BIOLOGY PRACTICALS - 2021-2022

CLASS- XII

PRACTICALS

Max. Marks: 15 for each Term

Evaluation Scheme			
	TERM - I	**TERM - II**	**MARKS**
Part A			
One Major Experiment	Experiment No. – 1	Experiment No. - 3	**4**
One Minor Experiment	Experiment No. - 2	Experiment No. – 4, 5	**3**
Part B			
Spotting (3 Spots of 1 mark each)	B.1, 2, 3, 4, 5	B.6, 7, 8	**3**
Practical Record + Investigatory Project &Record + Viva Voce			**5**
Total			**15**

Practicals should be conducted alongside the concepts taught in theory classes.

A. List of Experiments

TERM - I:

1. Isolate DNA from available plant material such as spinach, green pea seeds, papaya, etc.
2. Prepare a temporary mount to observe pollen germination.

TERM - II:

3. Prepare a temporary mount of onion root tip to study mitosis.
4. Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organism
5. Collect and study soil from at least two different sites and study them for texture, moisture content, pH and water holding capacity. Correlate with the kinds of plants found in them.

B. Study/observation of the following (Spotting)

TERM - I:

B.1 Flowers adapted to pollination by different agencies (wind, insects, birds).

B.2 Identification of stages of gamete development, i.e., T.S. of testis and T.S. of ovary through permanent slides (from grasshopper/mice).

B.3 Meiosis in onion bud cell or grasshopper testis through permanent slides.

B.4 T.S. of blastula through permanent slides (Mammalian).

B.5 Prepared pedigree charts of any one of the genetic traits such as rolling of tongue, blood groups, ear lobes, widow's peak and colourblindness.

TERM – II:

B.6 Common disease - causing organisms like *Ascaris, Entamoeba, Plasmodium*, any fungus causing ringworm through permanent slides, models or virtual images. Comment on symptoms of diseases that they cause.

B.7 Two plants and two animals (models/virtual images) found in xeric conditions. Comment upon their morphological adaptations.

B.8 Two plants and two animals (models/virtual images) found in aquatic conditions. Comment upon their morphological adaptations.

TERM-1

EXPERIMENT-1

Object : Study pollen germination on a slide.

Requirements : Flower with pollen grains, glycerine, slides, coverslip, 2 needles, microscope, 10 gm sucrose, 10 mg boric acid, 30 mg calcium nitrate, 10 mg potassium nitrate, 20 mg magnesium sulphate, 100 ml distilled water.

Procedure :

(i) Prepare the medium for pollen growth by mixing 10 gm sucrose, 10 mg boric acid, 30 mg calcim nitrate, 10 mg potassium nitrate, 20 mg magnesium sulphate in 100 ml of distilled water.

(ii) Take a drop of above nutrient medium on a slide, dust a few pollen grains on it and leave them undistrubed for 10 minutes.

(iii) Observe the slide under low power of compound microscope.

Observation & Conclusion : The pollen grain develops pollen tube arising from germpore. This shows that pollen grow in proper growth medium.

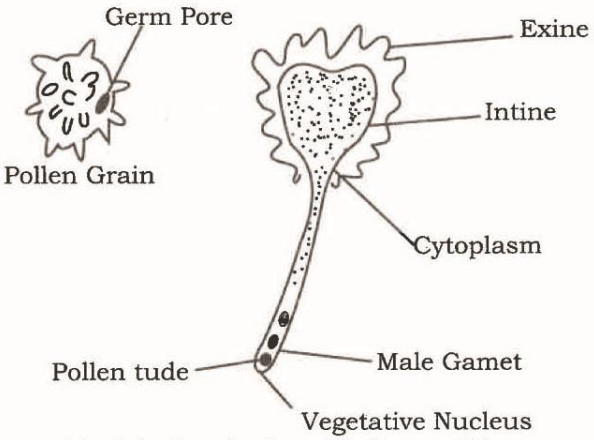


Fig. 1.1 : Germination of Pollen on slide

EXPERIMENT-2

Object : **Isolation of DNA from available plant material such as spinach, green pea seeds, papaya etc.**

Materials Required : Spinach leaves/Pea seeds/Papaya, Sand ,test tube, 50 ml beakers, Cheesecloth, Mortar and pestle, 10ml graduated cylinder.

Chemicals Required : 95% Ethanol solution (keep ice cold in plastic bottle in freezer),12% Salt solution,29.2 g deionized salt,250 ml distilled water,50% Detergent solution,50 ml Wisk Free,50 ml distilled water, Contact Lens Cleaning Solution, Use 1 tablet per 3ml of distilled water.

Procedure :

1. Choose 2-3 spinach leaves. Remove any stems if present.
2. Place 1 ml of distilled water in a mortar and pestle along with leaves. Add a small pinch of sand and grind until spinach looks like creamed spinach. Add the contents of the mortar and pestle to a 50 ml beaker.
3. Add 1 ml of 50% detergent solution and 9 ml salt solution to spinach. Mix well with a glass stir rod.
4. Place on a hot plate and heat until boiling. Remove from heat and let sit for 2 minutes.
5. Put on ice for 5 minutes so that it cools down.
6. Pour spinach mixture (supernatant) through cheesecloth into a clean beaker.
7. Pour the supernatant into a test tube then add 1 ml of freshly prepared contact lens cleaning solution.
8. Carefully layer 6 ml chilled 95% ethanol solution onto the green supernatant using a 10 ml graduated cylinder. Slowly pour ethanol down the side of the test tube. Try not to let the two layers mix together.
9. Using the wire loop, spool the DNA by gently swirling the loop at the interface between the green supernatant and the clear ethanol. The DNA will congeal at the point where the two layers meet.

EXPERIMENT-3

Object : Flowers adapted to pollination by different agencies(wind, insect).

Requirements : Sunflower (for insect pollination), Wheat flower (for wind pollination), Bottle - Brush (for bird pollination), forceps, slide, dissecting microscope and needles.

Procedure : **For insect pollination :**

(i) Take a sunflower. Observe the central black disc florets and peripheral yellow ray floret flowers.

(ii) Disk florets are sessile, bisexual, tubular, epigynous flowers born on receptacle. Sepals are modified intro hair. Petals are five fused. Stamens are five with fused anthers and free filaments (syngenesis). Pistil has bifid stigma, long style and round ovary.

(iii) Ray florets are yellow, unisexual and pistillate or neuter, sepals like ray floret, petals five, fused, ovate, stamens absent. Pistil has bifid stigma, style long, ovary, round shaped.

Pollination :

The disc florets are bisexual and protandrous (stamens mature before pistil). So cross pollination occurs. This pollination is mainly brought by insects.

Mechanism :

(i) Anthers mature first and release pollen grains. At this time stigma is immature and remain hidden in compressed form, below anthers.

(ii) The insects like honey bees walk over the disk florets to suck nectar from the base of style. The pollen grains stick to their legs and abdomen.

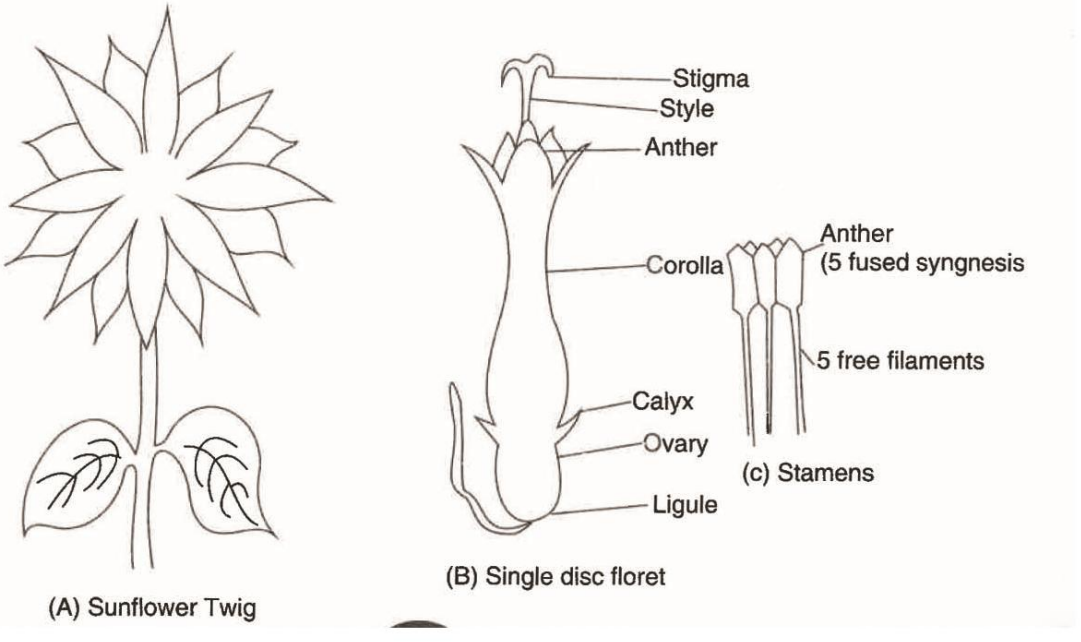
(iii) When these insects visit flowers of another plant of same species, they shed the pollen grain over stigma and bring about cross pollination.

(iv) As stigma reaches maturity the style elongates and the stigma comes above anthers, exposed to environment. Insect may pollinate it while collecting nectar.

(v) If cross pollination fails, then the stigma curls down towards anthers to pick up pollen grains and bring about self pollination.

(vi) Visit you school garden and observe pollination process.

Diagram :



(A) Sunflower Twig

(B) Single disc floret

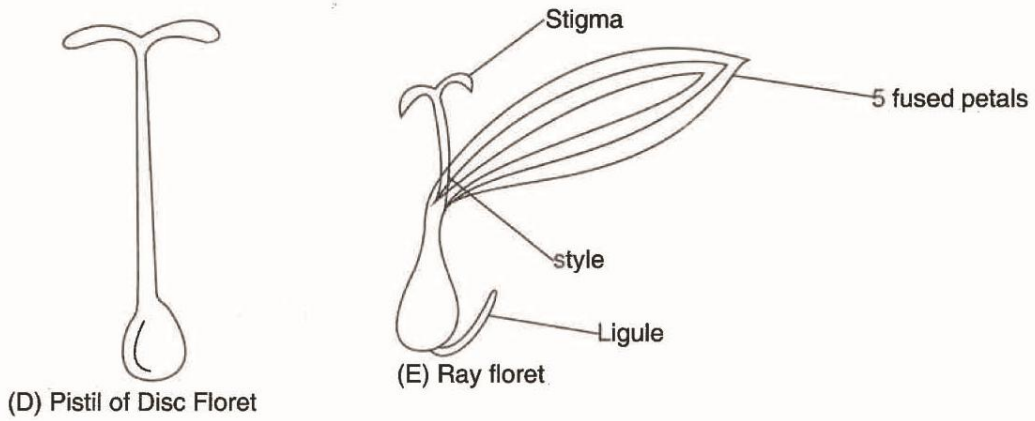


Fig. 1.1 : Floral parts of sunflower (Helianthus annuus)

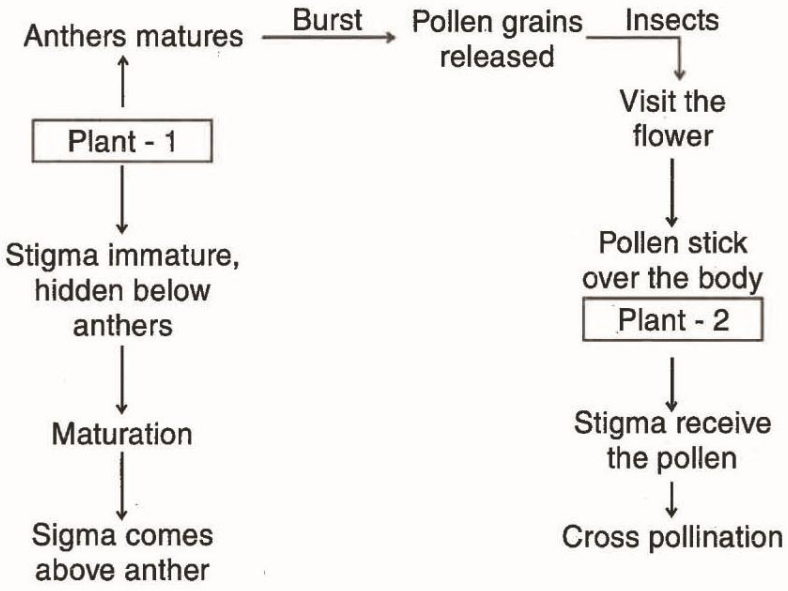


Fig. 1.2 : Diagrammatic representation of pollination in sunflower

Procedure : **(b) Wind pollination**

(i) Take a wheat flower, observe the spikelete.

(ii) The flower is sessile, bracteate, bisexual, hypogynous. The dry Lemma being the bract, dry membranous structure between the flower and rachilla called palea. Just above the palea there are two fleshy hairy lobes are known as lodicules, lower most sterile bracts are called glumes.

(iii) Stamens are three just above the lodicular. The filaments are long and emerge out of glumes, lemma and the palea after anthesis, dorsifixed, versatile, ditheous.

(iv) Generally tricarpellary, the carpels are united to form a unilocular, superior ovary, two laterally situated terminal feathery, styles and stigmas.

Pollination :

Transfer of pollen grains from stamens upto stigma occurs by wind so it is referred as Anemophily.

Mechanism :

(i) Immature stamens remain enclose in glumes, lamma and the palea before anthesis.

(ii) At anthesis they expose to the air and because of versatile after dehiscence pollen grains becomes free in the air.

(iii) By the help of air current they reaches at bushy stigma which catch pollen from air easily.

(iv) Like this way self pollination occurs in cereal plants.

(v) Visit a garden and observe the pollination process.

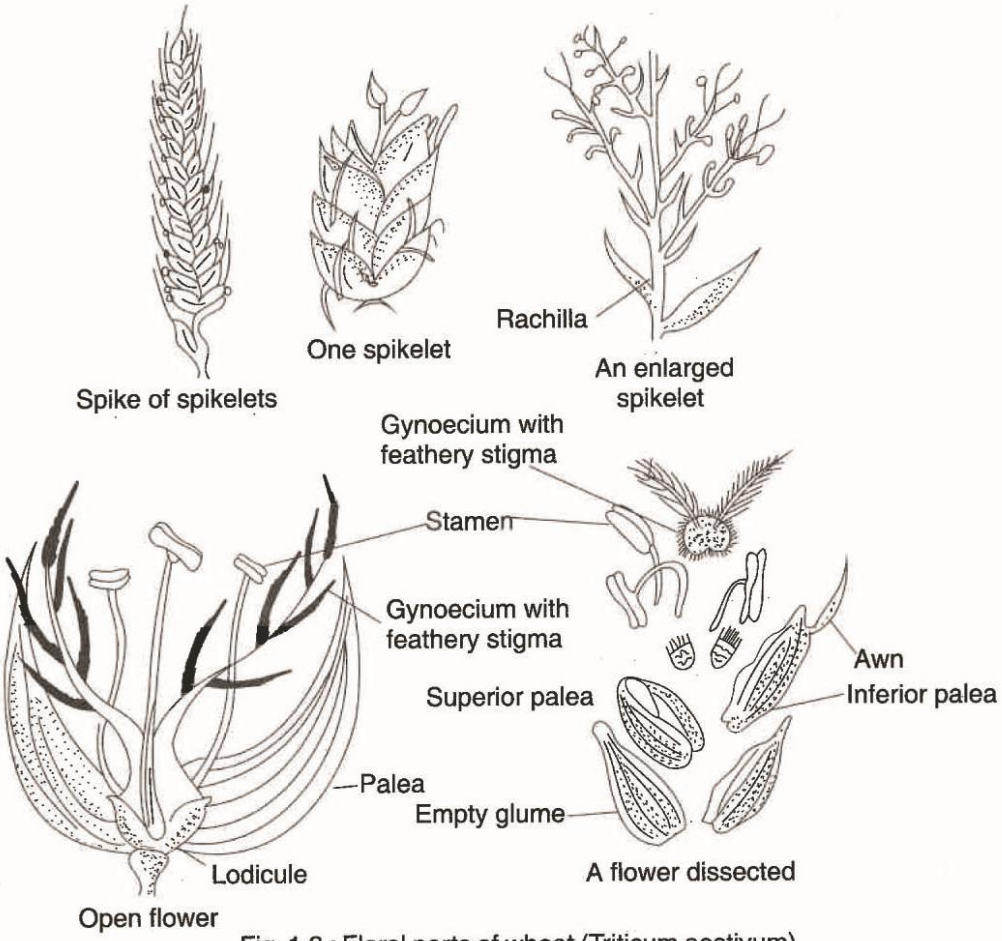


Fig. 1.3 : Floral parts of wheat (Triticum aestivum)

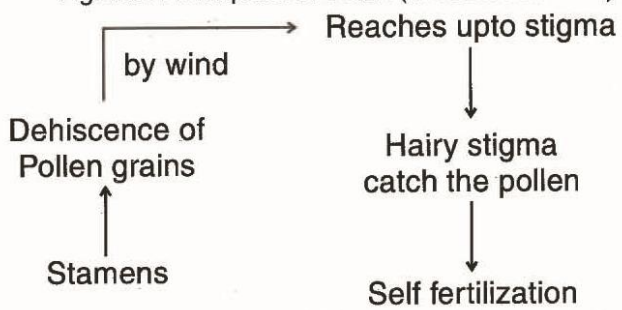


Fig. 1.4 : Diagrammatic representation to show wind pollination in wheat.

EXPERIMENT-4

Object : Identification stages of gamete development i.e., T.S. testis & T.S. ovary through permanent slides(pom any mammel).

Requirements : a) T.S. of Ovary (Mammalian)

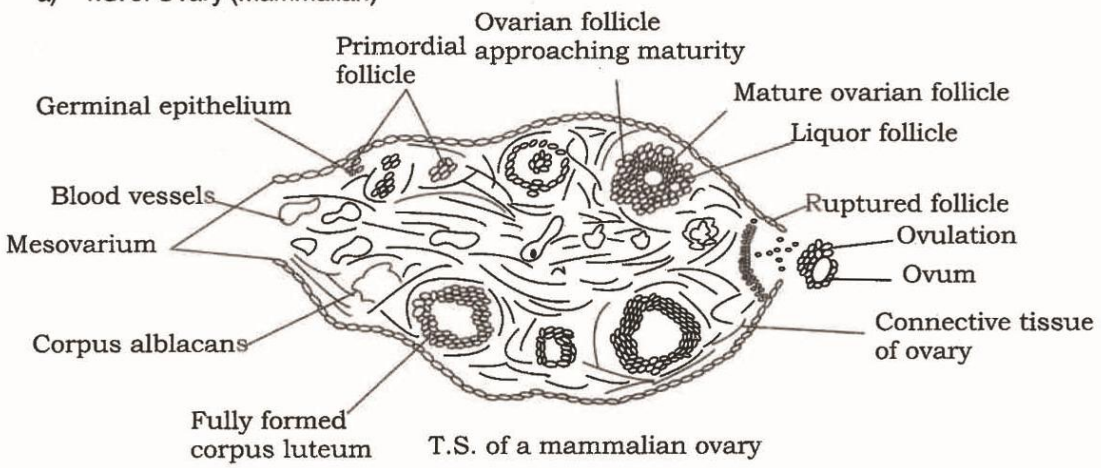


Fig. 3.1 : T.S. of a mammalian ovary

Comments :

(i) A mammalian ovary is a solid structure bounded by germinal epithelium followed by a thick layer of fibrous tissue, the tunica albuginea.
(ii) The ovary consist of an outer cortex which consist of young and mature follicles.
(iii) The inner medulla contains many rounded or oval bodies called Graafian follicles at various stages of development.
(iv) The medulla also contains blood vessels, nerve fibres and smooth muscles.
(v) The cortex may also contain a large mass of yellow cells termed Corpus luteum, formed by Graafian follicle after ovulation.

(b) T.S. of Testis (Mammalian) :

Fig. 3.2 : T.S. of a mammalian testis.

Comments :

(i) The T.S. shows a large number of long convoluted seminiferous tubules.
(ii) Each seminiferous tubule is lined by germinal epithelium, the cells of which divide mitotically to form spermatogonia.
(iii) Various stages in the development of sperms like primary spermatocytes, secondary spermatocytes, spermatids and spermatozoa are seen.
(iv) Large and prominent sertoli cells are present in seminiferous tubules which provide surface and nourishment to the developing spermatozoa.
(v) Interstitial cells or Leydig cells are present in between the tubules, they secrete the male sex hormone - testosterone.

EXPERIMENT-5

Aim : Meiosis in onion cell or grasshopper tesstis through permeant slide.

Requirements : Onion floral buds (any flower), acetocarmine, methyl alcohol, acetic acid, microscope, slides, coverslips, spirit lamp, needle, scissors, forceps etc.

Procedure :

(i) Pluck onion floral buds during morning hours.

(ii) Place them in 1 : 3 mixture of acetic acid : methanol (fixative) for 2 - 3 hours.

(iii) Take out an unopened floral bud and wash it thoroughly with water.

(iv) Place another on slide with a drop of acetocarmine. Put a coverslip and prepare a squash.

(v) Gently warm the slide and observe under low power and then under high power of microscope.

Observation :

A. Meiosis I

1. **Prophase :** It is of long duration and is the most important stage of meiosis.
   - **(a) Leptotene :** (i) Chromatin fibres condense to form chromosomes.
     (ii) Nuclear envelop nucleolus are distinct.
   - **(b) Zygotene :** (i) Homologous chromosomes form pairs called bivalents (synapsis)
     (ii) The individual of a pair are similar in length and position of their centromere.
   - **(c) Pachytene :** (i) The two chromatids of each chromosome become visible, so that abivalent becomes a tetrad.
     (ii) Crossing over takes place between non-sister chromatids.
   - **(d) Diplotene :** (i) Paired chromosomes start separating.
     (ii) Homologues are held together at certain points called chiasmata.
   - **(e) Diakinesis :** (i) Chromosomes become very short and contracted.
     (ii) Bivalents start moving towards periphery.
     (iii) Nucleolus and nuclear envelope disappear and spindle begins to be formed.
2. **Metaphase 1 :** (i) The bivalent arrange themselves at the equator of the spindle.
   (ii) The spindle get attached to the centromere of the chromosome.
3. **Anaphase 1 :** (i) The two chromosomes of each bivalent move to the opposite pole.
   (ii) Each pole has half the number of chromosomes with two chromatids each.
4. **Telophase 1 :** (i) The chromosomes at each pole uncoil and nucleolus and nuclear envelope reappear.
   (ii) Cytokinesis occurs to form two haploid daughter cells.

B. Meiosis II

1. **Prophase II :** (i) Chromatids with wide arms can be seen.
   (ii) Spindle formation starts.
   (iii) Nuclear membrane disappears.
2. **Metaphase II :** (i) Chromosomes arrange at equator.
   (ii) Centromere divides.
3. **Anaphase II :** (i) The sister chromatids of each chromosome separate and migrate towards the opposite pole.
   (ii) Each pole thus receives haploid number of chromosomes.
4. **Telophase II :** (i) The chromosomes begin to uncoil and become thin.
   (ii) The nuclear envelope and nucleolus are reconstituted.

Cytoknesis occurs, as a result four daughter cells are formed, each with haploid number of chromosomes.

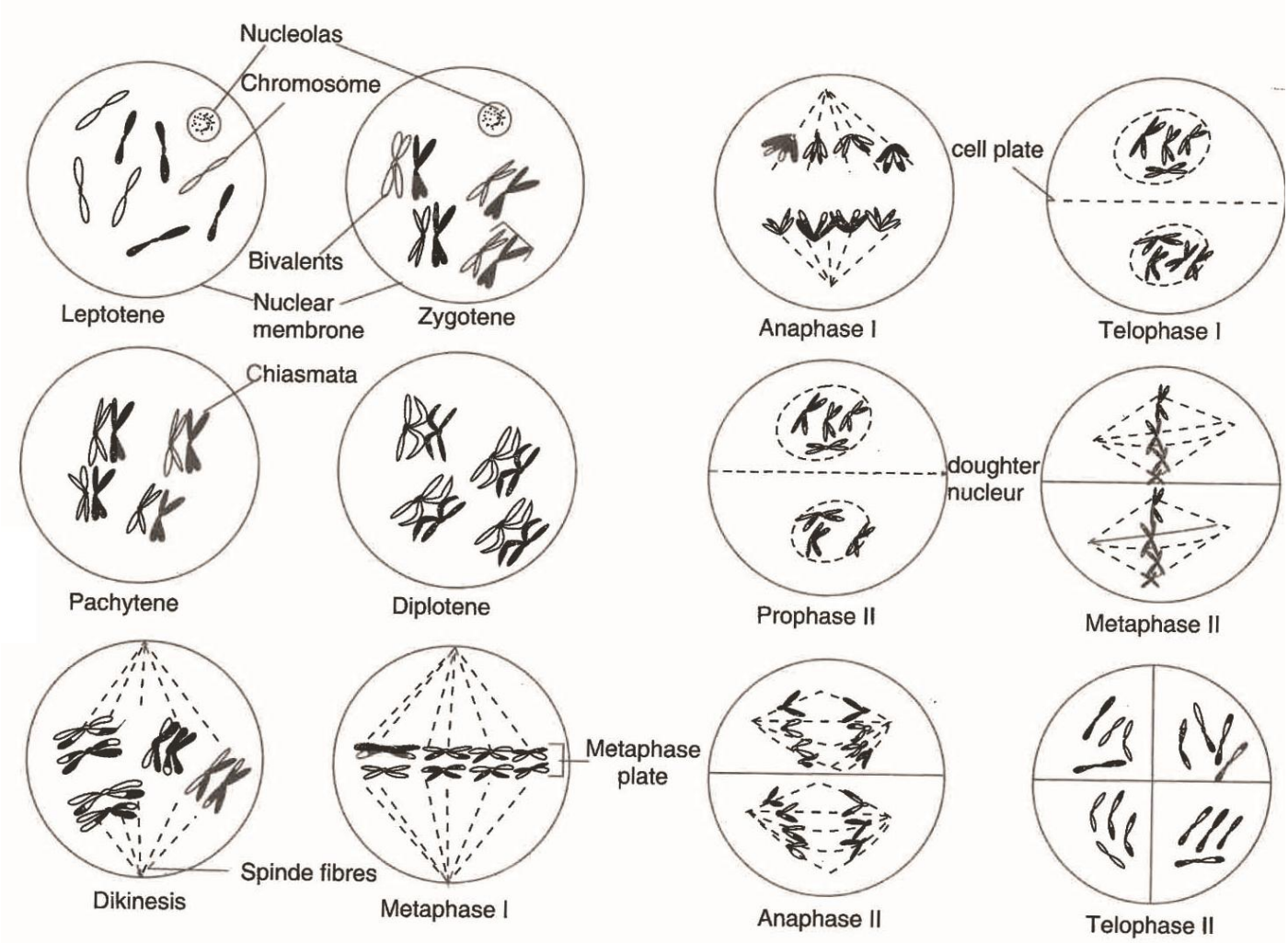


Fig. 4.1 : Stages of mitosis in animal cells.

Precautions : (i) Fix the floral buds during morning hours.

(ii) Anther should be squashed gently.

(iii) Slide should be warmed, not heated.

EXPERIMENT-6

Aim : T.S. of blastula through permanent slide.

Requirements : Permanent slide of blastuls, microscope

Observation :

(i) It is a 32 cell stage of embryo development.

(ii) Outermost cell layer become flattened and form a layer called trophoectoderm.

(iii) This layer never participate to form embryo.

(iv) Remaining cells form a mass of cell called inner cell mass leaving a cavity aside.

(v) Cavity is called blastocoel.

(vi) In this state it forms the connection with mother's uterus wall which is called implantation.

Diagram :

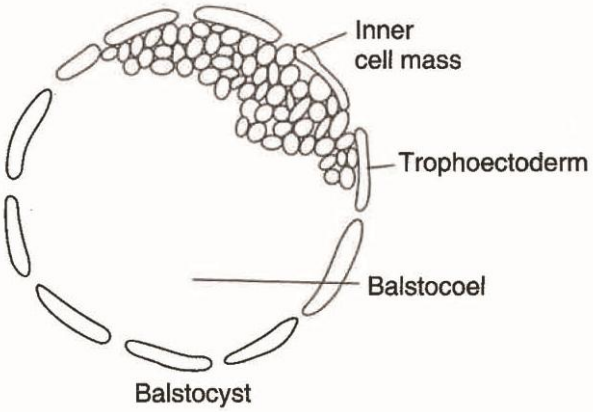


Fig. 5.1 : Blastocyst

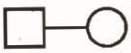
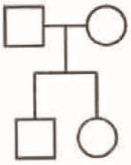
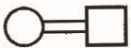
EXPERIMENT-7

Object : (a) Prepared pedigree charts of genetics traits such as rolling of tongue, blood groups, widow's peak, color-blindness.

Theory : Pedigree Analysis :

A record of the occurance of a trait in several generations of a human family is called pedigree.

For such analysis information about the family's history for a particular trait is collected. Then the expression of the trait is assembled into the family tree using standard symbols.

Symbol	Explanation
	Male
	Female
	Mating
	Parents and children (1 boy, 1 girl in order of birth)
	Dizygotic twins
	Death
	Monozygotic twins
	Sex unspecified
	Number of children of sex indication
	Effected individuals
	Consangineous marriage

1. **Rolling tongue :**

Some peson have the power to roll the tongue, while others are not so. A couple both of whom are tongue rollers, have three children ; two of whom can roll their tongues and one who cannot as shown in chart.

It is controlled by a dominant allele (R). A person who is unable to roll his tongue in this manner has recessive allele (r) and therefore non-rolling is ressive to rolling.

● ■ Tongue Rollers

○ □ Cannot Roll Tongue

Fig. 7.1 : Pedigree showing inheritance of ability to roll the tongue.

2. **Colour blindness :**

The inheritance of red-green colour blindness, a condition which causes a person to have difficulty in distinguishing red and green. An examination of giving chart shows that only males are afflicted. This gene must be inhritated in a still different manner, which is somehow connected with sex. Normal vision is controlled by dominant (C) gene and colour blindness by ressive gene (c).

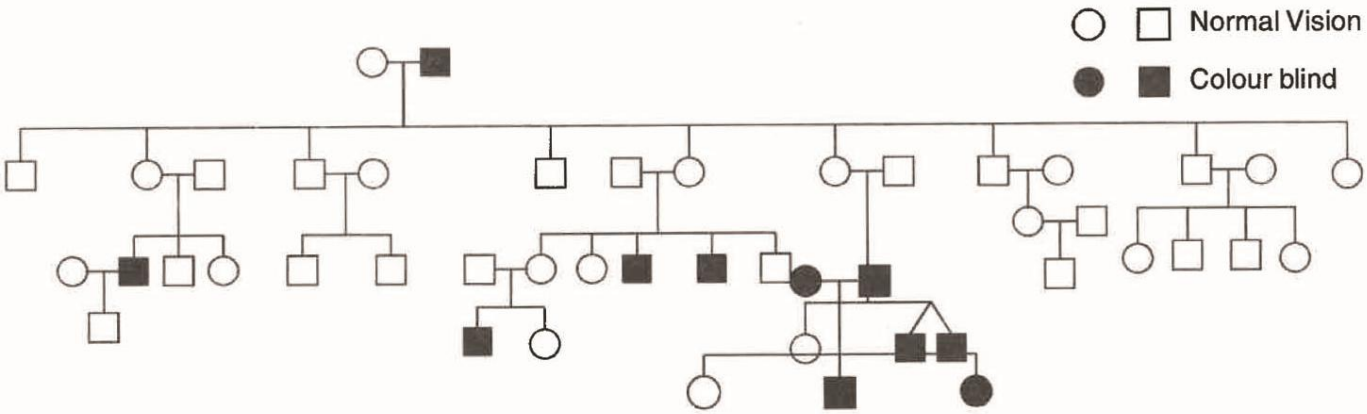


Fig. 7.2 : Pedigree showing inheritance of colour blindness.
Note that no girl in this family history are colour blind.

3. **Blood group :**

ABO blood group is controlled by three genes I^A, I^B, I^O. Different combination produce four blood types.

Genotype	Blood Type
$I^O I^O$	O
$I^A I^A$, $I^A I^O$	A
$I^O I^B$, $I^B I^O$	B
$I^A I^B$	AB

Blood types of parents produce various blood types.

Blood type of Parents	Possible bloodtypes of children
O × O	O
O × A	O, A
O × B	O, B
O × AB	A, B
A × A	O, A
A × B	O, A, B, AB
A × AB	A, B, AB
B × B	B O
B × AB	A, B, AB
AB × AB	A, B, AB

Fig. 7.3 : Pedigree showing inheritance of various blood groups.

4. Widow's peak :

Near the top part of the head there is a crown or whorl of hair which rotates in a clockwise direction in most people. In a few cases, however, the whorl may be counter clockwise as a result of a ressive gene (W). Generally a person will have two whorls mater than one. At the centre of the forehead the hairline may dip down to from a point which is called a widow's peak. This characteristic is inherited as a dominant character (win some favourites).

Fig. 7.4 : Pedigree showing inheritance of widow's peak hair line.

BIOLOGY

TERM - 2
PRACTICAL'S

EXPERIMENT-8

Object : Collect the study soil from at least two different sites and study them for texture, moisture content, pH & water holding capacity of soil. Correlate with the kinds of plants found in them.

Requirements : Sample of soil, measuring cylinder, glass rod, distilled water.

Procedure : **a) For texture of soil :**

Collect a sample of garden soil. Fill half the measuring cylinder with soil. Add equal amount of water in it and stir it thoroughly with glass rod. Allow it to stand undisturbed for nearly one hour. Soil particles settle down in different layers according to their sizes. Observe and note down the thickness of each layer in the observation table.

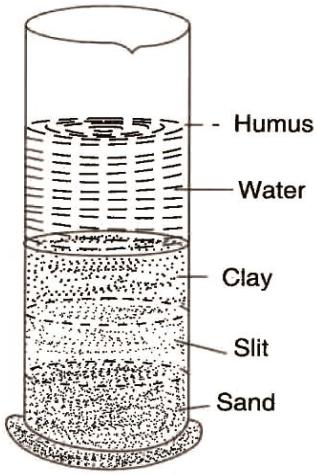


Fig. 2.1 : Different layers formed by different types of soil particles in water

Observation : Soil is a mixture of different organic and inorganic particles of varying sizes from 0.002 mm to 2.00 mm or more.

Size of particle	Name
2.0 mm and above	Gravel
2.0 mm – .2 mm	Coarse sand
0.2 mm – 0.02 mm	Sand
0.02 mm – 0.002 mm	Silt
less than .002 mm	Clay

Physical nature of soil :

(i) Colour : _____

(ii) Texture : _____

S.No.	Name of soil layer	Thickness of layer in cm.
01	Humus	
02	Water	
03	Clay	
04	Silt	
05	Fine Sand	
06	Gravel or coarse sand	

Precautions : (i) Note observations very carefully.

(ii) Use separate solid for separate experiments.

b) For moisture content of soil.

Requirements : Soil samples, weighing balance, digger, crucible, burner, wire gauge, tongs.

Procedure : (i) Half fill the crucible with garden soil and weigh it.

(ii) Now heat the crucible over burner for 15 minutes and cool it.

(iii) Again weigh the crucible with dry soil.

(iv) Repeat this practical with other soil samples.

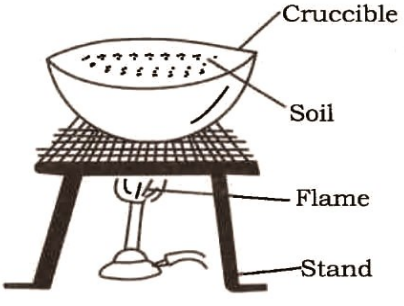


Fig. 2.2 : Heating of soil in crucible

(v) The difference in initial and final weight of crucible weight will be the amount of moisture content in soild.

Observations :

S.No.	Soil Type	Initial Weight of Crucible with Soil (A)	Final Weight of crucible with soil (B)	Difference (A – B)
01				
02				
03				
04				
05				
06				

Precautions : (i) Crucible should be dry before use.

(ii) Always use wire gauge to heat the crucible.

(iii) Use tongs to handle the crucible.

Object : **c) Study of chemical properties including pH of different soils.**

Requirements : Soil sample in potassium chloride solution, universal indicator, beaker, funnel, filter paper, test tube, conical flask, dropper, standard pH chart, barium chloride, nitric acid, sulphuric acid, silver nitrate, acetic acid, ammonium molybdate, ammonium hydroxide, ammonium chloride, diphenylamine methyl orange etc.

Procedure : (i) **pH of the soil :** Take 10 gm of a given sample of soil in a beaker. Add 100 ml of distilled water in it. Mix thoroughly. Dissolve 25 ml of potassium chloride solution in it. Leave it for 5 minutes. Stir well and filter the solution. Take 20 ml of the filtrate. Add 10 drops of universal indicator solution into the filtrate. The filtrate develops a specific colour. Match the colour of the filtrate with the standard colour pH chart to know the pH of the soil.

Precautions : (i) Always take proper amount of filtrate for performing the test.

(ii) Use of different acids must be done very carefully.

(iii) Note your observations very carefully.

Object : **d) To study the water holding capacity of garden soil and roadside soil.**

Requirements : Garden soil, road side soil, filter paper, balance, petridishes, oven, water etc.

Procedure : Take the soil samples, allow them to dry and crush them. Take two tin boxes with perforated bottom, place filter papers in the bottom of each of the tins and weight them separately. Now fill garden soil in one of the boxes and road side soil in the other by tapping to ensure uniform filling. Record the weight of the soil filled boxes. Place the soil filled boxes in petridishes containing water and allow them till upper surfaces of soils become wet. Now take out the boxes from petridishes and weigh them again, when the dripping of water from the tins stops.

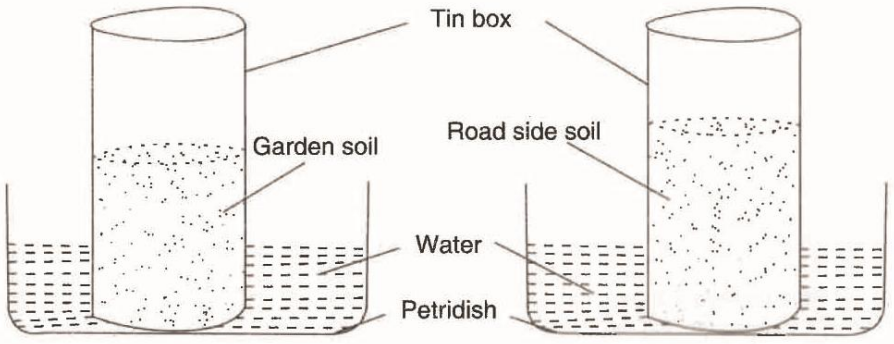


Fig. 2.3 : Experiment to study water holding capacity of soils

Observation :

S. No.	Soil sample	Wt. of empty box (x)	Wt. of box filled with soil (Y)	Wt. of box after taking out from petridish (Z)	Wt. of soil (Y–X)	Wt. of water retained by soil (Z – Y)
1.	Garden soil					
2.	Road side soil					

Water holding capacity of soil = $(Z - Y) / (Y - X) \times 100$

(i) of garden soil = ...

(ii) of roadside soil = ...

Precautions : (i) Weighing should be done accurately.

(ii) Weighing of tins after taking out of the petridishes should be done only when dripping of water has stopped.

Object : Types of plants found in soil having different pH and water holding capacity.

Soil Type	Name of the Plants
– Saline Soil (pH-upto 8.5)	Wheat (Triticum aestivum), Cotton (Gossypium Sp.), Palm (Phoenix slvestris), Zizyphus sp.
– Alkali Soil (pH-above 8.5)	Paddy (Oryza sativa), Beet root
– Well drained loamy to heavy soil	Isabgol (Plantago ovata), Soyabean (Glycine max) Barley (Hordeum vulgare)
– Sandy loam (pH = 6-8)	Groundnut (Arachis hypogea), Zea mays, Wheat.
– Clay soil	Groundnut, Pappaver seminiferum
– Dry soil	Zea mays, Ricinus (Ricinus sp.), Urd (Phaseolus mungo), Wheat, Cicer (Cicer arietinum), Pea (Pisum sativum) Mustard (Brassica campestries), Cowpea (Vigna unguiculata)

EXPERIMENT-9

Object : Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organisms.

Requirements : Water samples, universal indicator, pH colour chart, bulb, box, beakers, microscope, pencil, note book.

Procedure : (a) **pH of water :**

(i) Collect the water samples from different water bodies and keep them in seperate beakers say A, B, C and D.

(ii) Now take 10 ml from each beaker in test tube and mark them A, B, C, D.

(iii) Add 10 drops of universal indicator colour change occurs in test tube.

(iv) Match the solution colour with pH colour chart.

Observations :

S.No.	Water Sample	pH value
1.	A	
2.	B	
3.	C	
4.	D	

Result : pH of sample A is _____, B is _____, C is _____ and D is _____.

b) Clarity of Water

Procedure : (i) Collect the sampels from different water bodies and mark as A, B, C and D.
(ii) Put the beakers in a dark room or box (having a hole to pass the light).
(iii) Throw light into a torch or bulb on them.
(iv) Observe the turbidity and suspended particles in water.
(v) This phenomenon of observation of dust particles in water is called tyndals effect.

Result : Sample _____ shows the very less tyndal effect so it is more clear as compared to the other samples.

c) Presence of living organisms in water samples.

Procedure : (i) Collect water samples from three or four different ponds and study their organisms under microscope.

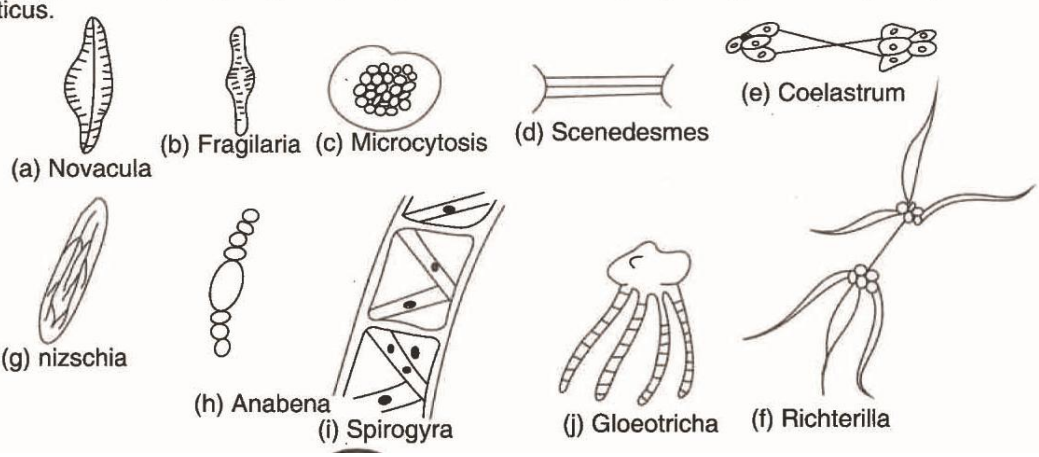
(ii) You can take the help of book for identification of the organisms.

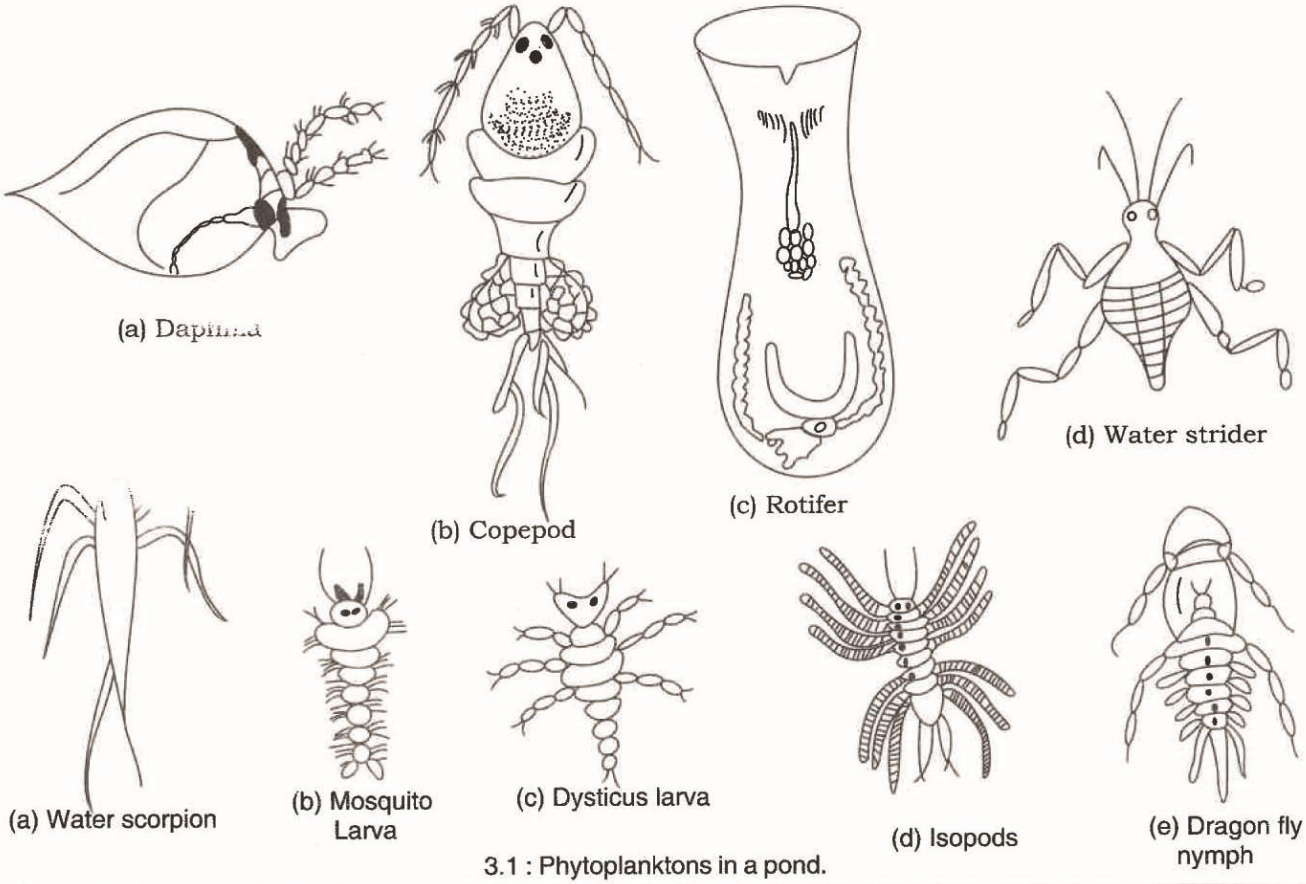
(iii) The pond water contains following organisms.

Phytoplanktons - a) Zygnema b) Navicula c) Nitzschia d) Fragilaria e) Anabena f) Spirogyra g) Loeotricha h) Ricaterilla i) Microcytosis g) Coelastrum k) Scenedesmus

Zooplankton : a) Daphnia b) Rotifer c) Copepod d) Water strider

Other organisms : a) Dragon fly numphs b) Larva of mosanito c) Isopods d) Water scorpion e) Larva of Dysticus.





3.1 : Phytoplanktons in a pond.

EXPERIMENT-10

Aim : Prepare a temporary mount of onion tip to study mitosis.

Requirements : Onion bulbs / root tips, conical flask, petri dishes, scissors, forceps, needles, methyl alcohol, aceitic acid, hydrochloric acid, accetocarmine, distilled water, spirit lamp, microscope, slides, coverslips, blotting paper etc.

Theory : Mitosis is a type of cell division in which the number of chromosomes remain same in the daughter cells.

Procedure :

(i) Take an onion bulb and remove the old roots with the help of a scalpel.

(ii) Place the base of the bulb on the rim of a bottle filled with water in such a way that base of the bulb touches the water. Keep it for a weak to grow the roots.

(iii) When the new roots become 2-3 cm long, cut their extreme tips and put them in fixative (1 : 3 mixture of acetic acid and methanol)

(iv) Remove 2 or 3 tips and hydrolyse them by warming ot 60°c in 1 N HCl for 15 minutes.

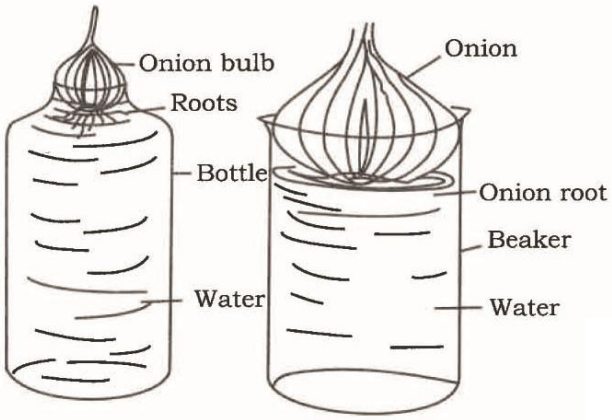


Fig. 7.1 : Method of growing onion root tips

(v) Wash them in water.

(vi) Place a drop of acetocarmine on the hydrolysed root tip on a slide.

(vii) Gently squash the root by tapping the coverslip with the blunt end of a pencil until the cells separate.

(viii) Gently warm the slide over a flame.

(ix) Observe first under low power of the microscope to locate the dividing cells. Examine the different stages of mitosis under the high power of microscope.

Observations : Various stages of mitosis could be seen.

1. **Interphase** :
   (i) Nucleus is large and distinct.
   (ii) Chromatin fibre appear in the form of a network within the nucleus.
   (iii) Nuclear envelope and nucleus are distinct.

2. **Prophase** :
   (i) Nucleus shows clear and distinct chromosomes.
   (ii) Each chromosome consists of two chromatids, joined at the point called centromere.
   (iii) Nuclear membrane & nucleolus are is disintegration.

3. **Metaphase** :
   (i) A bipolar spindle develops in the cell.
   (ii) Thick, short and condensed chromosomes are arranged at the equatorial portion of the spindle. (equatorial plate).
   (iii) Centromere of each chromosome divides into two centromere.

4. **Anaphase** :
   (i) Each chromosome divides into two chromatids which gets changed into daughter chromosomes.
   (ii) They assume V, J, I, L shape depending upon the position of the centromere.
   (iii) They start moving to opposite poles with arms directed towards the equator and centromere towards the pole.

5. **Telophase** :
   (i) Daughter chromosomes reach on the opposite poles.
   (ii) The spindle disappears and the daughter chromosomes uncoil to form chromation fibres.
   (iii) Nuclear membrane and nucleolus reappear.

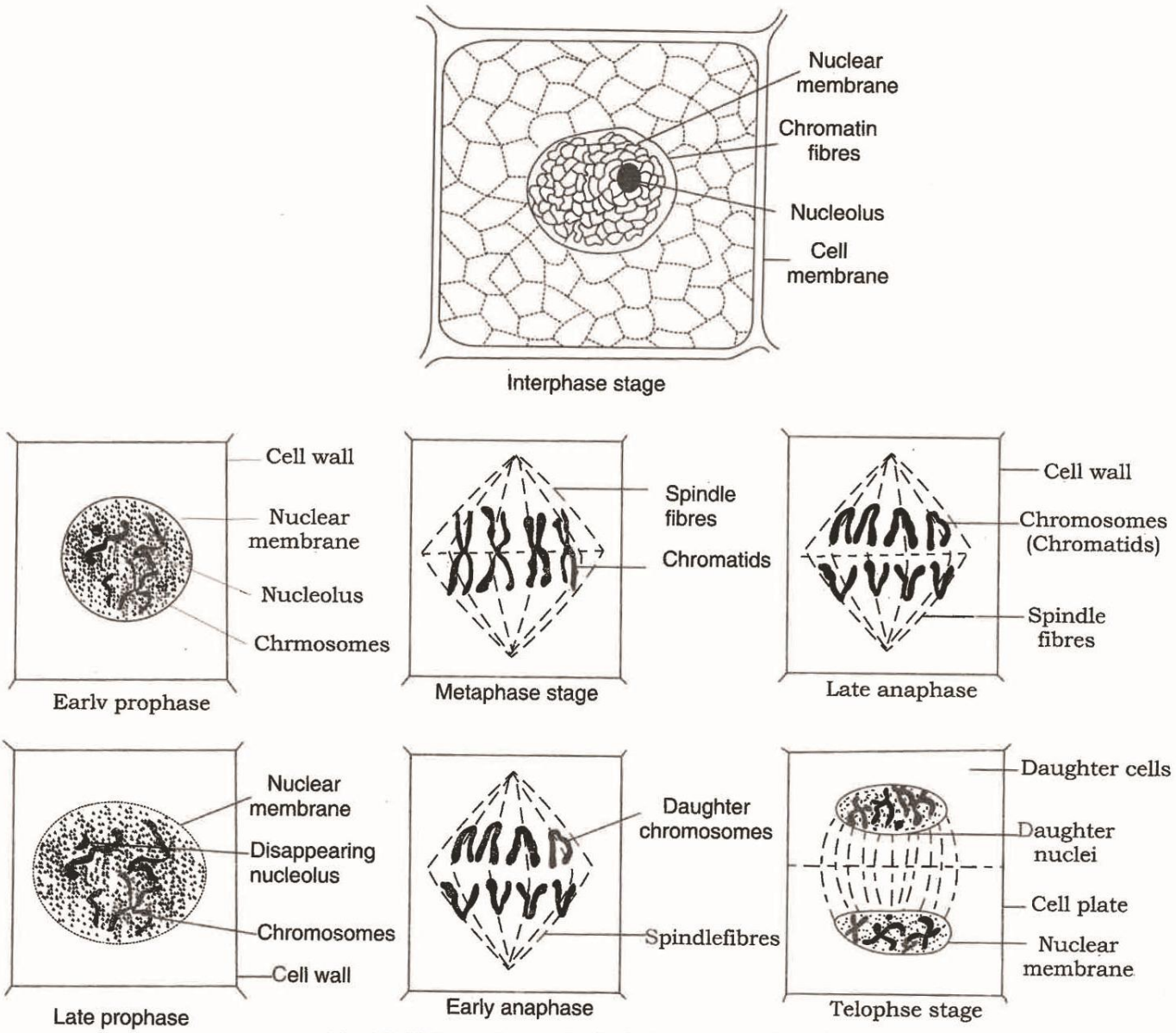


Fig. 7.2 : Various stages of mitosis in onion root tip cells.

Cytokinesis : Occurs by cell plate formation between the two daughter nuclei.

Precautions :
(i) The base of the onion bulb should be in contact of water while growing the roots.
(ii) Root tips should be fixed in morning between 8 am to 1 p.m.
(iii) The slide should be warmed gently much above the flame of the spirit lamp.
(vi) The root tips should not get dry during staining and warming up.

Aim : Meiosis in onion cell or grasshopper testis through permeant slide.

Requirements : Onion floral buds (any flower), acetocarmine, methyl alcohol, acetic acid, microscope, slides, coverslips, spirit lamp, needle, scissors, forceps etc.

Procedure :
(i) Pluck onion floral buds during morning hours.
(ii) Place them in 1 : 3 mixture of acetic acid : methanol (fixative) for 2-3 hours.
(iii) Take out an unopened floral bud and wash it thoroughly with water.
(iv) Place another on slide with a drop of acetocarmine. Put a coverslip and prepare a squash.
(v) Gently warm the slide and observe under low power and then under high power of microscope.

EXPERIMENT-11

Object : Identification of common disease causing organisms like Ascaris, Entamoeba, Plasmodiam, Ringworm through permanent slide or specimen. Comment on symptoms of disease that they cause.

Requirements : Permanent slides of Entamoeba, Plasmodium, Ascaris, Ringworm, Pencil, Notebook, Eraser, Microscope.

1) Entamoeba

Pathogen – Entamoeba histolytica.

Diseases – Amoebic dysentery, Abscesses in liver, lungs and brain, non dysenteric infection, Amoebiasis.

Symptoms :

1. As referred, the infection of entamoeba causes amoebiasis.
2. The passing out of stool with blood and mucus, abdominal pain, nausea, flatulence and bowel irregularity with headache etc.
3. In abscesses fever and high leucocyte number are the main symptoms which is referred as amoebic hepatitis.

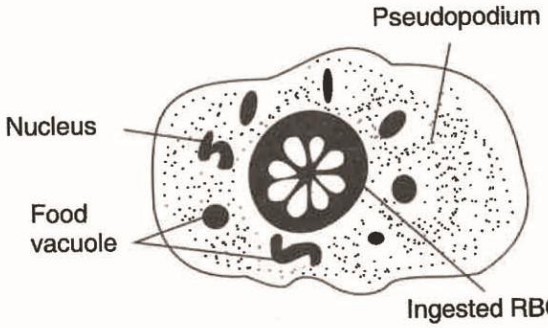


Fig. 9.1 : Entamoebs histolytics – The Trophozoite form

2) Plasmodium

Pathogen – Plasmodium vivax.

Diseases – Malaria.

Symptoms :

1. The symptoms appear on an average after about 14 days of infection.
2. The patient suffers from chills, shivering and high temperature (104°F) with convulsions followed by profuse sweating.
3. The patient become anaemic.

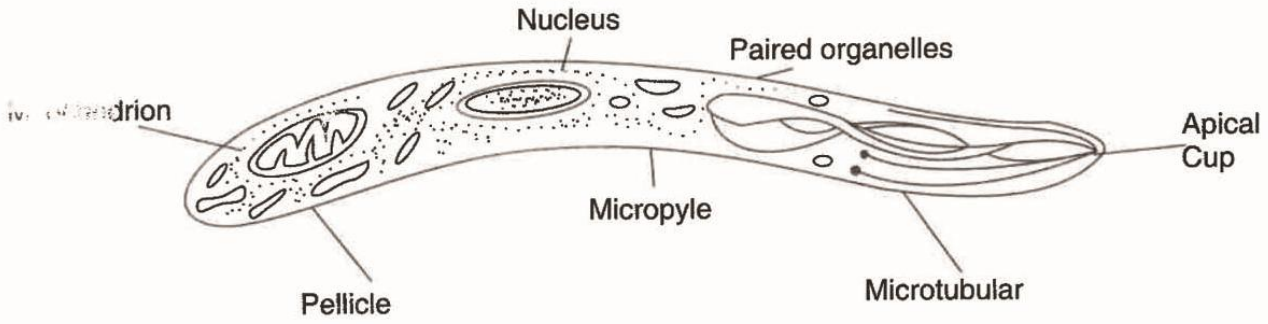


Fig. 9.2 : Plasmodium – Ultrastructure of sprozoite

3) Ascaris

Pathogen – Ascaris lumbricoides.

Diseases – Ascariasis.

Symptoms :

1. The patient feel abdominal discomforts and colic pains.
2. Other symptoms are diarrhoes, vomiting and a slight temperature.
3. They may block the intestine and appendix.
4. In childred it is more common, they dull the mental capacity and stunt growth.

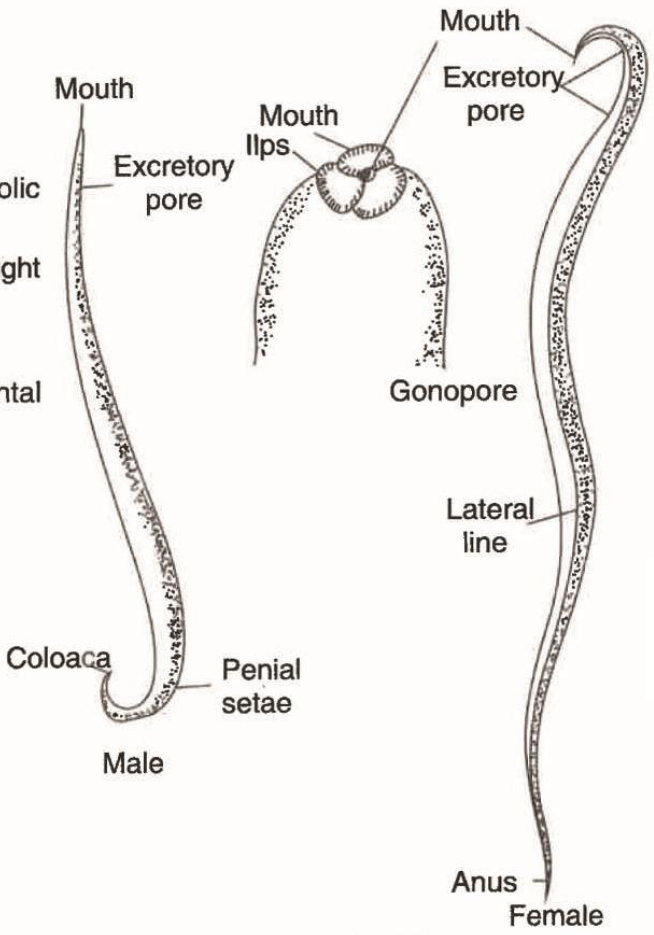


Fig. 9.3

4) **Ringworm**

Pathogen – Trichophyton spp.

Disease – Athlete's foot.

Symptoms :

1. It forms lesions on hairy parts of smooth skin.
2. It also infects the nails of the hands and feet.
3. Some species of these fungi cause ringworm of the scalp found chiefly in children.
4. Mostly they infect the skin so this fungi and diseases are called dermatomycoses.
5. Skin becomes dry and whitish in colour with keratin substances.

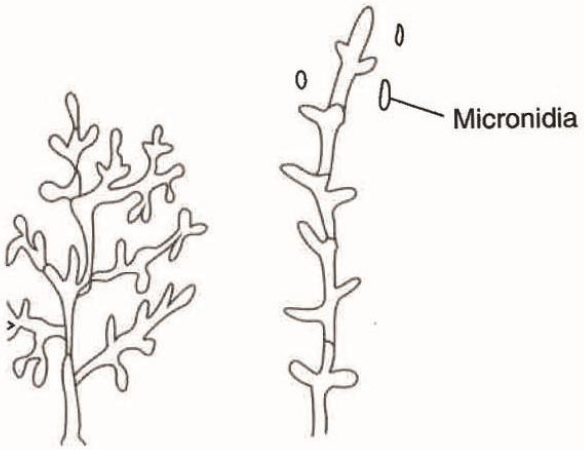


Fig. 9.4 : Trichophyton

Various species of Trichophyton and Disease caused by them.

	Species of Fungi	Diseases
1.	Trichophyton rubrum.	Athlete's foot, foot ringworm.
2.	T-rubrumn, T-mentogrophytes	Ringworm of the nails.
3.	T.tonsurans, T-violaceum, T.scholnleinii	Ringworm of scalp.

EXPERIMENT-12

Object : Two plants and two animals found in Xerophytic conditions. Comme upon their morphological adaptations.

Requirements : Specimens of Xerophytic plant and animals.

Plant – Opuntia, Calotropis ; Animals – Camel, kangroo, rats, moles.

Comments :

Xerophytic plants :

1. These plants grow in places with scanty water such as deserts and sandy hills.
2. Roots of these plants are extensive and deep in search of water.
3. Stomatas are deep seated or sunken to reduce transpiration.
4. Leaves are either very small or modified into spines.
5. Sometimes stem become flat and fleshy to store water and take over the function of stomata.

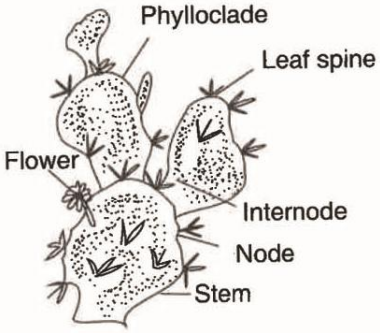


Fig. 10.1: Xerophytic Plant

6. Leaves are generally covered with a waxy deposition to prevent loss of water.
7. Anatomically they develop sclerencyhmatous tissue for mechanical strength.

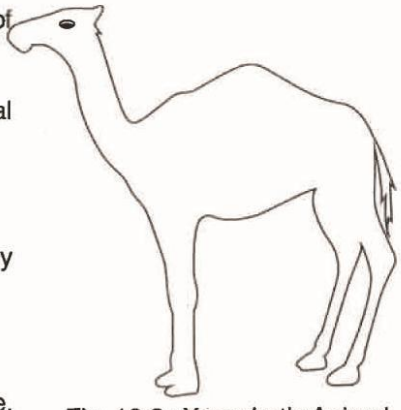


Fig. 10.2 : Xerophytic Animal

Xerophytic animals :

1. They lose so little water that they can recover 90% of the loss by using metabolic water.
2. Their nervous and hormonal mechanisms control thirst.
3. Many desert animals are nocturnal to avoid the heat of day time.
4. They have adaptation that minimises dehydration.
5. The camles reduce the chance of over heating by orienting to give minimal surface exposure to direct sunlight.
6. They produce dry faeces and concentrated urine.
7. When water is not available, the camels do not produce urine but store urea in tissues and solely depend on metabolic water and when water is available they rehydrate themselves by drinking upto 80 liters in 10 minutes.

EXPERIMENT-13

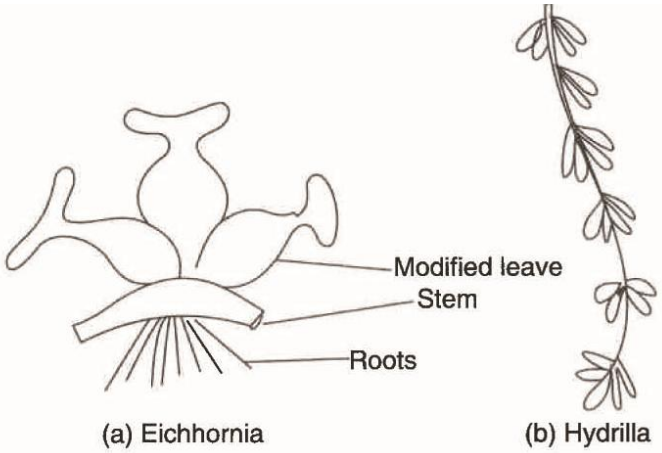
Object : Plants & animals found in aquatic conditions. Comment upon their morphological adaptation.

Requirements : Specimens of aquatic plants and animals.
Plants - Eichhornia, Lotus, Hydrilla
Animals - Fish

Comment

Aquatic plants :

1. Aquatic plants may be free floating, rooted and floating or submerged.
2. Due to the availability of water in plenty, the root system is poorly developed or may be absent.
3. The stem may be reduced or may be long, slender, flexible and spongy.
4. The stem is spongy in nature due to the presence of large air spaces, which makes them buoyant.
5. The leaves are thin and narrow in submerged plants like hydrilla.
6. The leaves may be large and flat with their upper surface coated with wax in floating types like lotus and water lily.

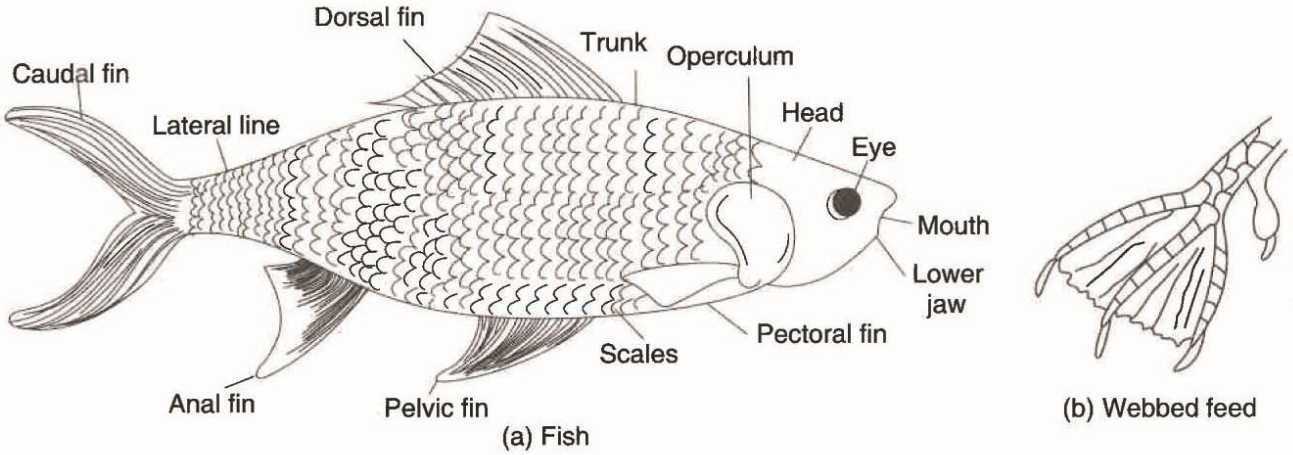


(a) Eichhornia (b) Hydrilla

Fig. 11.1 : Aquatic animals

Aquatic animals :

1. Body is compressed laterally to reduce friction during swimming.
2. Fins in fishes and flippers in whale help in swimming.
3. Swim bladder present in certain fish is filled with air and maintains buoyancy.
4. Frogs and ducks have webbed feet for swimming.
5. Body is covered with scales or waxy.
6. For respiration they have gills to exchange the gases exchange for respiration.
7. They excreate their ntrogenous waste through skin or excretory organs.



(a) Fish (b) Webbed feed

Fig. 11.2 : Aquatic animals