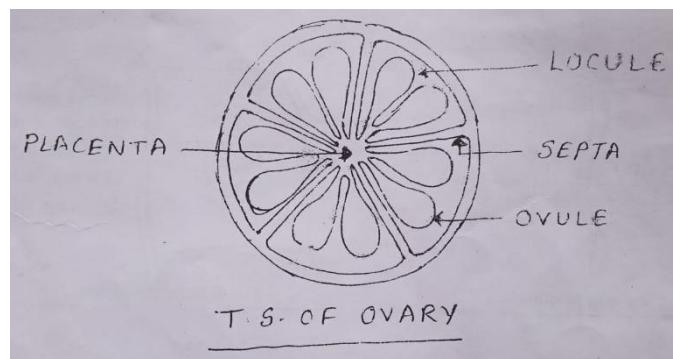
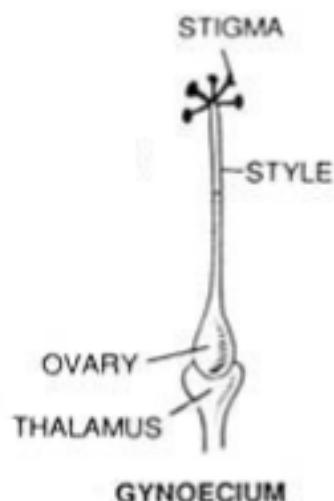
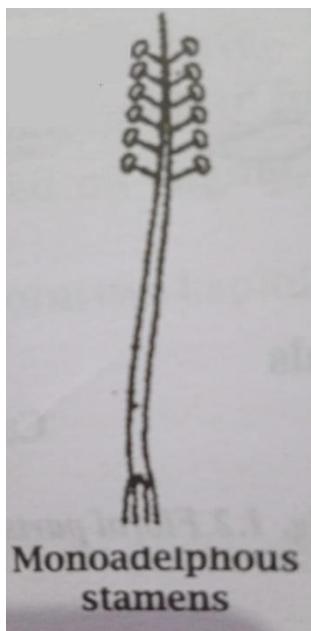
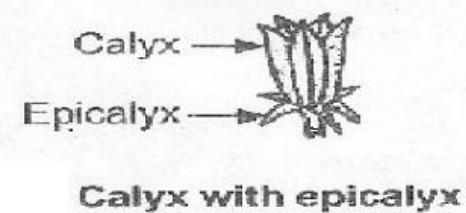
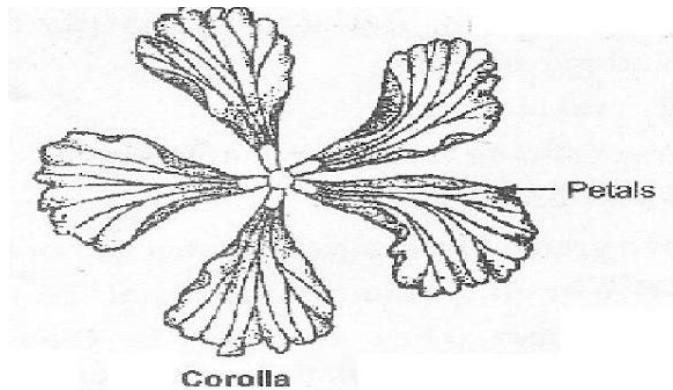
Epicalyx : There are 5- 7 free bracteoles, green in colour

Calyx : 5 sepals, green, gamosepalous, valvate aestivation

Corolla : 5 petals, polypetalous, large, red coloured and showy, twisted aestivation

Androecium : Many stamens, showing monadelphous condition. (Filaments are fused to form hollow staminal tube but anthers free). Anthers are monothecous and kidney shaped.

Gynoecium : Pentacarpellary, syncarpous (5 carpels – fused), ovary – superior and pentalocular (five chambers) with axile placentation, style passes through hollow staminal tube, stigma - 5 free capitate.



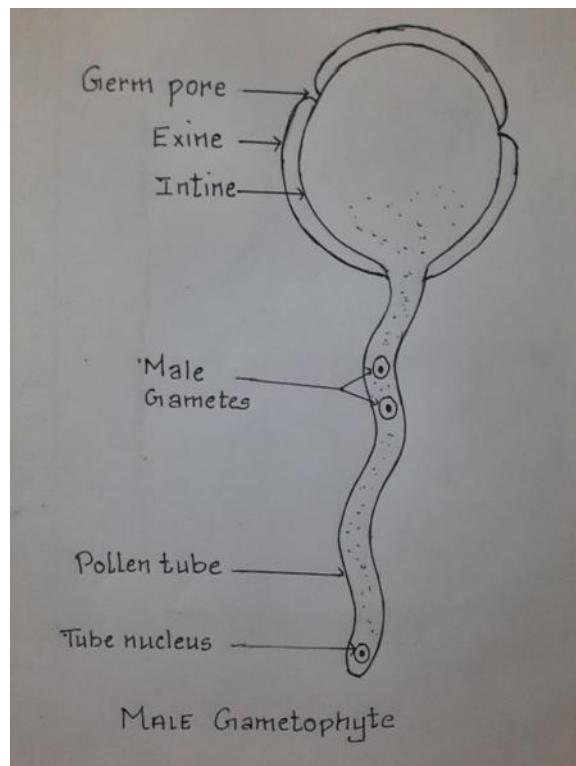
Please Note : Draw all diagrams for this experiment

Experiment no. 7
Study of pollen germination on slide

Requirement : Catharanthus flowers, sugar solution, germination chamber, slide

Observation :

1. A pollen grain has two layers outer exine and inner intine
2. A pollen grain germinates in the nutrient medium (sugar solution)
3. Intine get stretched and comes out through germ pore forming a pollen tube
4. Cytoplasm along with tube nucleus and generative cell get transferred in the pollen tube
5. A generative cell undergoes mitotic division and forms two haploid non motile male gametes



Please Note : Draw the diagram for this experiment

Experiment no. 8

Study of population density and frequency by quadrat method

Aim : To determine the population density and frequency of plants quadrat method

Procedure :

1. Count the number of each plant species present in each quadrat
2. Record the data in the observation table.
3. Calculate population density, population frequency and frequency percentage using the formula

Formulas to calculate population density and frequency :

- 1) Population Density = $\frac{\text{Total number of individuals of a species in all the quadrat studied}}{\text{Total number of quadrats studied}}$
- 2) Percentage Frequency (F) = $\frac{\text{Total number of quadrats in which the species occurred} \times 100}{\text{Total number of quadrats studied}}$
- 3) Abundance (A) = $\frac{\text{Total number of individuals of species}}{\text{Number of quadrats in which species occurred}}$

Observation table:

No	Plant species	No of individuals per quadrat				Total no of individuals of a species in all the quadrats studied (N)	Total no of quadrats in which the species occurred (A)	Total number of quadrats studied (B)	Population density (N/B)	Frequency percentage (A/B*100)
		1	2	3	4					
1	Sp a									
2	Sp b									
3	Sp c									
4	Sp d									

Result:

- 1) Species a : Population density = _____, Percentage frequency = _____
- 2) Species b : Population density = _____, Percentage frequency = _____
- 3) Species c : Population density = _____, Percentage frequency = _____
- 4) Species d : Population density = _____, Percentage frequency = _____

Experiment no. 9
Study of water samples for its pH and clarity (turbidity)

Aim : To study the pH and clarity of the given water sample.

➤ **Procedure for pH of water:**

1. Take water sample A, B and C in three separate beakers and test the nature of the three samples using litmus papers.
2. Note the pH referring the pH scale

Observation Table for pH:

Sr.no.	Water samples	pH	Nature
1.	Sample A		
2.	Sample B		
3.	Sample C		

➤ **Procedure for clarity of water:**

1. Observe the beakers of sample A and sample B through hole of Tyndall set up for clarity / turbidity.
2. Note the clarity of the water sample

Observation table for clarity:

Sr. No.	Water Samples	Clarity
1.	Sample A	
2.	Sample B	

Experiment no. 10
Study of soil sample with respect to their texture/type and pH

Aim : To study the pH and type of given soil sample

Procedure for pH of soil sample :

1. Take filtrate of soil sample A, B and C in three separate beakers and test the nature of the three samples using litmus papers.
2. Note the pH referring the pH scale

Observation table for pH

No.	Soil Samples	pH	Nature
1.	Sample A		
2.	Sample B		
3.	Sample C		

Procedure for type of soil sample:

1. Observe the sample A, B and C from the measuring cylinder and find the percentage of the sand, silt and clay.
2. Note the type of soil

Observation table for type of soil

No.	Soil samples	% of Sand	% of Silt	% of Clay	Type of soil
1.	Sample A	80	10	10	Sandy
2.	Sample B	40	50	10	Loamy
3.	Sample C	20	20	60	Clayey

Experiment no. 11
Study of suspended particulate matter in air

Aim : To study the presence of suspended particulate matter in the air collected from different sites

Requirement : Leaves sample (Road side, Indoor), slides, glycerine, cover slips / glass rod with cotton, ear buds, compound microscope

Observation Table :

S. No.	Leaf Samples	Particulate Matter	Inference
1	Washed Leaf	No particulate observed	No pollution
2	Unwashed Leaf	More dust particles, pollen grains, spores, carbon particles	More polluted

Experiment No. 12
Study of presence of living organisms (planktons) in Water

Aim : To study the presence of living organisms in different samples of water

Requirement: Water samples (distilled water, pond water), methylene blue, slides, coverslips, compound microscope

Observation Table :

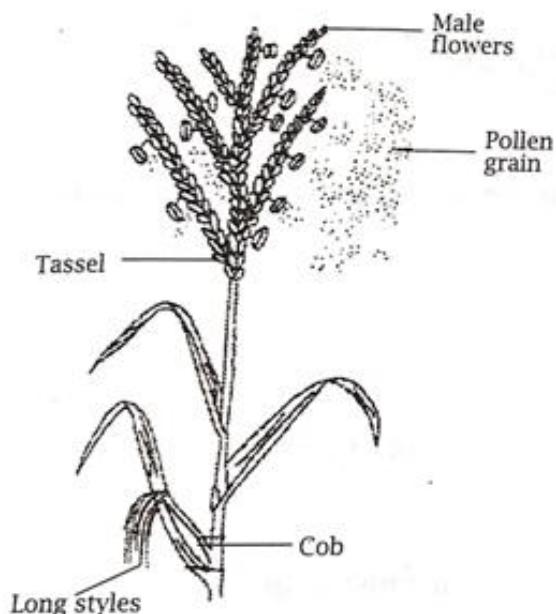
S. No.	Water Sample	Micro-organisms
1	Distilled water	Microorganisms are absent
2	Pond water	Different types of microorganisms such as paramoecium, diatoms, algae, some planktons, copepod, daphnia, rotifer etc.

Spotting

A. Study of floral adaptations to pollination by insect and wind

➤ Pollination by Wind (Eg. Maize)

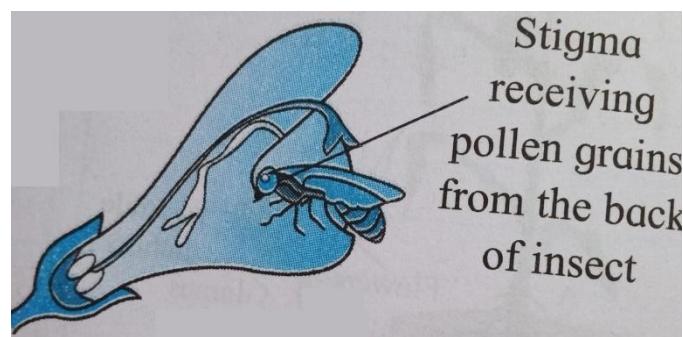
- 1) Flowers are small, unattractive, odourless and nectarless.
- 2) Anthers are versatile.
- 3) Pollens are large in number.



Anemophily e.g. Maize

➤ Pollination by Insect (Eg. Salvia)

- 1) Flowers have bright colour and nectar.
- 2) Pollen grains are large, sticky and spiny.
- 3) When the insects visits the flower the pollen grains get attached to the body parts of the insect and are carried to the stigma of the another flower along with the insect.



Please Note : Don't draw diagrams for this experiment

A. Demonstration of hybridization technique

Aim: To comment on the exercise of hybridization through charts / models

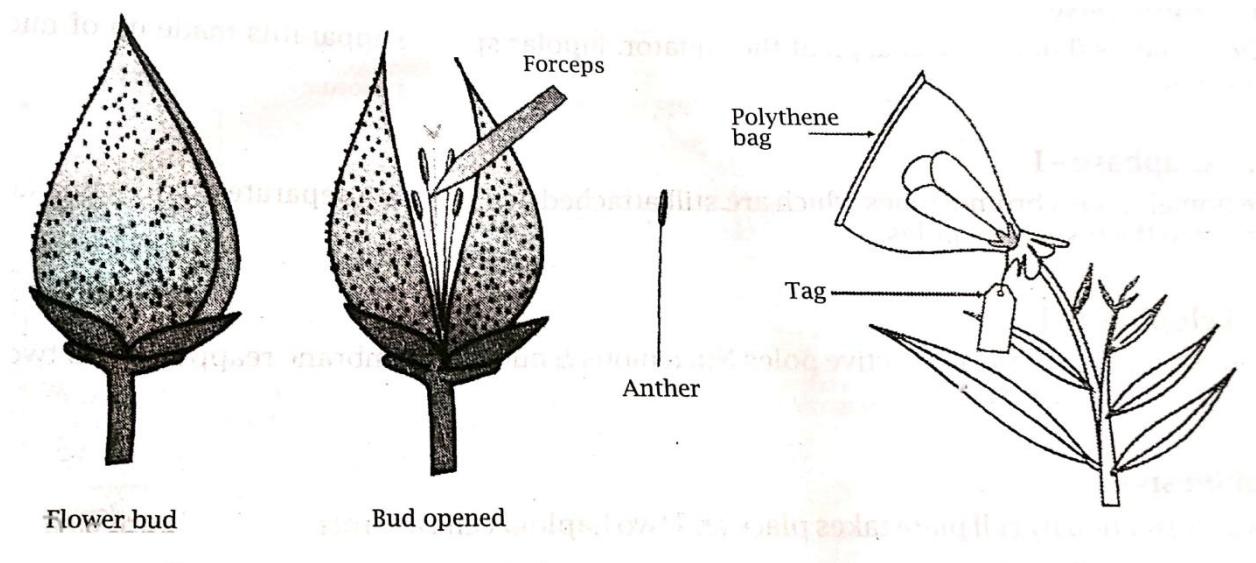
Emasculation - Step of Hybridisation

- 1) It is removal of stamens well before anthesis i.e formation of pollen grains.
- 2) It converts bisexual flower into female parent.
- 3) It is done to prevent self pollination.

OR

Bagging and Tagging - Step of Hybridisation

- 1) Emasculated flowers are enclosed in polythene bags or sterile paper bags to prevent pollination by foreign pollen grains. This is called bagging.
- 2) A tag is tied which contains information about both the parents, date of emasculation etc. This is called tagging.



Please Note : Don't draw diagrams for this experiment

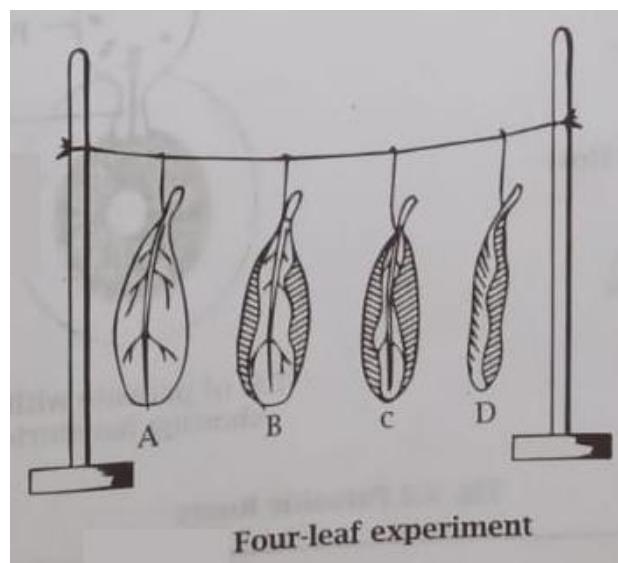
B. Comparative study of rates of transpiration in the upper and lower surface of leaf, using four leaf experiment

Aim : To study rate of transpiration in the upper and lower surface of leaf by using four leaves.

Observation :

1. The leaf 'A' on which grease is applied on both the surface do not dry and remain fresh after 24 hours.
2. Leaf 'B' on which grease is applied on lower surface show little wilting because transpiration takes place only through upper surface of leaf.
3. Leaf 'C' on which grease is applied on upper surface show more wilting than leaf B as transpiration takes place through lower epidermis in which stomata are large in number than upper surface.
4. Leaf 'D' which is without grease show complete wilting because transpiration takes place through both the surface of leaf.

Conclusion : Rate of transpiration is more from lower surface of leaf than from upper surface of leaf.

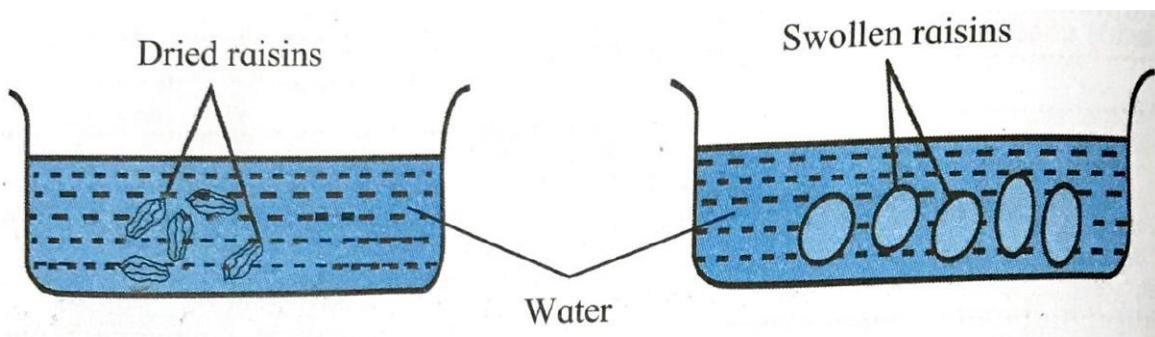


Please Note : Don't draw diagrams for this experiment

B. Study of imbibition using raisins

Aim : To study the imbibition using raisins

Observation : Dry raisins as they are hydrophilic, imbibe water, swells up and become soft



Imbibition using raisins

Please Note : Don't draw diagrams for this experiment

B. Separation of plant pigments by paper chromatography

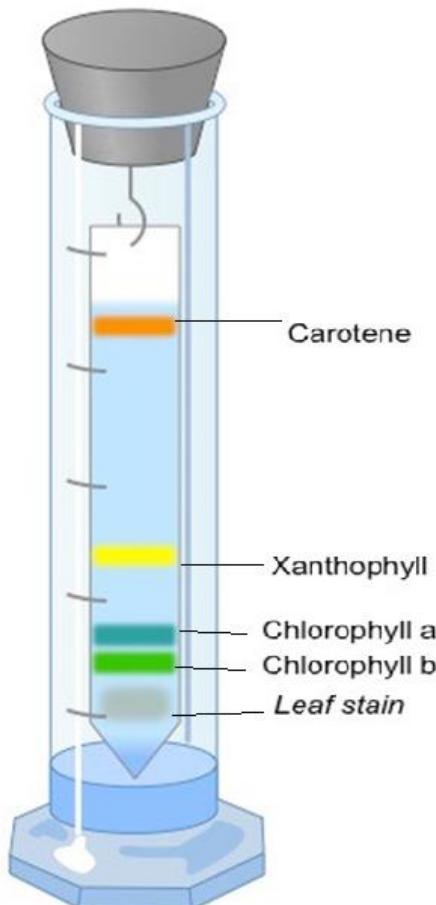
Aim : To study the separation of plant pigments by paper chromatography.

Observation:

On the strip we can observe the separation of photosynthetic pigments as bands of different colours - yellowish green, bluish green, yellow and orange in a particular sequence.

Conclusion :

From loaded spot upto the top, the sequence is chlorophyll-b (yellowish green), chlorophyll-a (bluish green), xanthophylls (yellow) and carotene (orange).



Separation of plant pigments by paper chromatography

Please Note : Draw the diagram for this experiment

C. Study of plants found in xerophytic and aquatic habitats

➤ **Aquatic Adaptation (*Hydrilla*)**

- 1) It is a submerged hydrophyte i.e., grows entirely under water.
- 2) The stem is slender and soft.
- 3) Leaves lack cuticle and stomata.

➤ **Aquatic Adaptation (*Eichhornia*)**

- 1) It is free floating hydrophyte.
- 2) The stem is spongy & stores water in aerenchyma.
- 3) Leaves have swollen petiole.
- 4) Roots have root pockets.

➤ **Aquatic Adaptation (*Typha*)**

- 1) It is anchored hydrophyte which grows in marshy places or shallow waters.
- 2) Leaves are long, linear.
- 3) Leaves have aerenchyma tissue.
- 4) They have cuticle and stomata on the emergent part.

➤ **Xerophytic Adaptation (*Calotropis procera*)**

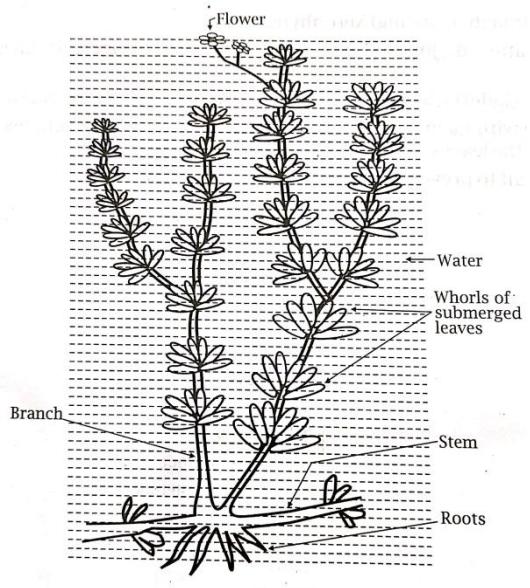
- 1) It is non succulent xerophyte.
- 2) The leaves and young branches are covered by hair.
- 3) The leaves are thick and somewhat leathery.
- 4) The plant possess latex.

➤ **Xerophytic Adaptation (*Acacia arabica*)**

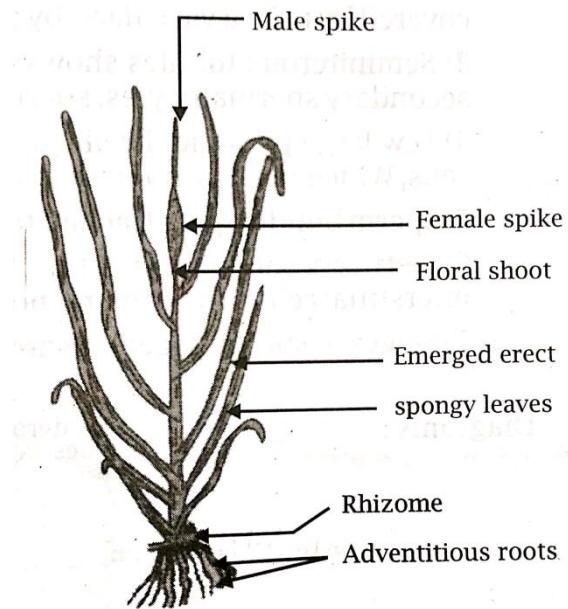
- 1) It is non succulent xerophyte.
- 2) The leaves are bipinnately compound.
- 3) The stipules are modified into spines to reduce transpiration.

➤ **Xerophytic Adaptation (*Opuntia*)**

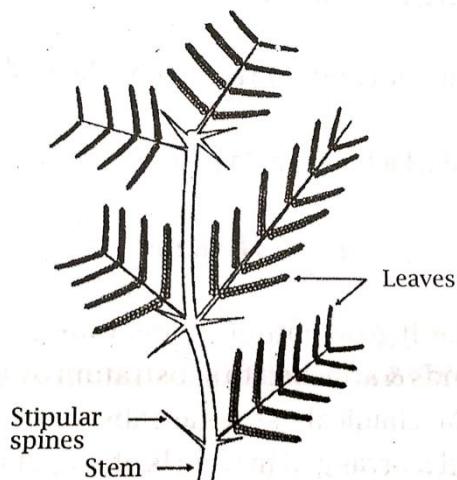
- 1) It is succulent xerophyte.
- 2) The stem is phylloclade.
- 3) Bristles are present to prevent grazing.



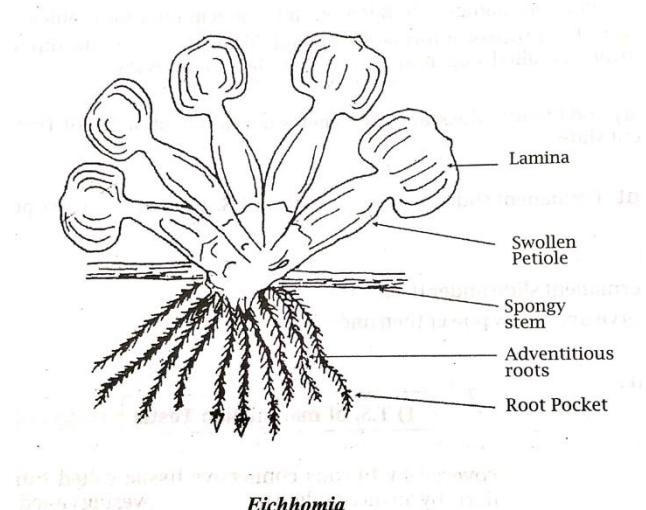
Hydrilla



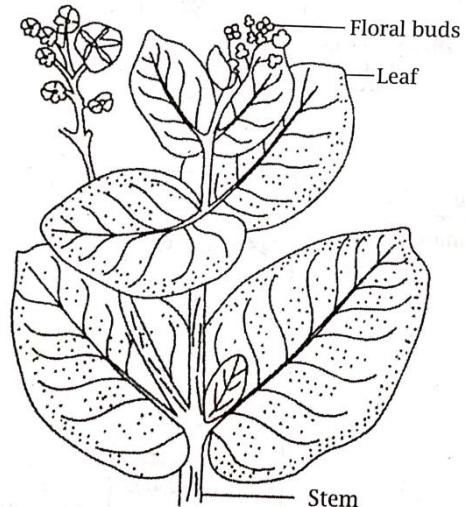
Typha



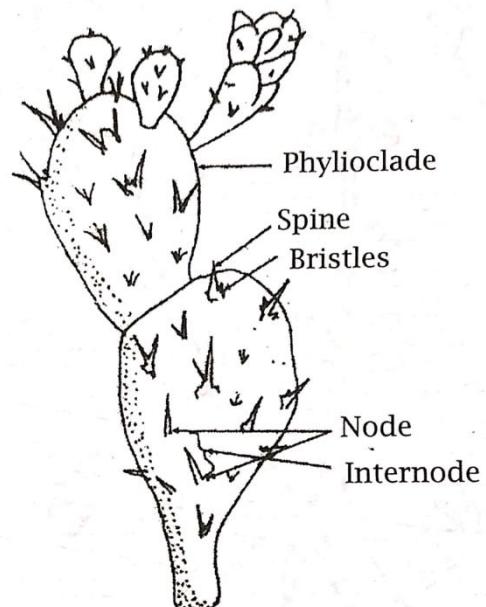
Acacia arabica



Eichhornia



Calotropis procera



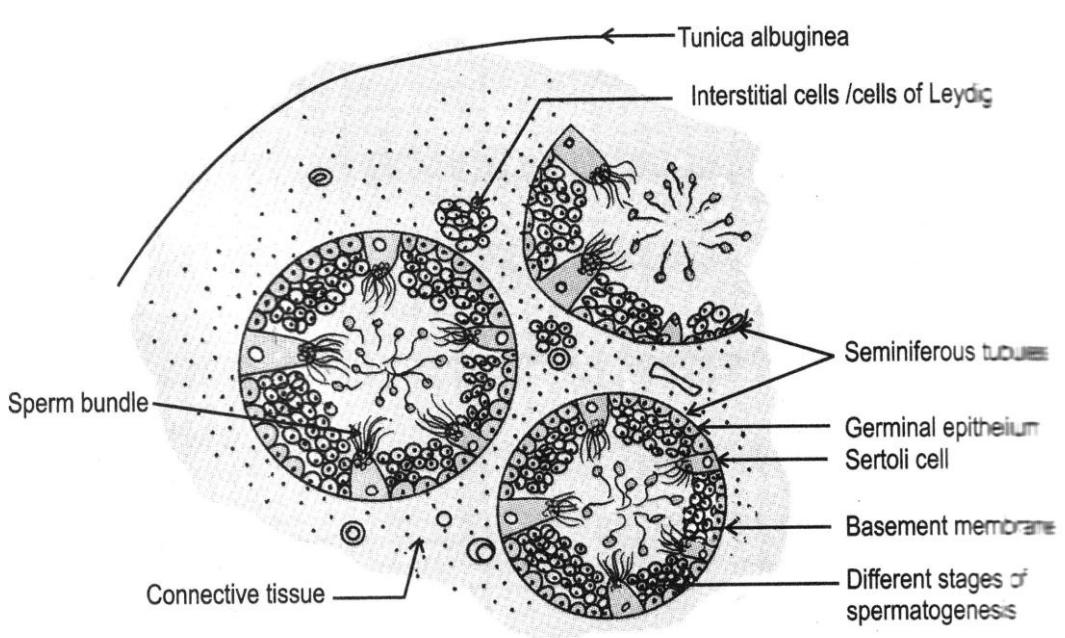
Opuntia dillenii

Please Note : Don't draw diagrams for this experiment

D. Study of histological structure of mammalian organ

➤ T.S. of Testis

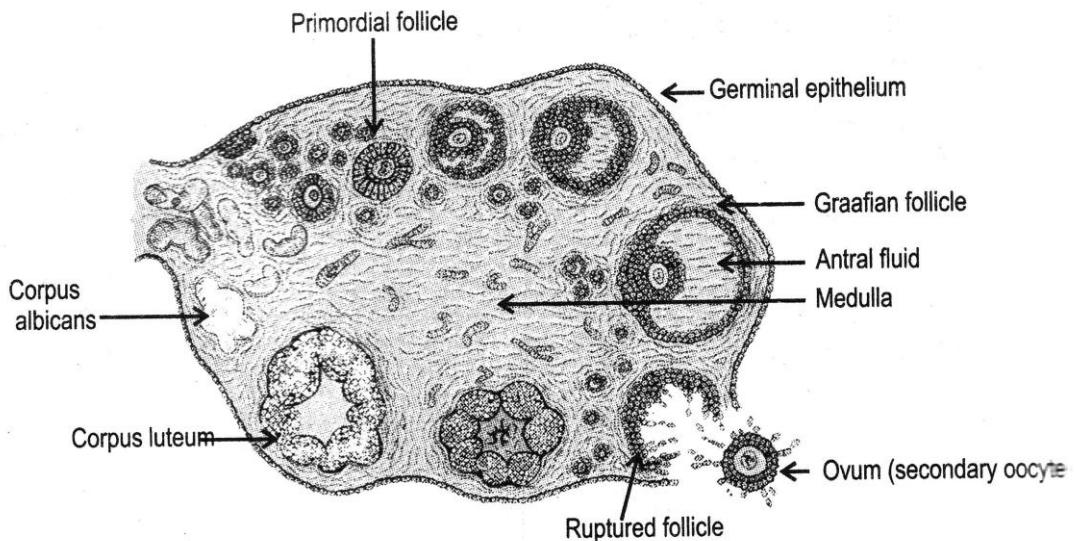
- 1) T.S. of testis shows tunica albigenia and seminiferous tubules.
- 2) Seminiferous tubules are lined by cuboidal germinal epithelial cells.
- 3) It shows different stages of spermatogenesis like spermatogonia, primary and secondary spermatocytes, spermatids and sperms.
- 4) Large pyramidal cells present between germinal epithelial are called nurse cells or sertoli cells.



T.S of testis

➤ T.S. of Ovary

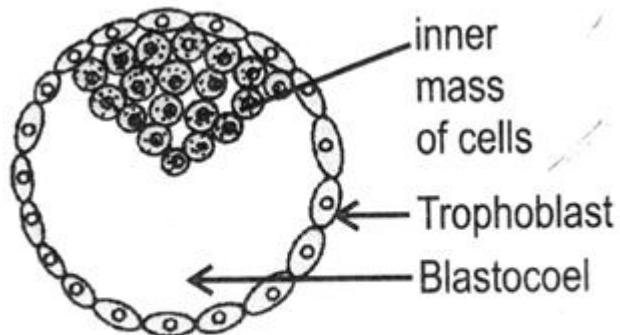
- 1) T.S. of ovary shows inner medulla and outer cortex.
- 2) The cortex is lined by germinal epithelium.
- 3) Cortical region shows different stages of development of ovarian follicles or graafian follicles.
- 4) After ovulation graafian follicle converts into corpus luteum. If ovum is not fertilized corpus luteum converts into corpus albicans.



T.S of ovary

➤ **V.S. of Blastula**

- 1) The V.S. of blastula shows outermost layer called trophoblast.
- 2) It encloses a cavity called blastocyst cavity or blastocoel and inner cell mass.
- 3) The trophoblast cell layer produces extra embryonic membrane while the inner cell mass develops into proper embryo.



V.S of Blastocyst

Please Note : Draw all diagrams for this experiment

E. Study various syndromes and karyotypes in human beings

1) Down's syndrome (21 Trisomy) ($46+1=47$)

1. Down's syndrome was described by John Langdon Down.
2. Syndrome is caused by aneuploidy which means addition or deletion of one or two chromosomes in diploid chromosome number.
3. Down's syndrome is due to extra chromosome number 21. It shows presence of three copies of 21st chromosome instead of homologous pair of (Trisomy for 21st Chromosome) ($2n+1$)
4. It is due to failure of separation of chromosome or disjunction during meiosis.

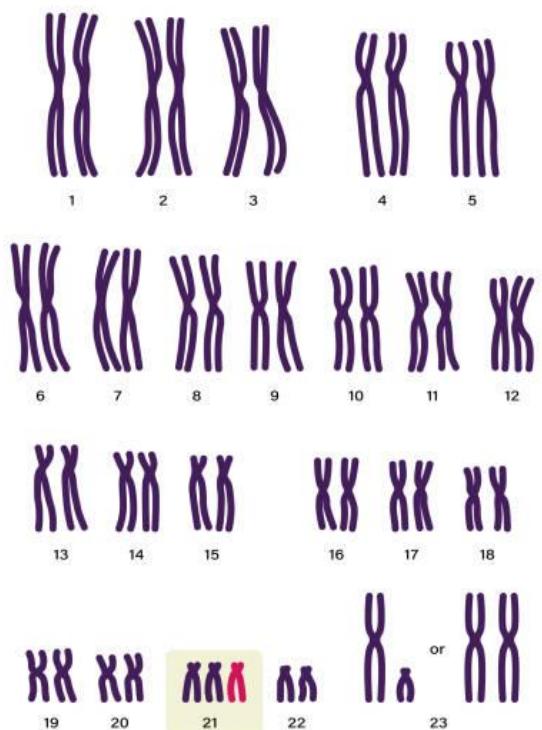
Symptoms:

1. Most children show fold of skin (epicanthal skin fold) over the inner corner of the eye. This results in downward slanting of eyelids.
2. The face is typically flat and rounded flat nose, mouth open and tongue protruding.
3. Mental retardation
4. Due to poor skeletal development, they have short stature and relatively small skull, palate is arched.
5. Flat hand with characteristic crease which runs all the way across the palm (Simian crease).

2) Turner's syndrome (44+XO)

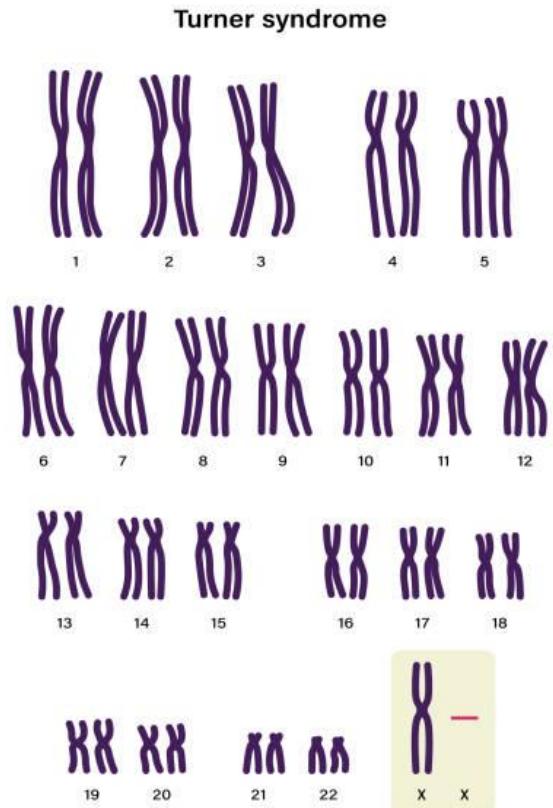
1. Turner's syndrome was described by H. H. Turner.
2. It is due to X-monosomy.
3. It arises due to non-disjunction during meiosis of either male or female.
4. Turner's syndrome is fatal in early pregnancy.
5. Person with Turner's syndrome have 45 chromosomes with only one sex chromosome X. Such a genotype is therefore represented by (44+XO).

Down syndrome



Symptoms:

1. The phenotype in these patients is female.
2. They have a short stature, webbing of neck, low posterior hair line, secondary sexual characters do not develop.

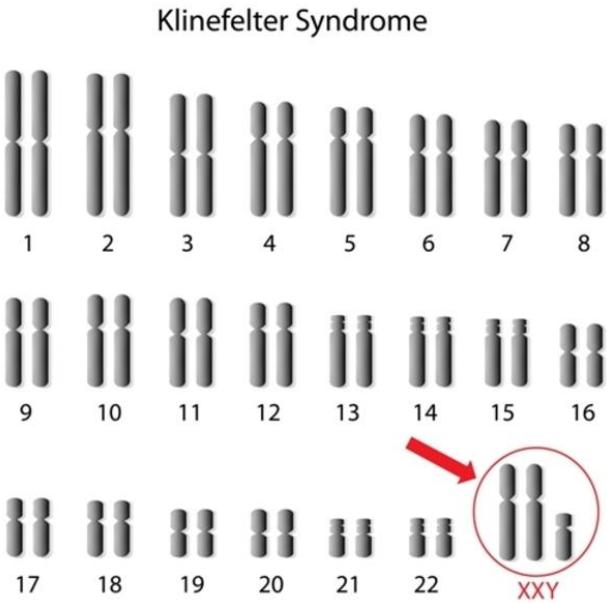


3) Klinefelter's syndrome (44+XXY)

1. It is caused due to an extra sex chromosome i.e. extra X chromosome.
2. So the genotype is XXY instead of XY so they are sometime described as feminized males.
3. The extra chromosome arises as a result of non-disjunction of X chromosome during meiosis during gametes formation.

Symptoms:

1. Patients are tall, thin, eunuchoid (sterile and poorly developed secondary sexual characters).
2. Testis are very small.
3. They have normal intelligence.
4. Spermatogenesis is absent.



Please Note : Don't draw diagrams for this experiment

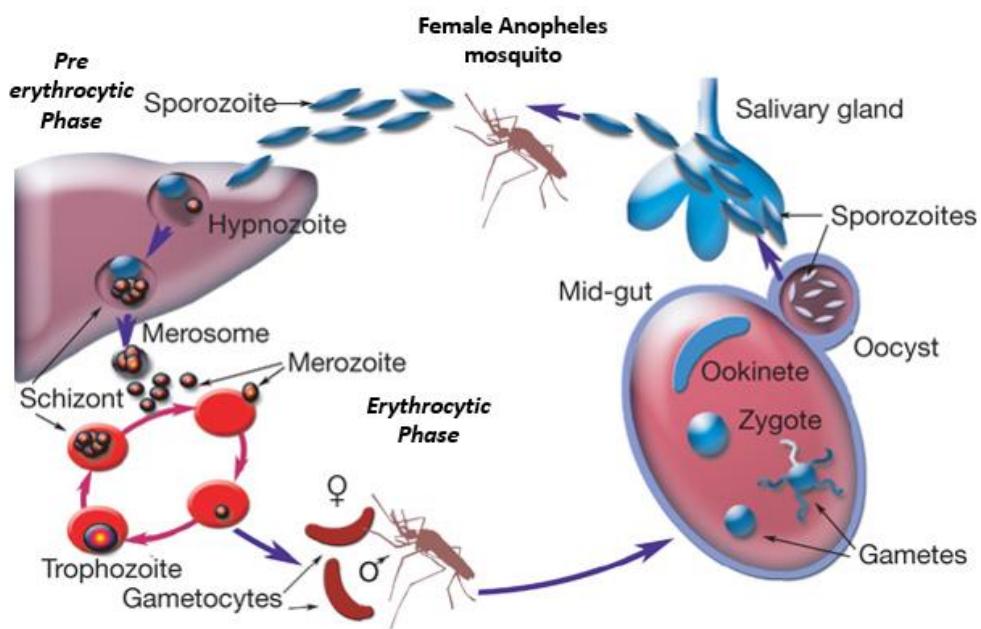
F. Study of common disease causing organisms

➤ **Pathogen (Plasmodium)**

- 1) Plasmodium is an intracellular blood parasite which causes malaria.
- 2) The life history of plasmodium is completed in two hosts, the man and the female anopheles mosquito.

Symptoms :

- 1) It causes malaria.
- 2) Its symptoms include fever, shivering, caused by release of haemoglobin arthralgia (joint pain), vomiting, anaemia (caused by hemolysis), haemoglobinuria, retinal damage and convulsions.



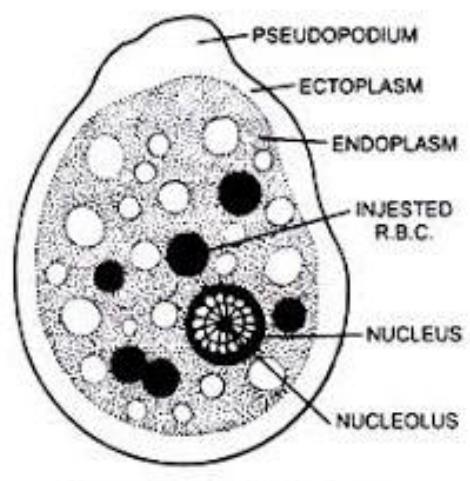
Life Cycle of Plasmodium

➤ **Pathogen (Entamoeba histolytica)**

- 1) Entamoeba histolytica is a parasite in the large intestine of man.
- 2) It occurs in three stages 1. Trophozoite 2. Pre-cystic stage 3. Cystic stage.
- 3) Disease is caused by the trophozoite form.

Symptoms :

- 1) It causes amoebiasis in man.
- 2) It causes amoebic dysentery, abscess in liver, lungs and brain.



Entamoeba histolytica

➤ **Pathogen (Ascaris)**

- 1) Ascaris lumbricoides (roundworm) is intestinal roundworm that are infectious to humans.
- 2) Body is elongated, cylindrical and covered with cuticle.

Symptoms:

- 1) The disease caused by ascaris is called ascariasis.
- 2) It causes restlessness, weight loss, anorexia, distended abdomen, intermittent loose stool and occasional vomiting.

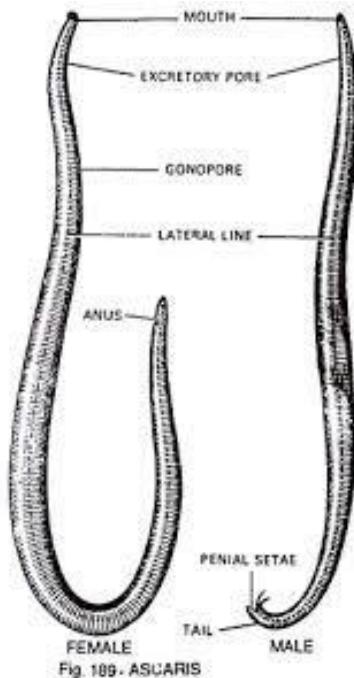


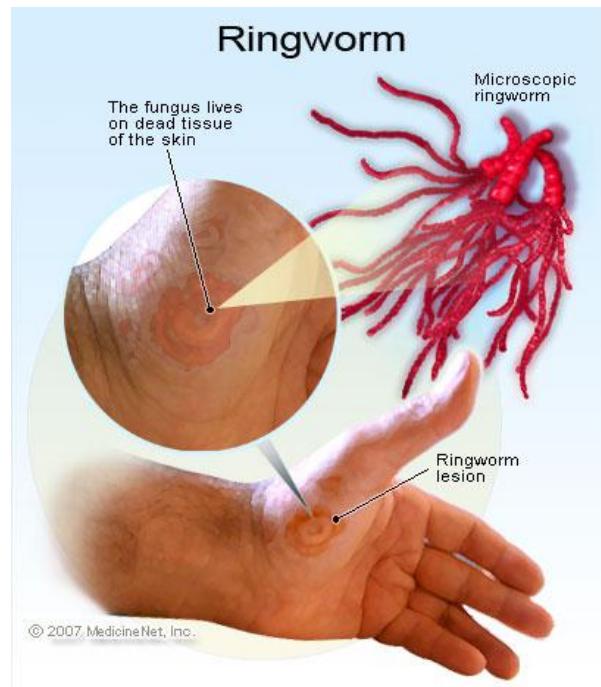
Fig. 189 - ASCARIS

➤ **Pathogen (Ringworm)**

- 1) It is caused by *trichophyton*, *microsporum andouini* and *epidermophyton*.
- 2) *Microsporum andouini* is commonly called ringworm.
- 3) The fine mycelium of the fungus occurs in the dermis.

Symptoms:

- 1) Ringworm causes dermatomycosis.
- 2) Red ring patches of vesicles on the skin
- 3) Intense itching and scaly skin and scalp



Please Note : Don't draw diagrams for this experiment

G. Study of meiosis

Meiosis is a special type of cell division that occurs in the diploid reproductive or germ tissue (cells). It is a reduction division that results in the formation of four haploid daughter cells.

Meiosis occurs in two steps viz. Meiosis I and Meiosis II

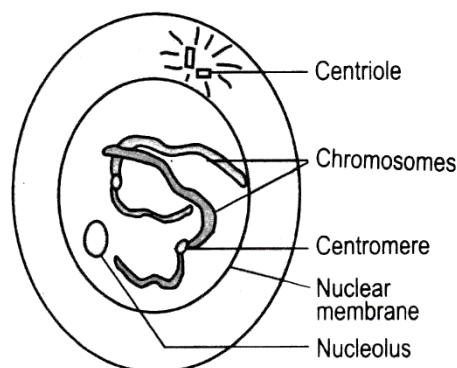
- I. **Meiosis I** : It is reduction division in which chromosome number is reduced to half of the number of chromosome in the parent cell. It is completed in two stages Karyokinesis I and Cytokinesis I
 - A. Karyokinesis I : It's the nuclear division which takes place in four sub stages
 1. Prophase I : It is an initial and very lengthy phase. Its divided into five sub-stages
 - i. Leptotene : Chromosomes becomes distinct and appears like long, thin and beaded threads.
 - ii. Zygote : It is characterised by paring of homologous chromosomes called 'Synapsis'. Paired chromosomes are called bivalents or tetrad.
 - iii. Pachytene : Each bivalent or tetrad consist of four chromatids (two pairs) and each pair is united by a centromere. In this stage crossing over (X shaped chiasmata) occurs in between two non-sister chromatids of bivalent. Exchange of genetic material or chromatid segments takes place which result in recombination that leads to variation and thus the evolution of the organism.
 - iv. Diplotene : After crossing over, homologous chromosomes start repelling from each other but remain attached at the chiasmata.
 - v. Diakinesis : Terminalisation i.e. shifting of chiasmata toward end of chromatid takes places. Nucleolus and nuclear membrane completely disorganize and disappear.
 2. Metaphase I : The tetrads arrange at the equator plane of the cell in such a way that centromeres of homologues tetrads lie towards the poles and arms towards the equator.
 3. Anaphase I : Reduction division takes place in this stage i.e chromosomes number is reduced to half of the total number. Tactile (spindle) fibrils start condensing, become shorter and pull chromosomes (homologous) toward opposite poles. It results in the separation of recombined homologous chromosomes towards opposite poles.
 4. Telophase I : In this phase chromosomes reach the opposite poles. Nucleolus reappears. Nuclear membrane gets developed around each set of chromosomes, forming two daughter nuclei.
 - B. Cytokinesis I : It's the division of cytoplasm which occurs by formation of cell plate in plant cell and furrow formation in animal cell. Two daughter cells formed are having single, haploid nucleus each.

II) **Meiosis – II** : It is divided into Karyokinesis – II and Cytokinesis – II

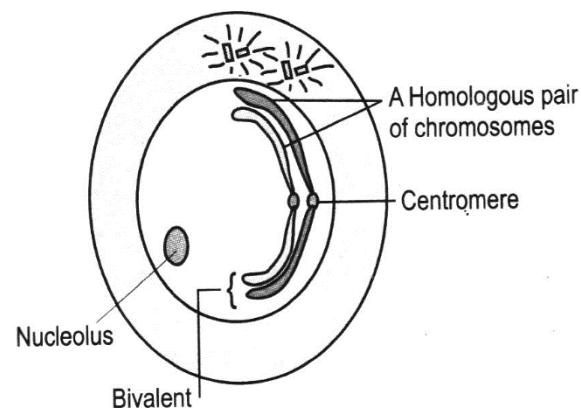
A. Karyokinesis II : It consist of 4 substages

1. Prophase II : It is the initial phase. Nucleus enlarges. Chromosomes becomes prominent, shorter and thicker. Nucleolus and nuclear membrane disappear.
2. Metaphase II : With the help of spindle fibres chromosomes get arranged along the equatorial plane in such a way that the centromere lie on the plane the arms towards the poles.
3. Anaphase II : Centromere divides and sister chromatids get separated which are now called as daughter chromosomes. Tactile (spindle fibres) fibres start condensing becoming shorter and shorter pulling daughter chromosomes upto the opposite poles.
4. Telophase II : Daughter chromosomes get collected at the opposite poles. Reappearance of nucleolus and nuclear membrane results in the formation of two daughter nuclei. At the end of karyokinesis II, four nuceli are formed.

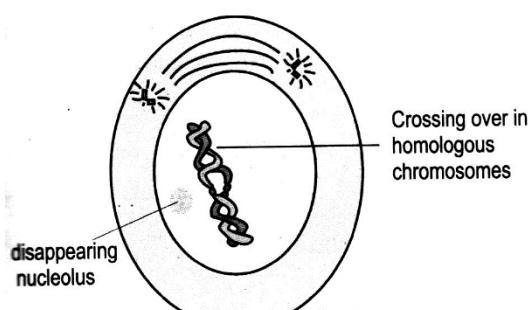
B. Cytokinesis II : In plant, Cell plate formation takes place at the centre of the cell and animal cell divide by furrow formation. It give rise to daughter cells.



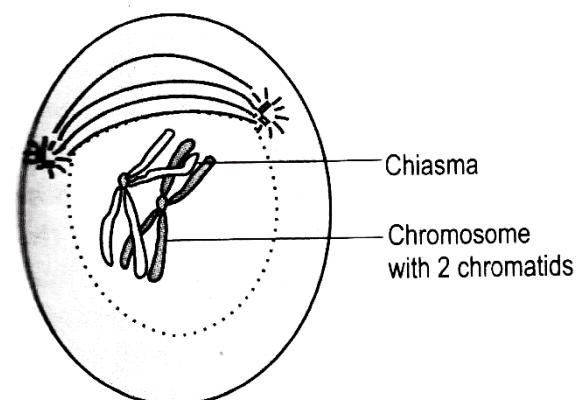
Leptonene



Zygotene



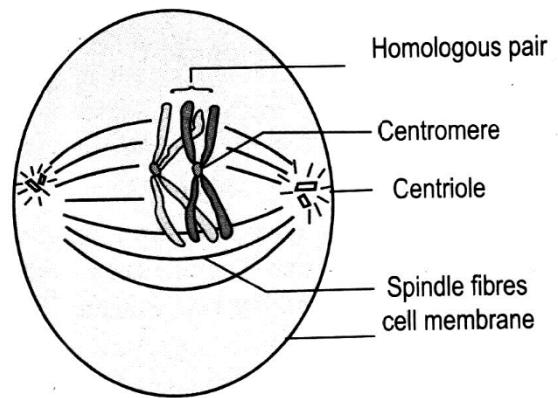
Pachytene



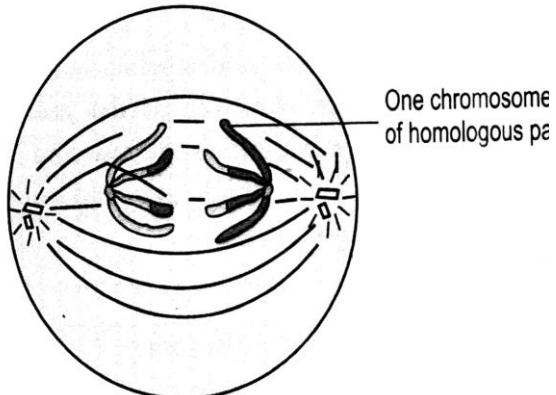
Diplotene



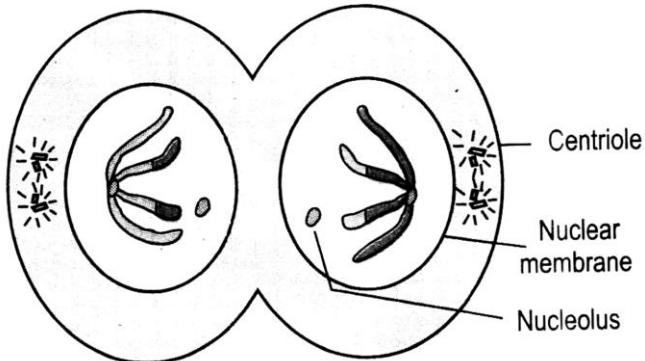
Diakinesis



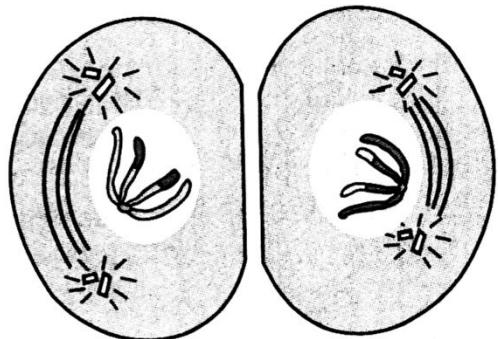
Metaphase-I



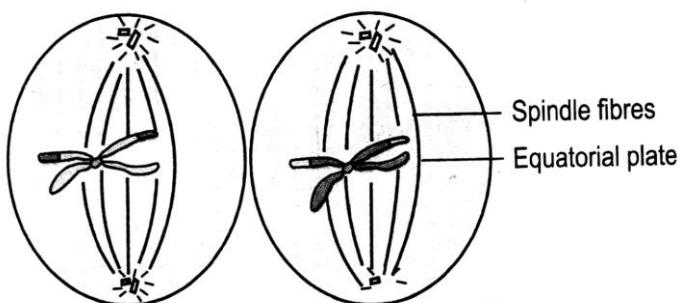
Anaphase-I



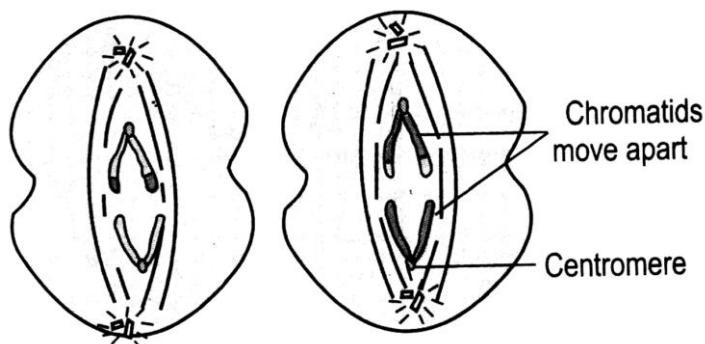
Telophase-I



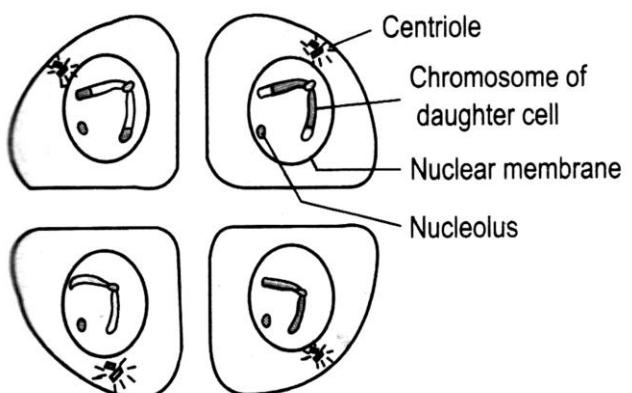
Prophase-II



Metaphase-II



Anaphase-II



Telophase II and cytokinesis

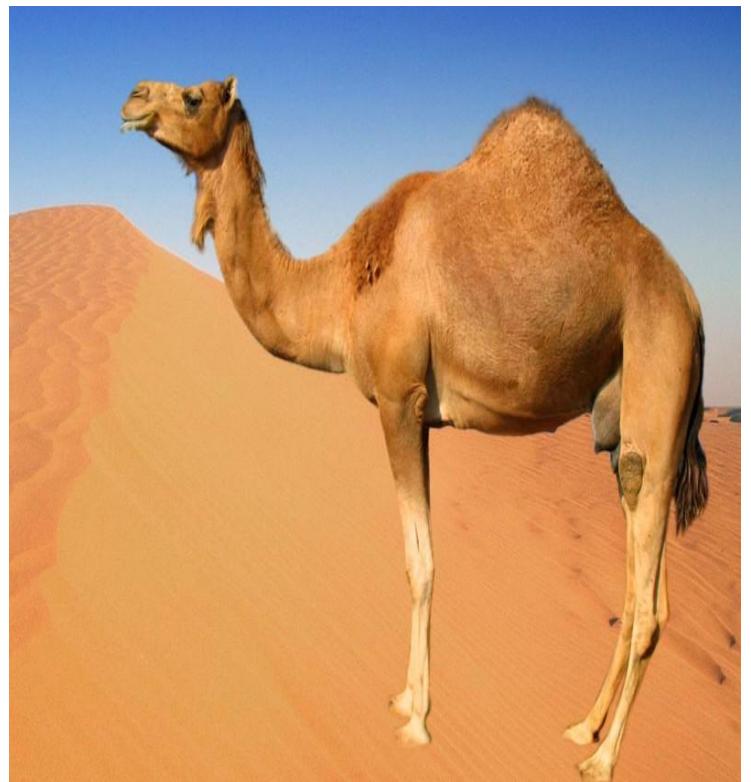
Please Note : Draw all diagrams for this experiment

H. Study of morphological adaptations of animals found in xeric and aquatic habitat

Adaptations of animals found in xeric conditions

➤ Camel - Xerocole Animal

- 1) It excretes concentrated urine in order to conserve water.
- 2) It accumulates fat in the hump so that heat flows away from the body and inward flow of heat is prevented.
- 3) They can even close their nostrils to stop sand blowing in.



➤ Kangaroo Rat - Xerocole Animal

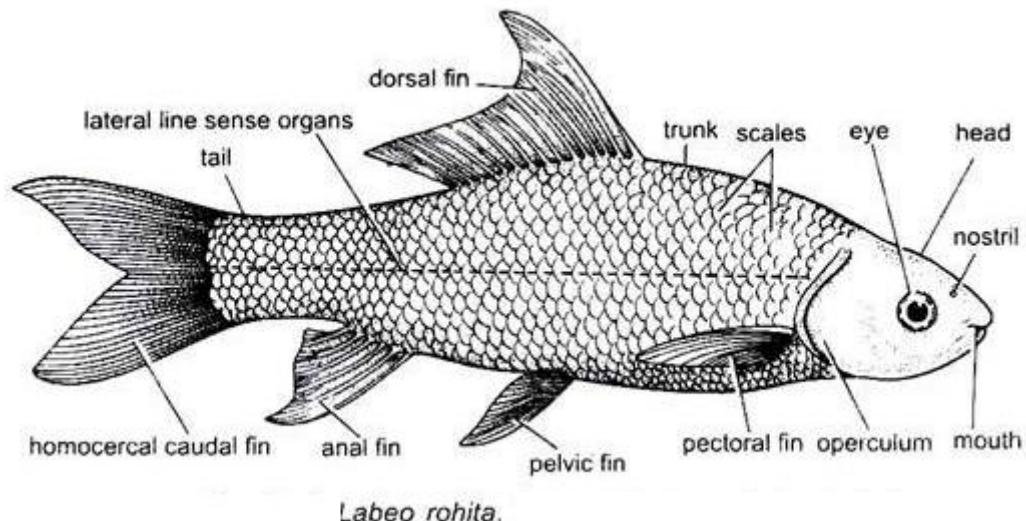
- 1) It is nocturnal in habit to avoid heat and to have humid air inside.
- 2) It obtains metabolic water and it has the ability to derive hygroscopic water from dry seeds which it eats.
- 3) Kangaroo rats neither sweat nor pant to keep themselves cool.



Adaptations of animals found in aquatic conditions

➤ **Labeo rohita - Aquatic Animal**

- 1) Body is laterally compressed to reduce friction.
- 2) They have gills for respiration and fins for swimming.
- 3) Body is covered by scales to prevent osmotic entry of water in the body.



➤ **Dolphin - Aquatic animal**

1. They have streamlined body to reduce friction.
2. Snout is beak like.
3. Dolphin's flippers control steering.
4. Nostrils are positioned near the top of the head to allow animal to the surface breathe.

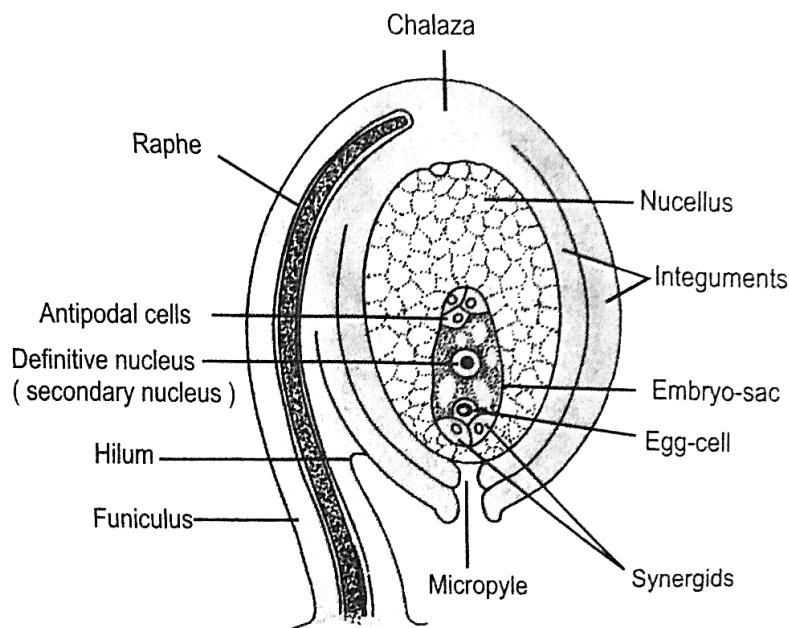


Please Note : Don't draw diagrams for this experiment

I. Study of V.S. of anatropous ovule

V. S. of Anatropous Ovule

1. Anatropous ovule is also called inverted ovule and it is the most common type of ovule in angiosperms.
2. The ovule shows two main parts viz body and funicle
3. The body shows central parenchymatous tissue called 'nucellus' surrounded by two protective covering outer and inner integuments.
4. A narrow opening at the apex of the ovule is called micropyle opposite of chalaza.
5. Embryo sac is multicellular eight nucleated and seven celled structure consisting of egg apparatus, diploid secondary nucleus and three antipodal cells.



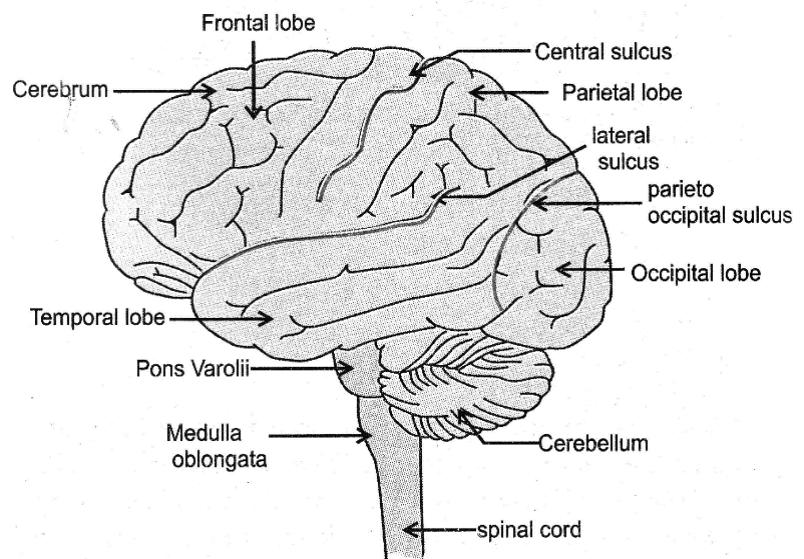
V. S. of Anatropous Ovule

Please Note : Draw all diagrams for this experiment

I. Study of parts of human brain, ear and eye

➤ Human Brain (Encephalon)

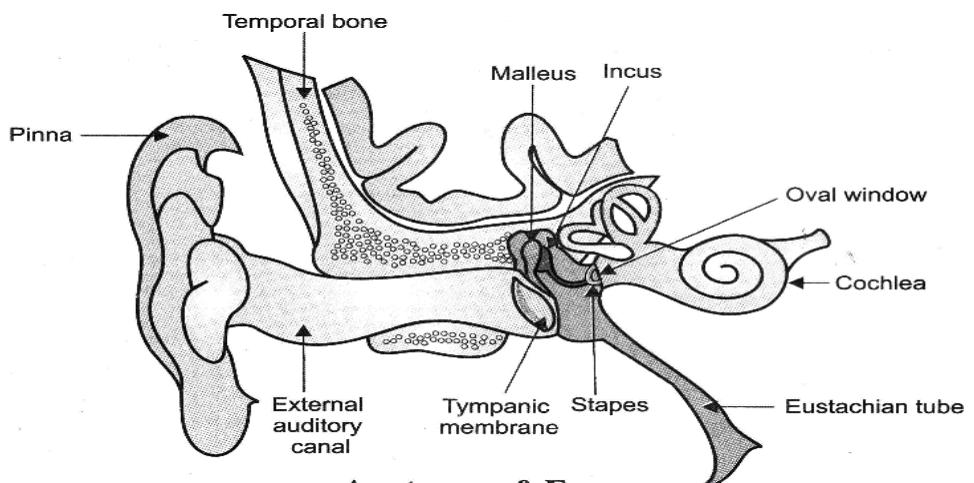
1. Brain is mainly divided into three main parts – viz Forebrain, Midbrain and Hindbrain
2. Fore brain consists of olfactory lobes, cerebrum and diencephalon.
3. Midbrain consists of Crura cerebri and Corpora quadrigemina.
4. Hind brain consists of Cerebellum, Pons varolii and Medulla oblongata.
5. Cerebrum is a largest part of brain consisting of Frontal, Parietal, Temporal and Occipital lobes.
6. Cerebrum shows outer cerebral cortex made up of grey matter and inner cerebral medulla made up of white matter.
7. Cerebrum mainly contain the areas for intelligence, will power, memory, taste, hearing and vision



Lateral view of human brain

➤ Human Ear

1. The ears are the sensory organs that help in hearing and maintaining body equilibrium.
2. Each ear is divided in three parts i.e., external ear, middle ear and internal ear.
3. The external ear consists of the pinna and external auditory meatus (canal).
4. Middle ear has three ear ossicles (malleus, incus and stapes) and a Eustachian tube.
5. Eustachian tube connects the middle ear cavity with the pharynx, which helps in equalizing the air pressure on either side of the tympanic membrane.
6. The internal ear is fluid filled structure called labyrinth.
7. Labyrinth has cochlea and vestibular apparatus.
8. Cochlea has organ of corti which contains the hair cells that acts as auditory receptors.

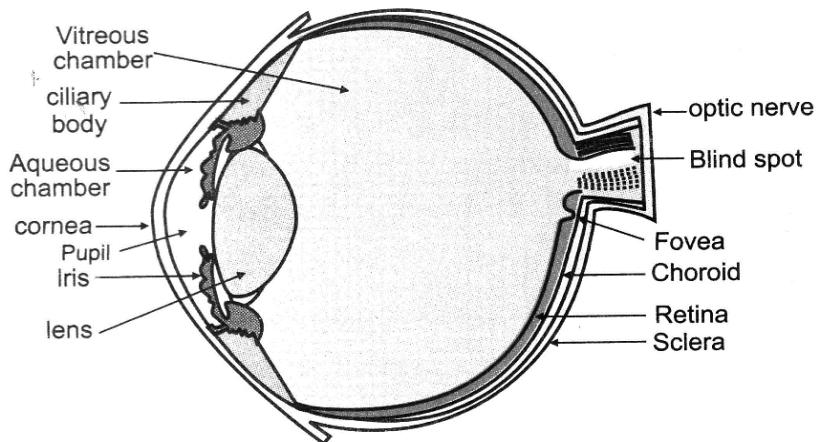


Anatomy of Ear

9. Vestibular apparatus consists of three semicircular canals and the otolith organ formed of the sacculus and utriculus.
10. Semicircular canals and otolith organ help in maintaining body posture and the balance of the body.

➤ **Human eye**

1. A pair of eyes are located in sockets of the skull known as orbits.
2. The wall of eye is formed by three layers, i.e. sclera, choroid and retina.
3. Sclera is the outer layer, formed of dense connective tissue.
4. The anterior, transparent part of the sclera is called cornea.
5. Choroid is the middle, bluish layer which contains many blood vessels.
6. Choroid's anterior part is thick and forms the ciliary body.
7. Forward segment of the ciliary body is pigmented and opaque known as iris. This is the visible coloured portion of the eye.
8. A transparent crystalline lens is present anteriorly which is held in position by the ligaments of ciliary body.
9. The aperture in front of the lens and surrounded by the iris is known as pupil.
10. Retina is the innermost layer of the eye.
11. It consists of three sub layers viz. ganglion cells, bipolar cells and photo receptor cells
12. Photoreceptor cells are sensitive to light and are of two types called rods and cones.
13. The optic nerve leaves the eye from the blind spot.
14. A yellowish pigmented spot is present lateral to the blind spot called macula lutea, which has a central pit known as fovea.
15. In fovea the cones are densely packed and hence it has greatest resolution of vision.
16. The space between the cornea and the lens is known as aqueous chamber and is filled with thin watery fluid known as aqueous humor.
17. The larger space between the lens and the retina is known as vitreous chamber and is filled with the transparent gelatinous fluid known as vitreous humor.
18. The aqueous humor and the vitreous humor maintain the shape of the eyeball.



Anatomy of an eye

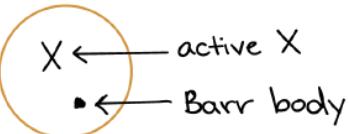
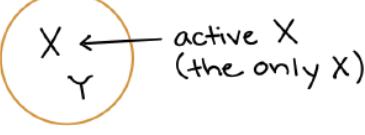
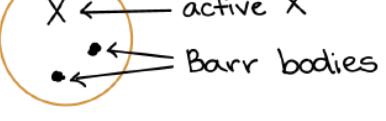
Please Note : Draw all diagrams for this experiment

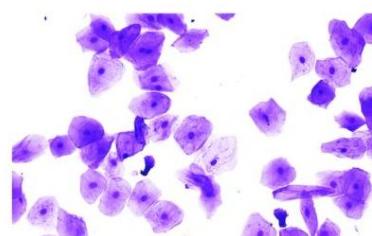
19. I. Examine the presence and absence of Barr body in the given sample

Observation :

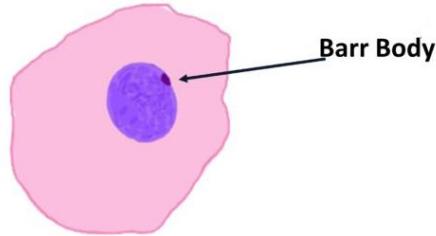
1. Barr body is seen attached on the inner side of nuclear membrane of the cell.
2. It is the condensed inactive X-chromosome found in the female somatic cell.
3. The chromatin body is made inactive by a process called lyonization.

Only one bar body is seen in the cell of normal female and never in the cell of normal male.

XX female	
XY male	
XXY male (Klinefelter)	
XXX female (triple X)	



Squamous cells in the buccal / smear

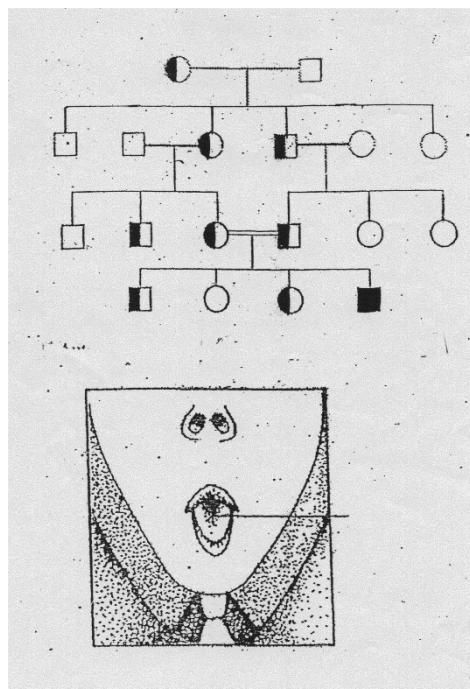


Please Note : Draw the chart and 2nd (lowermost) diagram for this experiment

J. Study of pedigree chart of genetic traits

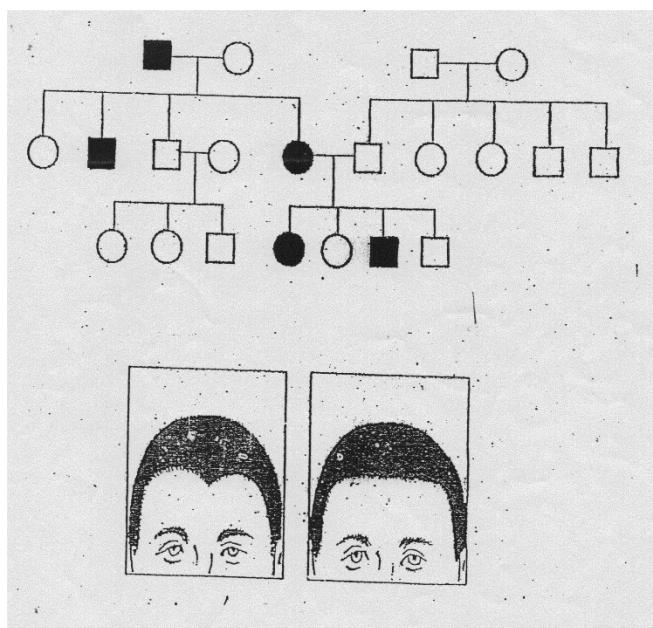
➤ Pedigree Chart of Rolling Tongue

- 1) It is ability of tongue to roll.
- 2) It is autosomal dominant inheritance.
- 3) Homozygous (AA) and heterozygous individuals (Aa) can roll their tongue.
- 4) The person homozygous (aa) cannot roll the tongue.



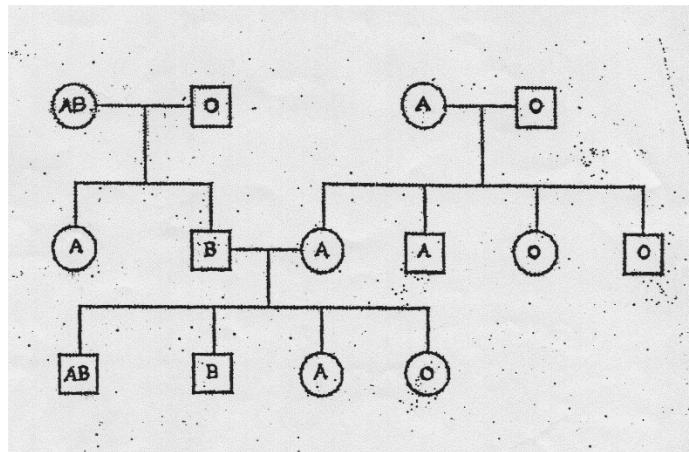
➤ Pedigree Chart of Widow's peak

- 1) The 'V' shaped hair line on the forehead is called widow's peak.
- 2) It is autosomal dominant inheritance.
- 3) The gene presents in 'AA' and 'Aa' combination results in widow's peak whereas 'aa' results in straight line.



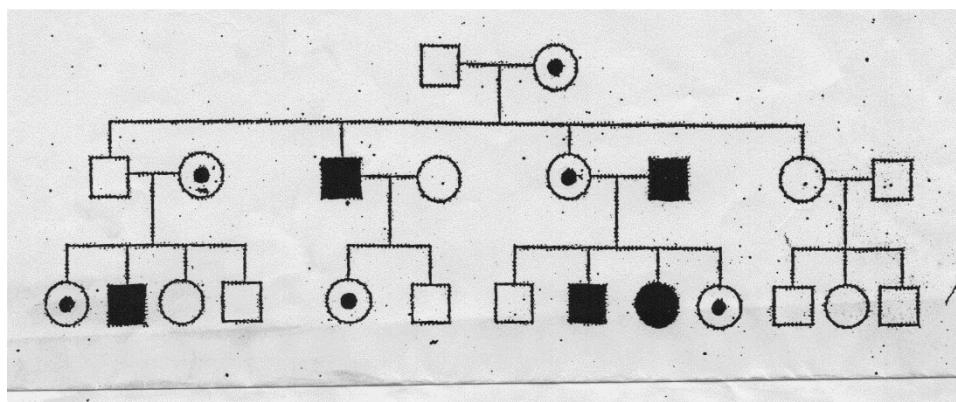
➤ **Pedigree Chart of Blood group**

- 1) The gene I controls ABO blood groups.
- 2) It has three alleles, IA, IB and i.
- 3) IA and IB are co-dominants and are completely dominant over i.



➤ **Pedigree Chart for Colour blindness**

- 1) Red green colour blindness is a X linked recessive inheritance.
- 2) It is more common in males than in females, due to presence of double dose of X chromosomes in females.
- 3) It shows criss cross inheritance

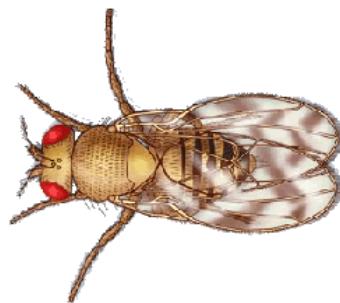
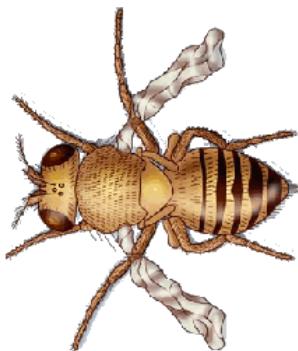


Please Note : Don't draw diagrams for this experiment

J. Study wing shape and eye colour in Drosophila

Observation table:

	<i>Eye colour</i>	<i>Pattern of Wing</i>
Culture 1	<i>Red (Wild)</i>	<i>Normal</i>
Culture 2	<i>Black (Mutant)</i>	<i>Vestigial</i>



Black Eye, Vestigial Wing

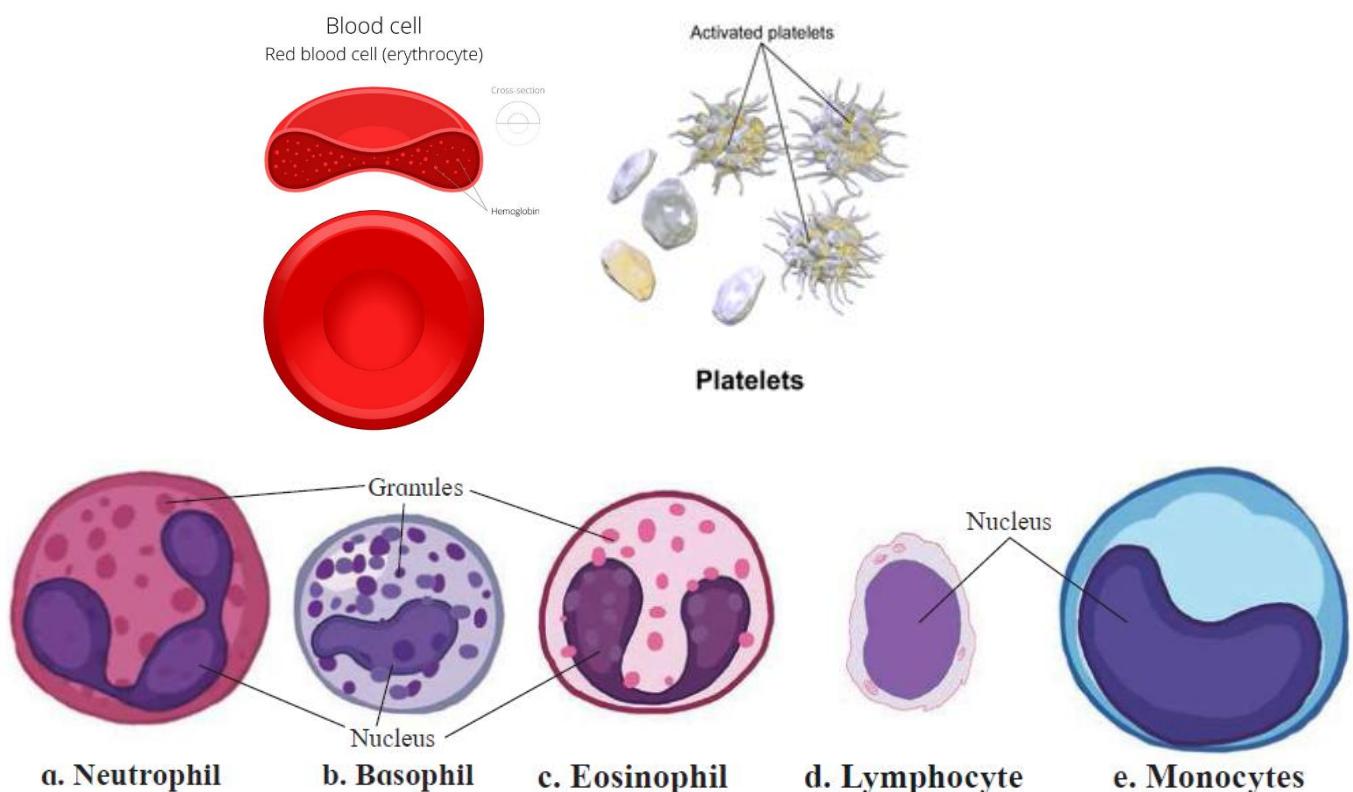
Red Eye, Normal Wing

Please Note : Don't draw diagrams, but draw the chart for this experiment

J. Identify blood cells in the slide of blood smear

Observation table:

Cells	Structure	Function
RBC (Erythrocytes)	Circular, biconcave, non nucleated cell	Transport oxygen from lungs to tissues and carbon dioxide from tissues to lungs.
WBC (Leucocytes)	Colourless, nucleated, amoeboid cell	Destroys germs and inactivates toxins
Acidophils	Bilobed nucleus	Destroy antigen-antibody complex by phagocytosis
Basophils	Twisted nucleus	Secrete heparin (Anticoagulant), histamine (inflammatory in allergic reaction), Serotonin
Neutrophils	2 to 7 lobed nucleus	Phagocytic
Lymphocytes	Round nucleus	Produce antibodies
Monocytes	Kidney shaped nucleus	Phagocytic
Platelets	Round, biconvex, Non nucleated cell	Blood clotting



Please Note : Draw all diagrams for this experiment

Project
