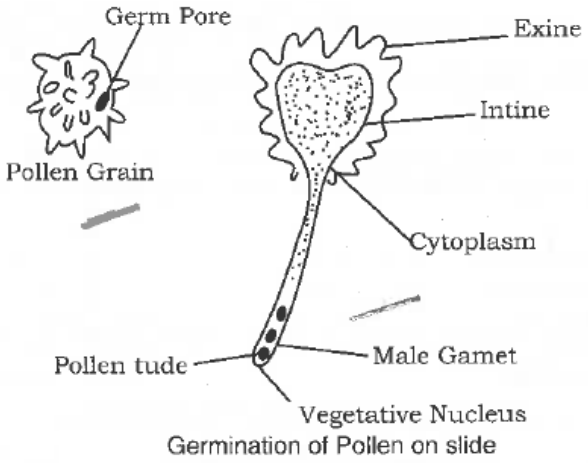
EXERCISES – 1

(1) Aim: To study Pollen germination and growth of Pollen tube.



Germination of Pollen on slide

(2) Materials required: Flower, needles, Safranine stain, glycerine, coverslips, microscope.

(3) Procedure:

(1) Take out the pistil from a Portulaca flower.

(2) Stain the isolated pistil and mount in glycerine, Press gently, observe under dissecting microscope.

(3) Take out carefully each germinated pollen and count.

(4) Mount a pollen in glycerine and observe under compound microscope.

(4) Observations:

(1) Observe many pollen grains germinating over stigma. The growth of the pollen tube is stimulated by sugary substances secreted by the stigma.

(2) Pollen tube carrying with it tube nucleus and the generative nucleus.

(3) The generative nucleus divides forming two male gametes.

(4) Count the number of germinated pollen grains.

(5) Precautions:

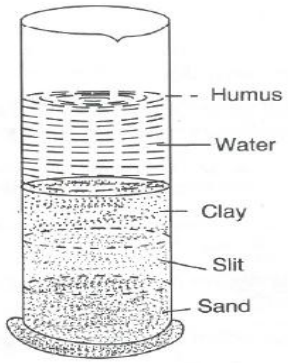
(i) Mounting should be free from air bubbles.

(ii) Material should be moderately stained.

(iii) Use the clean slide.

EXERCISES - 2(A)

(1) Aim: To Study the texture of the soil depending upon particle size.



Different layers formed by different types of soil particles in water

(2) Materials required: Digger, polythene bags, scalpel, beakers, measuring cylinders, meshes of different pore sizes, test tube etc.

(3) Procedure:

(A) With a digger, collect soil from a field put it in a measuring cylinder half filled with water.

(B) Shake the cylinder well and allow it to stand undisturbed.

(C) Soil Particles will gradually settle down in the cylinder.

(D) Note the height of each layer of soil in the measuring cylinder.

(4) Observation Table:

S. No.	Name of Soil layer	Size of Particle
1	Coarse sand (gravel)	2 to 0.2 mm
2	Sand	0.2 to 0.02 mm
3	Silt	0.02 to 0.002 mm
4	Clay	Less than 0.002 mm

S. No.	Soil Sample	Thickness of Layer in mm		
		Sand	Silt	Clay
1	Garden soil			
2	Road side soil			
3	Play ground soil			

(5) Precaution

(1)Take the equal amount of soil in all measuring cylinders.

(2) Note the observations very carefully.

EXERCISES- 2(B)

(1) Aim: To determine the water holding capacity of the given samples of soil.

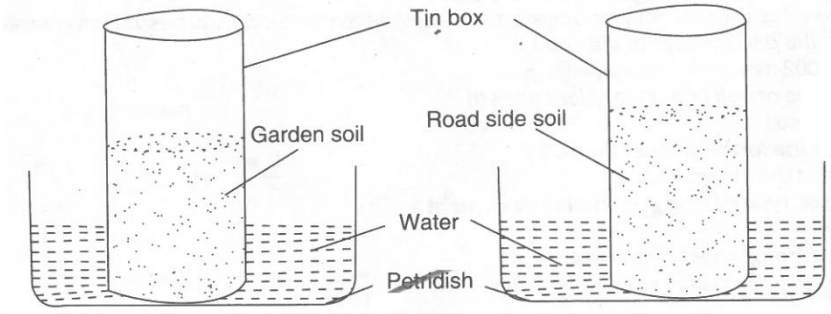


Fig. 2.3 : Experiment to study water holding capacity of soils

(2) Materials required: Three measuring jars, three funnels, soil samples, water, muslin cloth.

(3) Procedure:

(A) Take three Measuring jars, label them A, Band C. Put a funnel on the mouth of each Jar.

(B) Spread a piece of muslin cloth at the bottom of each funnel.

(C) Now take 100g of sandy soil and put in the funnel of Jar A. Similarly Put 100 g clay soil in the funnel of Jar Band 100g loamy soil in the funnel of Jar C.

(D) After this pour 100 ml water in each funnel.

(E) Note the water collected in each jar at an interval of three minutes each and continue for about 20 minutes.

(F) Note the final volume of water collected in each jar which will indicate the rate of percolation.

(4) Observation Table:

S. No.	Type of Soil	Amount of water collected at an interval of 3 Minutes (mL)					
		3	6	9	12	15	18
1	Sandy Soil						
2	Clayey Soil						
3	Loamy Soil						

5. Results: Clayey soil allows least water to pass through as it has got maximum water holding capacity.

6. Precaution:

(1) Water should be added at the same time in all 3 samples. `

(2) Reading of the water left in the cylinder should be taken carefully.

EXERCISE- 2(C)

(1) Aim: To study pH of different types of soil.

(2) Material Required: Soil Samples, test tube, funnel, filter paper, pH paper of different range, distilled water, beaker.

(3) Procedure:

(1) Make solutions of various given soil samples by mixing with distilled water and shaking vigorously.

(2) Filter off each solution in different test tubes.

(3) Dip pH paper of wide range i.e. 2-10 in each solution.

(4) Take out the dipped pH paper after about 3-4 minutes and dry it.

(5) Match the colour of the pH paper with the colour scale given on the pH paper booklet.

(6) Now dip the pH paper of narrow range of about the same value as determined above and take out after 3 minutes. Correspond the colour obtained with standard pH table.

(7) Thus the exact pH of each soil sample can be determined.

(4) Observation Table:

S. No.	Soil Sample	pH
1		
2		
3		

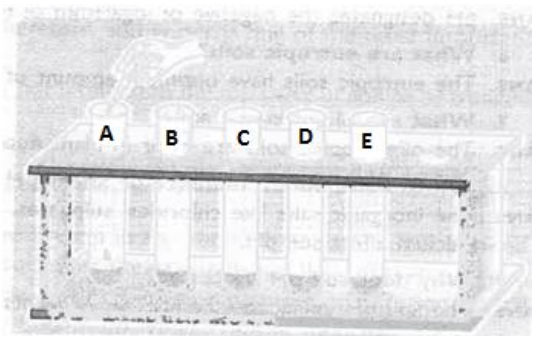
(5) Precautions:

(1) Wash the glassware thoroughly and get it oven dried before the experiment.

(2) Use standard reagents.

(3) Work with one soil solution at a time.

(4) Only distilled water should be used.



EXERCISE - 2(D)

(1) Aim: To estimate the moisture contents of the given sample of soil.

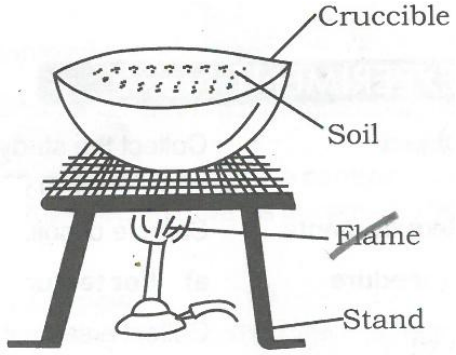


Fig. 2.2 : Heating of soil in crucible

(2) Materials required: Digger, Polythene bags, forceps, scalpel, beakers, test tubes, spirit lamp, physical-balance, crucibles, weight box etc.

(3) Procedure:

(1) Take a small lump of soil and weigh it.
(2) Keep it in a crucible and heat it to about 100°C for 10 Minutes over a lamp.
(3) Stir the soil while heating. Then allow the soil to cool down and weigh.
(4) To make sure that all the water contents are driven out, heat the soil again.
(5) Cool and then weigh again. Repeat three to four times till the weight becomes constant.

Observation table:

S. No.	Soil Sample	Initial weight (x) gm	Final weight (y) gm	Moisture content (x-y) gm
1	Garden soil			
2	Road side soil			
3	Field soil			

Result: The difference in the initial and final weights will represent the quantity of water present in the soil. .

Precautions:

(1) Soil samples should be kept in new polythene bags.
(2) Soil should be heated properly.
(3) Crucible should be dry.

EXPERIMENT NO. - 3(A)

(1) Aim: To study the pH of water sample.

(2) Materials required: Water samples, universal indicator, pH colour chart, beakers slides, test tube.

Procedure:

(a) pH of water -

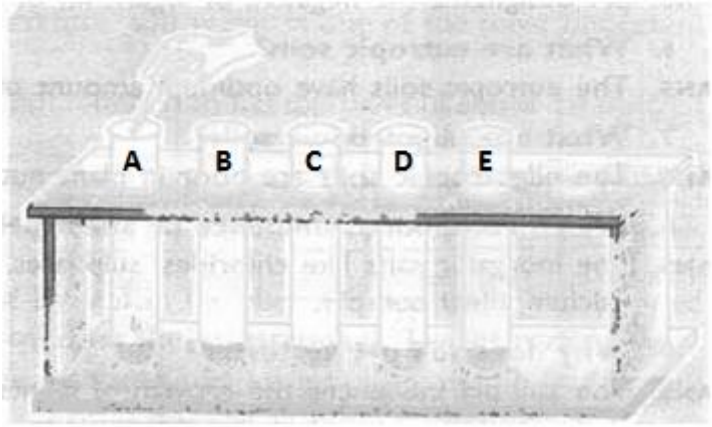
(i) Collect the water samples from different water bodies and keep them in separate beakers' A, B, C, D .
(ii) Now take 10 ml from each beakers in test tube and mark them A, B, C, D.
(iii) Add10 drop of universal indicator colour change occurs in test tube.
(iv) Match the solution colour with pH colour chart.

Observation: pH of different sample of water are different. Optimum pH of water is between 7-8. If pH is less than 7 than nature is acidic and if more than 7 then its nature is basic.

Sr. No.	Samples of Water	pH Value
1		
2		
3		

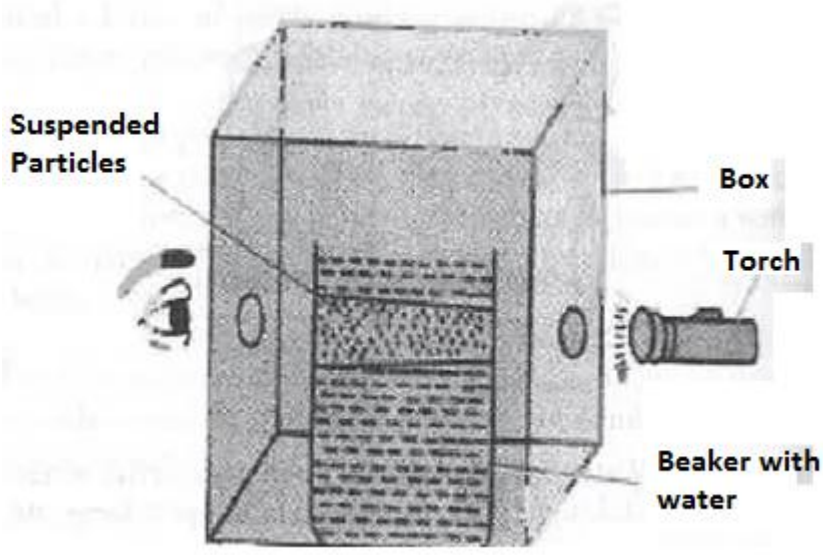
Precautions:

1. Proper amount of universal indicator should be added to water samples.
2. pH paper should be compared with chart after complete drying of pH paper.
3. Care should be taken while collecting the water samples.



Exercise - 3(b)

(1) Aim: To examine the presence of Particulate Matter (suspended Pollutants) in a sample of water.



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(2) Materials Required: Card board box, torch, beaker, different samples of water.

(3) Procedure:

(1) Take a cardboard box and prepare a Tyndal set-up from it to test turbidity.
(2) Tyndal set-up can be prepared by making a pencil size hole in the card board box and fixing a light source on the other side of the box.
(3) Place the beaker containing the samples of water one by one.
(4) Observe the sample of water through the hole, compare the turbidity of different water samples.

(4) Observation:

Suspended particulate pollutants (such as clay particles, organic matter, Bacteria, unicellular organisms etc.) may be observed.

(5) Precautions:

(1) The hole in the cardboard box should not be large.
(2) The light source should be of sufficient intensity.
(3) Torch should be placed at the level of hole in the opposite wall.

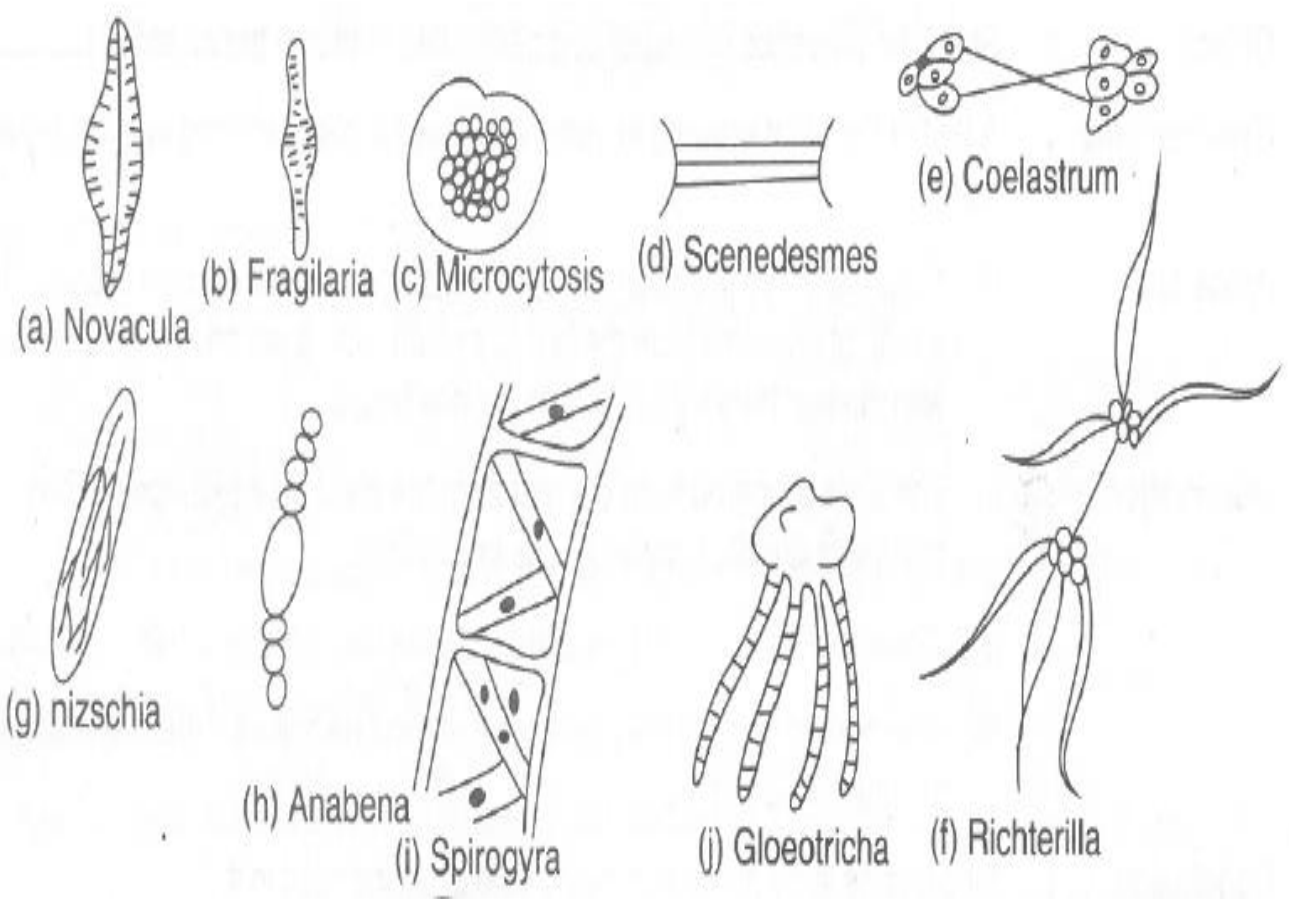
Exercise -:-3(c)

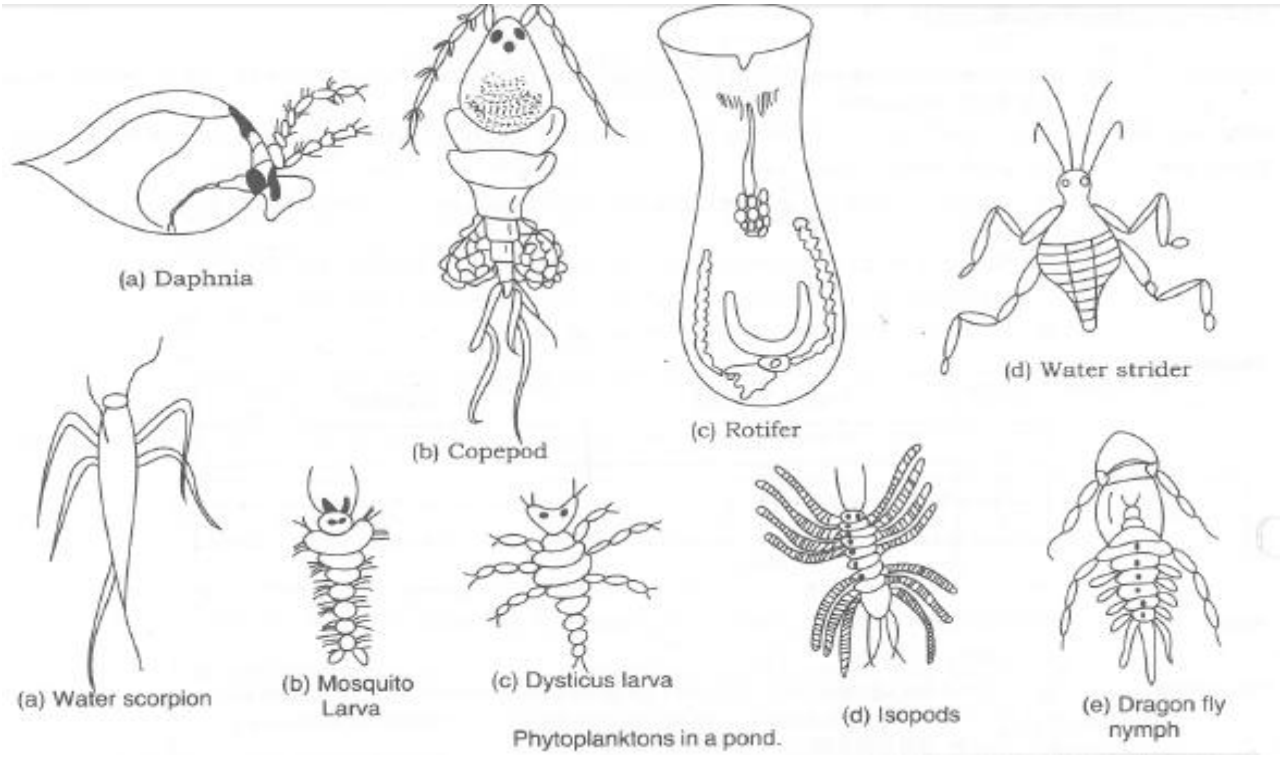
(1) Aim: To study different water samples for the presence of living organisms.

(2) Materials required: Water Samples(such as pond water, river water, canal water etc., microscope, slides, dropper, methylene blue, spirit lamp, etc.

(3) Procedure:

(1) Take a clean slide and put a few drops of water separately from different water samples.
(2) Spread the drops to make a thin film of water on the slide.
(3) Allow it to dry. Pass the lower side of the slide through the flame of spirit lamp two or three times to fix the living organism present in water on to the slide.
(4) Add a few drop of a methylene blue on the slide. Leave the slide for two minutes.
(5) Throw off the stain, put a drop of glycerine and mount in glycerine.
(6) Cover with the coverslip and observe under the microscope.





Phytoplanktons in a pond.

(4) Observation: A number of types of microorganisms (such as bacteria-protozoa, diatoms. some algae) are observed. Different types of organisms present in water samples are given.

(5) Conclusion: Presence of large number of micro-organism indicates the presence of organic pollutants.

(6) Precautions:
(1) Beakers which are used for collecting water samples should be clean.
(2) Shake the water well before putting the drops of water on the slide from it.
(3) Pass the slide through the flame only to get it dry.

Exercise – 4

1. Aim: To examine the presence of particulate matter in the air.

2. Materials required : leaves of plants growing at two different sites (e.g. road side and industrial area) white paper, microscope, slides, coverslips.

3. Procedures:
(1) Pluck leaves from the plant growing at two different sites.
(2) Put a few drop of glycerine on each of the leaves and rub it with a clean brush.
(3) Take a drop of glycerine from the leaves over a clean slides and cover it with the coverslip.
(4) Observe it under the microscope repeat the experiment by taking a leaf from the plant growing in a glass house.

4. Observation: The slide prepared from the leaf of a plant growing on roadside and industrial area or any other open area, shows the presence of number of pollutants such as dust, pollens grains and spores etc.

5. Precautions :
(1) This experiment is done very carefully.

Exercise 5

(1) Aim: To determine the population density of plants at a place by the quadrate method.

(2) Materials required: Meter scale, string, nails" hammer, measuring, tape, paper.

(3) Principle: Average number of particular plant species present per unit area is called as population density.

(4) Method:

(1) Choose a nearly area of square field of size 2m and fix the iron Nails at the comers of this square field. Now tie a string and ready the square field.

(2) Now divide this square field into 10 small squares by tying strings at the distance of 10- 10 ems. This square is called as quadrate.

(3) Record the name and number of all species present in the squares.

(4) Population density of the plants in this quadrats can be identified by following formulae-

$$\text{Density} = \frac{\text{Total no. plant speices}}{\text{Observation table:}}$$

Observation table

S.No.	Name of Plants species	No.of plants in quadrate of 1x1 m			Total no. of plants in a quadirate	Average
1	Plant A	Quadrate I	Quadrate II	Quadrate III		
2	Plant B					
3	Plant C					
4	Plant D					

Result:

(1) No. of plant species studied in a quadrate are '

(2) Plant species with high density in the quadrate are and species with less density are _.

Precautions :

(1) Only the individuals of one plant species should be considered at one time.

(2) Square field should be taken from single place only.

Experiment No. - 6

(1) Aim: To determine the population frequency of any field by quadrate method.

(2) Materials required: Meter scale, string, nails" hammer, measuring, tape, paper.

(3) Principle: Total no. of quadrate having species in them among the total no. of quadrate gives the percentile of population frequency. .

(4) Method:

(1) Make an area of 1m 2 of a square field. Fix 4 nails at the comers of field and tie a string/thread on the nails.

(2) Now make 10 small squares of area 10 em' by fixing the nails at the corners and tying the thread around them.

(3) In this way 10 quadrate are formed.
(4) By counting the no. of plants in each 1-8 or 1-10 quadrate, population frequency can be determined by following formulae.

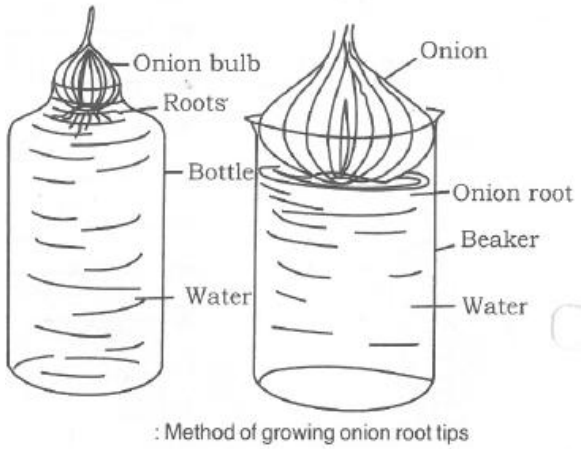
$$\text{frequency \% of species} = \frac{\text{No. of quadrates in which species are present} \times 100}{\text{Total no. of quadrates taken for sample}}$$

(5) Observation Table:

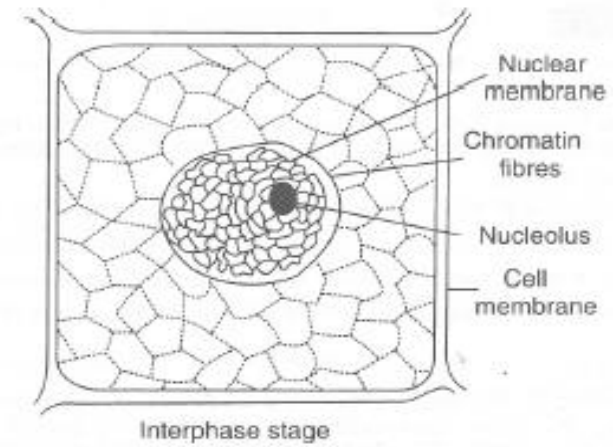
S.no.	Name of the plant species	No. of Sp. Present in quadrate of 1 x 1 m^2 size										Frequency
		1	2	3	4	5	6	7	8	9	10	
1	A											
2	B											
3	C											
4	D											
5	E											

(6) Precautions:
(1) Square field should be taken from one place only.
(2) Measurement should be done carefully.
(3) One quadrate should not be overlapped with another quadrate.

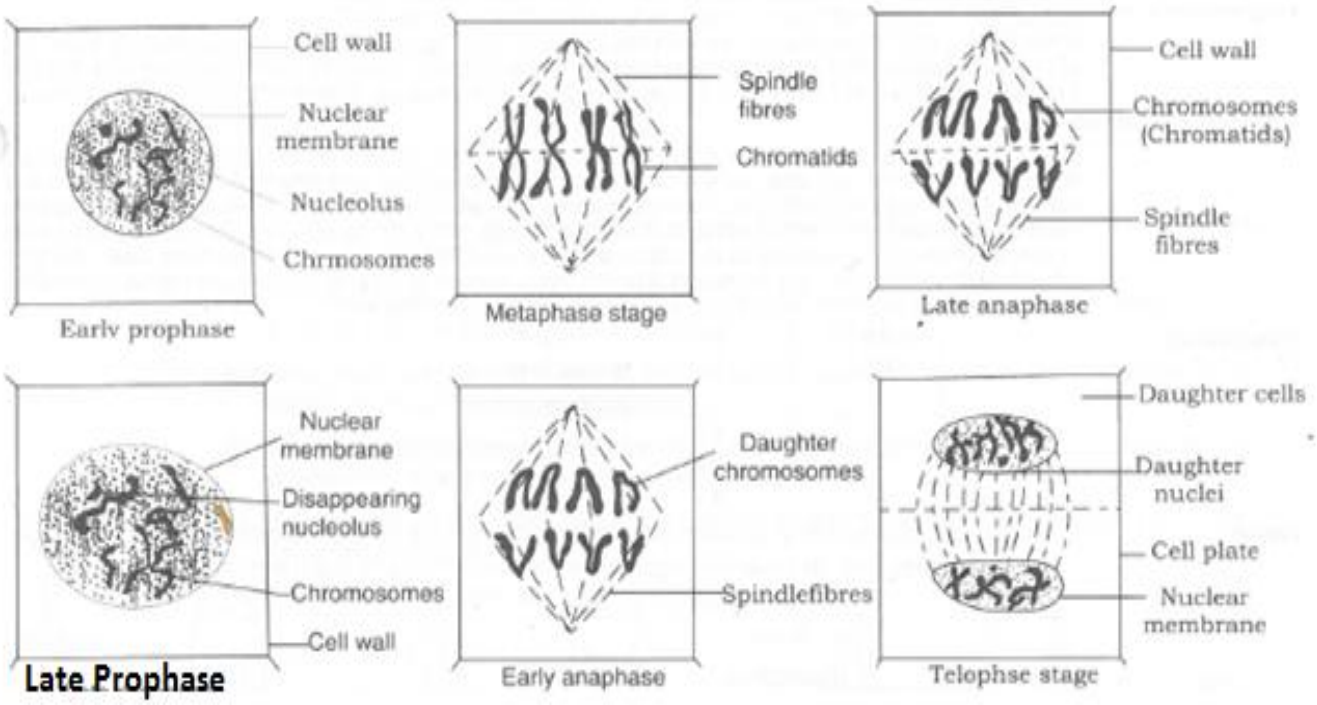
Exercise -7
1. Aim: To make a temporary mount of the onion root tip to study various stages of mitosis.
2. Materials required: Onion root tips, needles, brush, slide, coverslip, burner, microscope, acetocarmine stain.
3. Procedure:
(1) Take a root tip on clean slide and put a drop of acetocarmine stain on it.
(2) This makes the stain specific for nuclear materials. Gently warm it a little over a burner. On warming the stain evaporates. Before it is dried add.more stain on it.
(3) Squash the root tip with the help of a needle or a force put the coverslip. Tap it a bit more from above.
(4) Now take the slide in the folds of a blotting paper and apply gentle pressure with hands.
(5) Observe the slide under the microscope first in the low power and then after locating a specific area in the high power. Examine and identify various stages of mitosis.



: Method of growing onion root tips



Interphase stage



4. Precautions:

(1) The slide should be warmed gently much above the flame of the spirit lamp.
(2) The acetocarmine stain should be filtered before use.
(3) There should be no air bubble in the slide.

5. Observation:
Various stages of mitosis could be seen –

(1) Interphase:
(i) Chromatin fibres appear in the form of a network within the nucleus.
(ii) Nuclear envelope and nucleolus are distinct.

(2) Prophase:
(1) Chromatin material shortens and condenses into thread like structures called chromosomes. .
(2) Each chromosome consists of two chromatids that are joined at a point called centromere.
(3) Nuclear membrane and nucleolus disappear.

3) Metaphase:
(1) Chromosomes become arranged at the equator of the spindle.
(2) Each chromosome get attached to the spindle fibres at its centromere.

(4) Anaphase:
(1) The two sister chromatids of each chromosome separate from the centromere and move towards the opposite poles.
(2) The daughter chromosomes appear V,J,L and I shaped depending upon the position of centromere.

(5) Telophase:
(1) Nuclear membrane and nucleolus reappears and two daughter nuclei appear at opposite poles.
(2) Cytokines is occurs by cell plate formation between the two daughter nuclei.

Exercise - 8(a)

(1) Aim: To study the effect of different pH on the activity of salivary amylase on starch.

(2) **Requirements:** Test tube, test tube stands, beaker, funnels, starch, Iodine, potassium iodide, sodium chloride, different pH tablets.

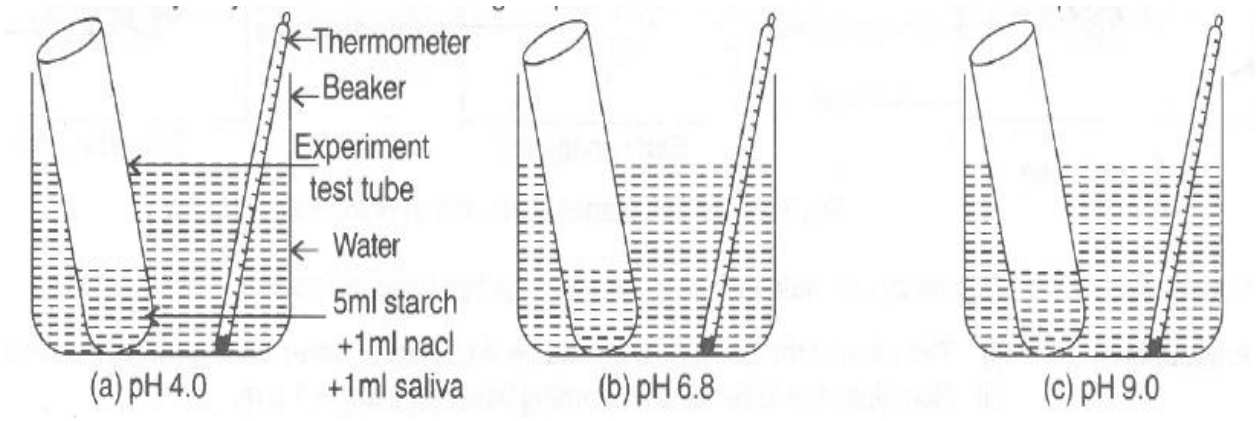
(3)P**rocedure:**
(1) Make three series of test tubes having 1ml of iodine solution in each. Keep them separately in three stands.
(2) To a test tube add 5 ml of 1% starch solution, lml of 1% NaCl and a tablet of known pH (say pH =5), to another test tube add 5ml of 1% starch solution 1 ml of 1% NaCI and a tablet of known pH (say pH = 6.8) and to the third test tube add 5 ml of 1% starch solution, 1 ml of 1% NaCl and a known pH tablet (say pH = 8).
(3) Put these test tube in a water bath at 37°C, for 10 minutes
(4) To these test tube add 1 ml of diluted enzyme.
Take a drop from each test tube and pour it to the test tubes having iodine solution. Keep these tubes in water bath throughout the experiment.
(5) After an interval of 2 minutes, again take a drop from each tube and pour it to the iodine tubes and note the change of colour of iodine.
(6) Keep on repeating it after an interval of every 2 minutes till the colour of iodine does not change. Note the total time taken for these tubes till they do not give any colour with iodine solution.

Observation

Time (in Minutes)	**Reaction with Iodine**		
	Test tube with PH = 5	**Test tube with PH = 6.8**	**Test tube with PH = 8**
0	Blue Colour	Blue Colour	Blue Colour
2	Blue Colour	Blue Colour	Blue Colour
4	Blue Colour	Blue Colour	Blue Colour
6	Blue Colour	Blue Colour	Blue Colour
8	Blue Colour	Blue Colour	Blue Colour

Result :

PH = 5 is acidic and pH = 8 in alkaline, therefore salivary any lase did not act in these tubes. Whereas the enzyme acted in the tube with pH = 6.8 (slightly acidic) and digested the starch.



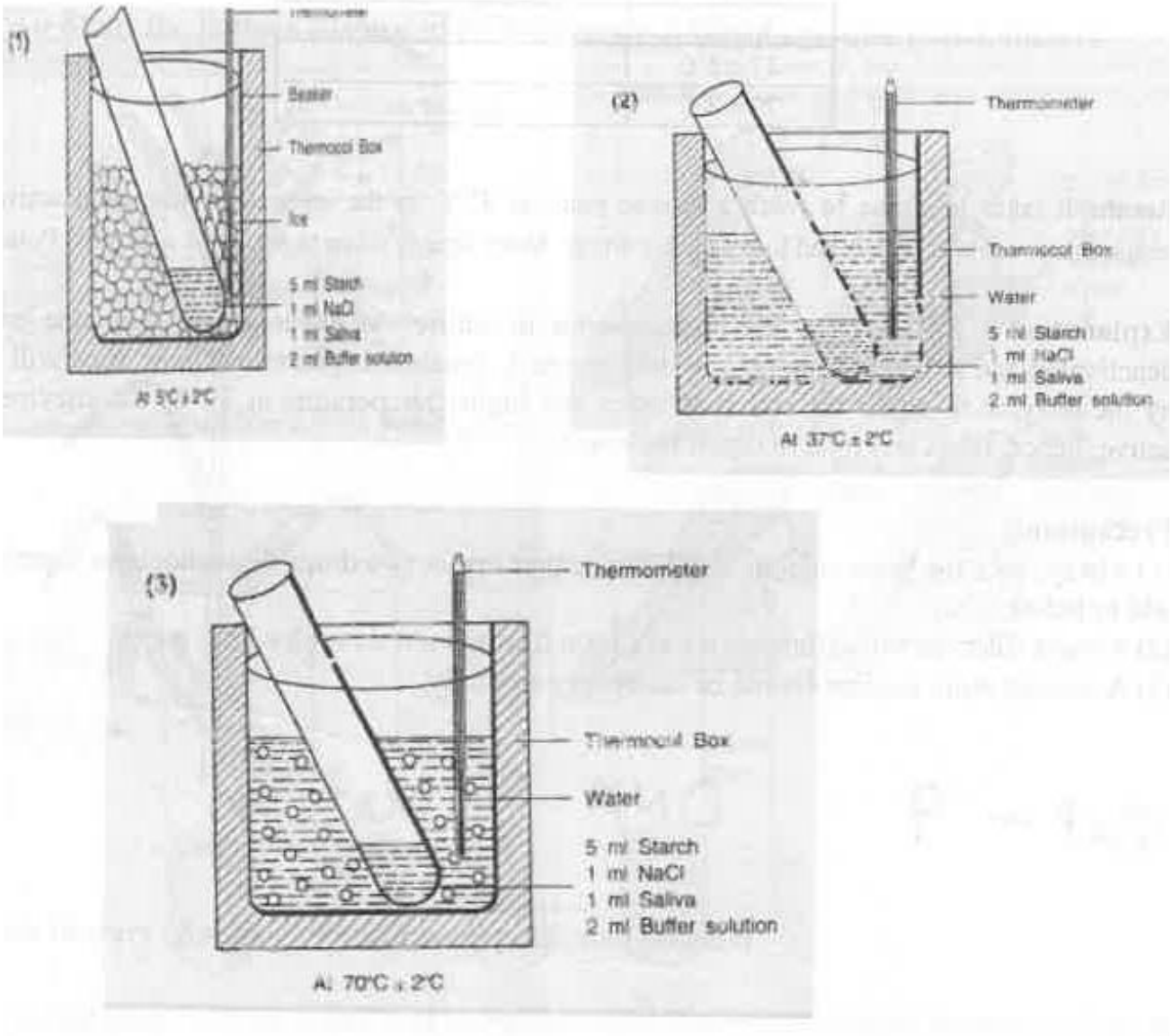
Precautions:

(1) Filter the saliva through a wet cotton film and not through a filter Paper. (2) All the glasswares used must be thoroughly cleaned and dried.

(3) All the weighing and measuring should be done very accurately.

Exercise - 8(b)

(1) Aim: To study the effect of different temperatures on the activity of salivary amylase on starch.



(2) **Requirements:** Test tube, test tube stands, pipettes, beakers, funnel, spirit lamp, burner, starch, NaCI, distilled water, iodine solution, etc.

(3) Procedure:

(1) Make three series of test tubes having 1 **ml** of Iodine solution in each. Keep them separately in three stands.

(2) Make three experimental test tubes each having 5 ml of 1% starch and 1 ml of 1% NaCl solution. Maintain them at three different temperature viz. 5±2°C, 37±2°C, and 70±2°C in different water baths.

(3) Add 1ml of diluted enzyme in .all the three experimental tubes with the help of dropper take a drop from these test tubes and to the tube containing iodine. Note the time of adding as

zero minute. (4) After an interval of 1 minutes again take a drop from each tube and pour it to the iodine tubes and note the change in colour of iodine, keep on repeating the experiment at an interval of every 2 minutes till the colour of iodine does not change.
(5) Note the time taken for by different experimental tubes till they do not give any colour with iodine.

Observation

Temperature	**Time taken{in min) to reach the achromic point.**
S ± 2°C	
37 ± 2°C	
70 ± 2°C	

Result: It takes less time to reach achromic point at 37°C as the' enzyme is maximum active at this temperature, while at higher and lower temperatures. More time is taken to reach the achromic Point.

Explanation : All Enzymes are proteinaceous in nature. At lower temperature, the enzyme is deactivated and at higher temperature the enzyme is denatured. Therefore, more time will be taken by the enzyme to digest the starch at lower and higher temperature at 37°C, the enzyme is most active, hence, takes less time to digest the starch.

Precautions:
(1) Always take the same amount of solution, either one or two chops throughout the experiment to add to iodine tubes.
(2) Always filter the saliva through a wet cotton film and not through a filter paper.
(3) Achromic point reading should be taken very carefully.

Exercise - 9

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

Spinach leaves/Pea seeds/Papaya, Sand ,test tube, 50 ml beakers, Cheesecloth, Mortar and pestle, 1Omlgraduated cylinder.

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.

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 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.

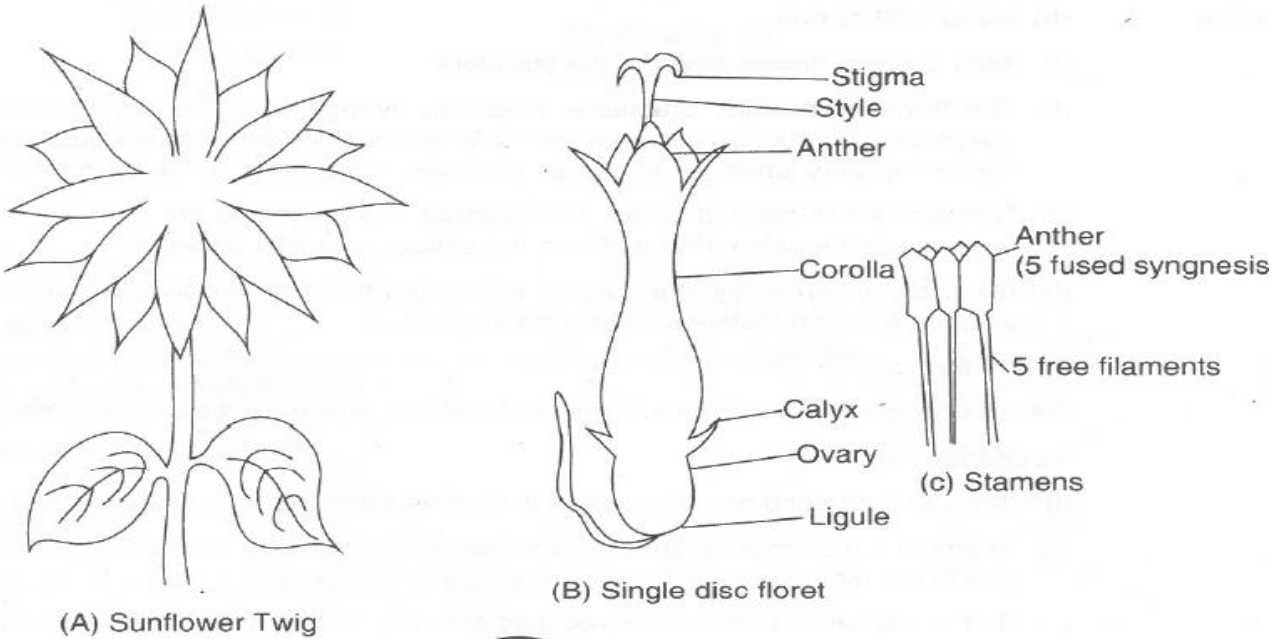
9. Using the wire loop, spool the DNA by gently swirling the loop at the interface between the green supernatant and the clear ethanol. The DNA will congeal at the point where the two layers meet.

Spoting

Spot 1

Aim: To Study the flowers adapted to pollination by different agencies (wind, Insect).

(1) Maize flowers (Anemophilous or wind pollinated flowers)



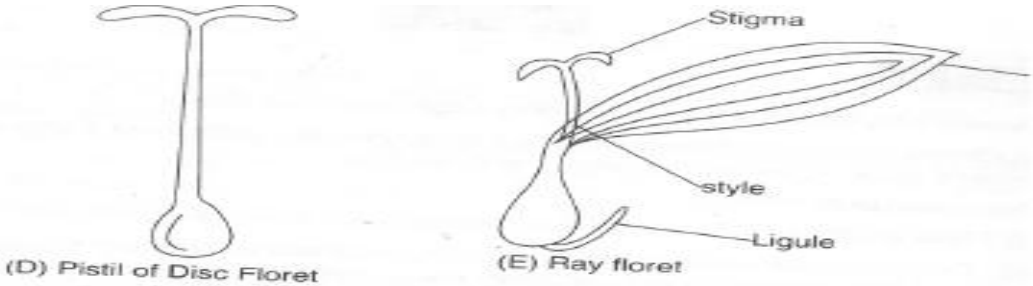


Fig. 1.1 : Floral parts of sunflower (Helianthus annuus)

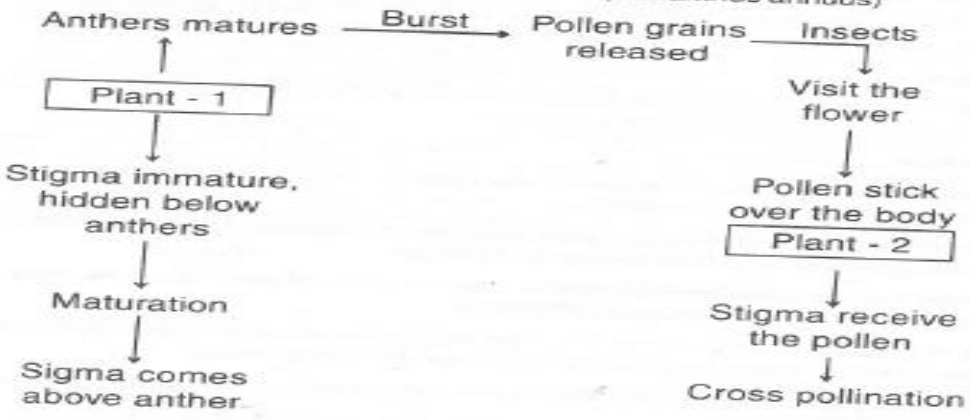


Fig. 1.2 : Diagrammatic representation of pollination in sunflower

A) The maize plant is monoecious and bears unisexual flowers. The male flowers are born in terminal inflorescence while the female flowers are born in axillary inflorescence.

(B) The flowers are colourless, odourless and nectarless.
(C) Flowers are small and inconscipicous.
(D) Both the stigmas and anthers are exerted.
(E) Anthers are versatile, and pollen grains are light, small and dusty.
(F) Stigma is hairy, feathery or branched to catch wind born pollen grains.
(G) The pollen grains are produced in very large numbers.

(2) Salvia flowers (Entomophilous or Insect pollinated flowers.)

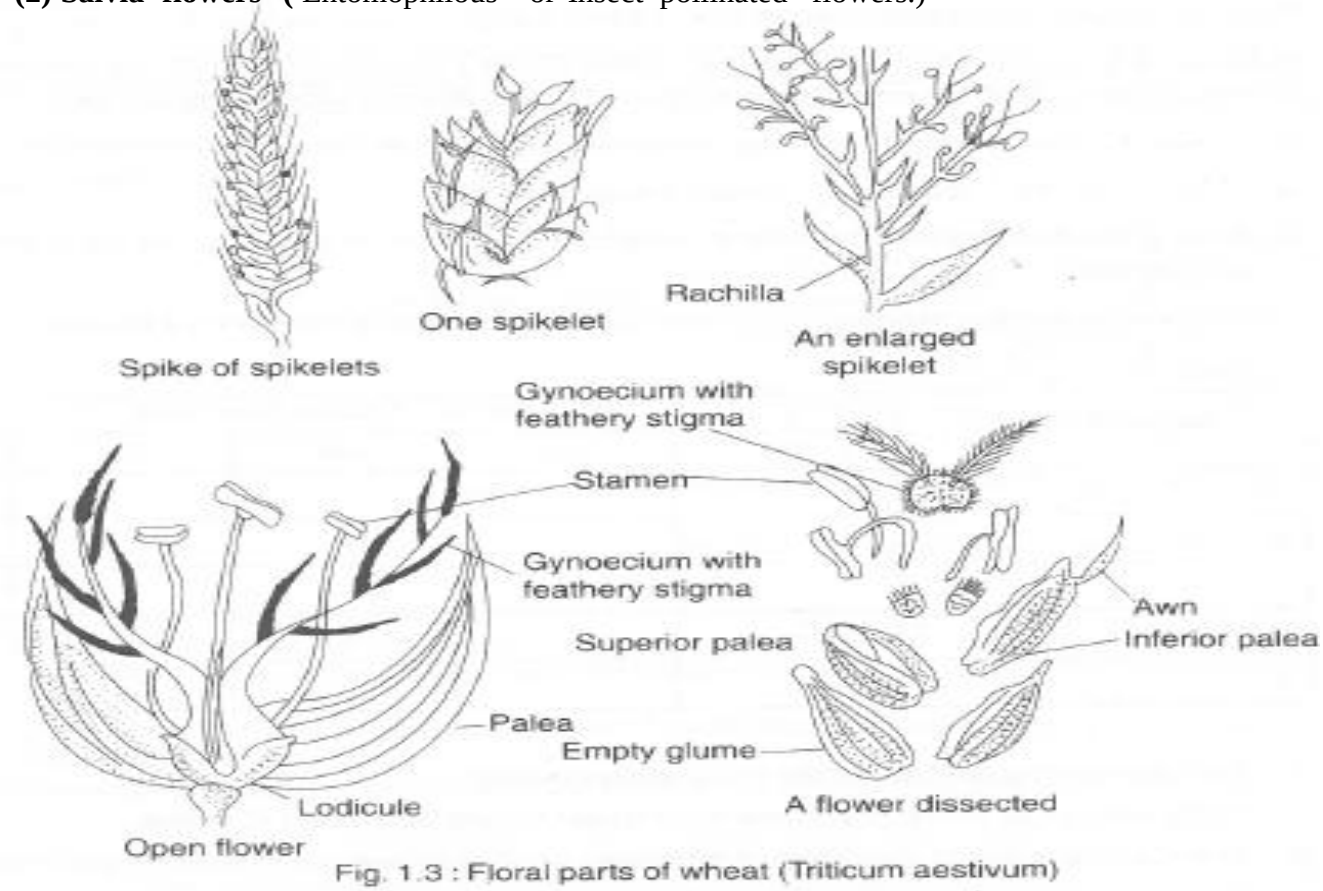
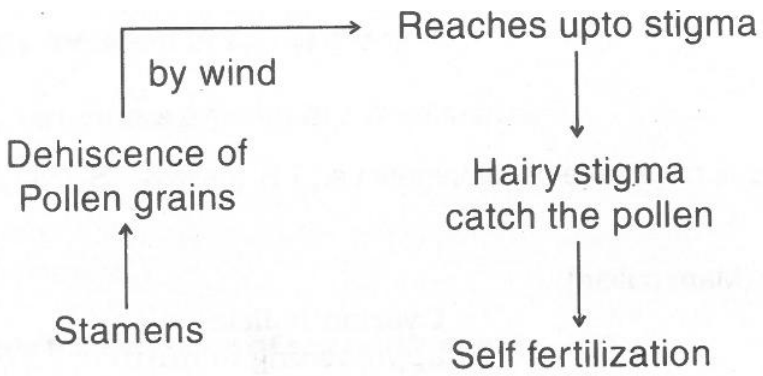


Fig. 1.3 : Floral parts of wheat (Triticum aestivum)

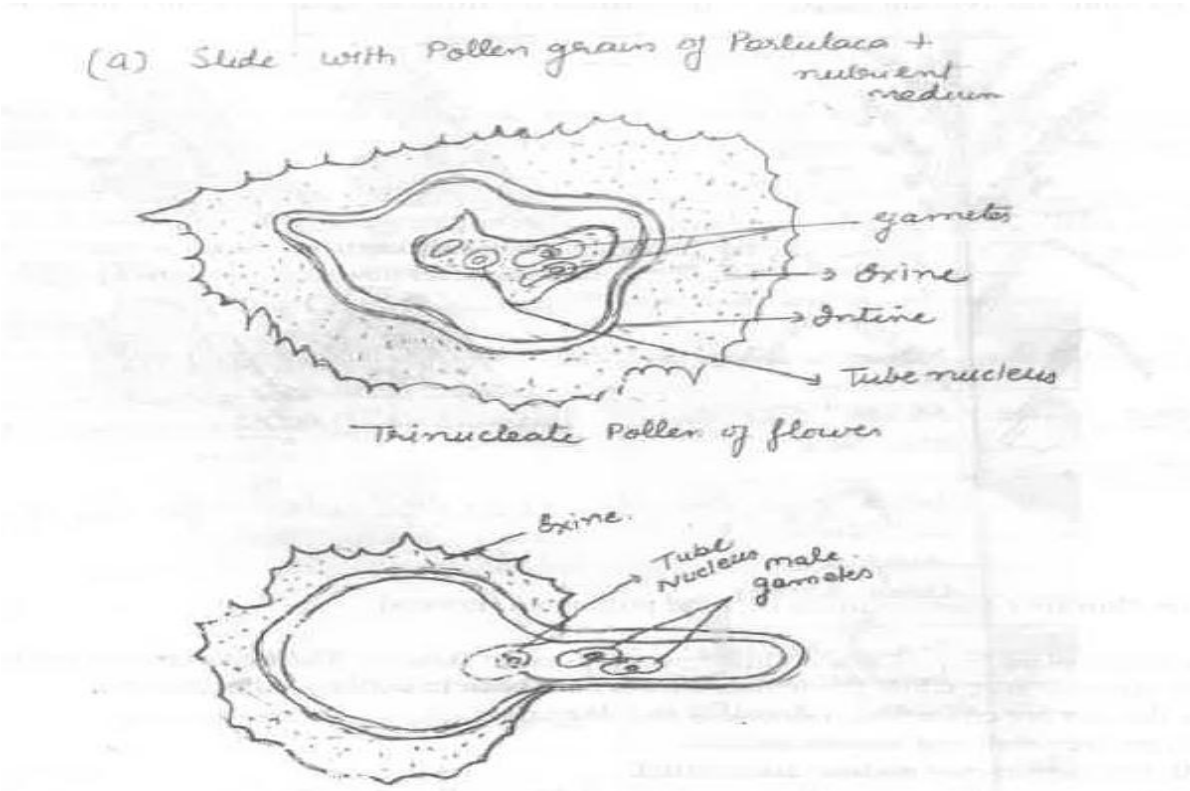


. 1.4 : Diagrammatic representation to show wind pollination in wheat.

(A) The flowers are showy or brightly coloured for attracting pollinating Insects.
(B) Flowers secrete nectar to feed visiting insects. Nectar glands are placed in such a position that an insect must touch both the anthers and stigmas.
(C) The flowers have landing platform for the insects.
(D) The flowers are protandrous with bilipped corolla and have turn pipe or lever mechanism.
(E) Each stamen has long connective which bears a fertile anther lobe at the upper end and sterile plate like anther lobe at the lower end.

Spot - 2

Identification: Pollen germination on a slide.



Comments:

(1) Pollen grain or microspore is the first cell of male gametophyte.

(2) Each pollen grain of a flowering plant (angiosperm) possesses two cells.

(i) Vegetative cell (2) Generative cell

(3) On the stigma, the pollen grain absorbs water and nutrients from the stigmatic secretion through its germ pores.

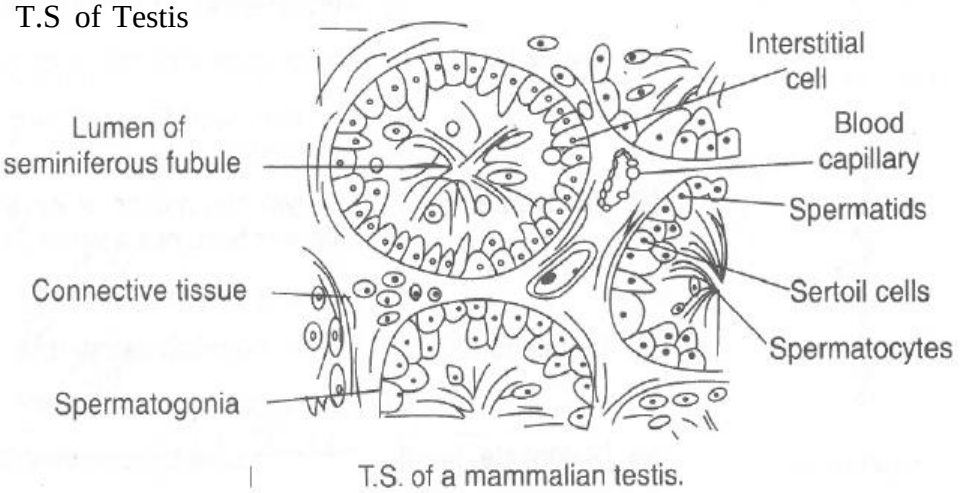
(4) The tube cell gives rise to a pollen tube, the generative cell also descends into the pollen tube and divides in to two male gametes.

(5) There is only one pollen tube from one pollen.

(6) Certain pollen grain do not germinate and are referred as sterile pollens.

Spot-3(a)

Identification: T.S of Testis



T.S. of a mammalian testis.

Comments:

(1) The mammalian testis is covered by a thick fibrous tissue called tunica albuginea.

(2) The testis consists of numerous seminiferous tubules embedded in the interstitial tissue.

(3) Various types of germinal cells are present from outside towards lumen in the following sequence. Spermatogonia Spermatocytes Spermatids Spermatozoa Sperms.

(4) Between the germinal cells, pyramid shaped cells called sertoli cells are present.

(5) The interstitial cells or leydig cells are present in between the tubules they secrete the male sex hormone, testosterone.

Spot - 3(b)

Identification: T.S of ovary.

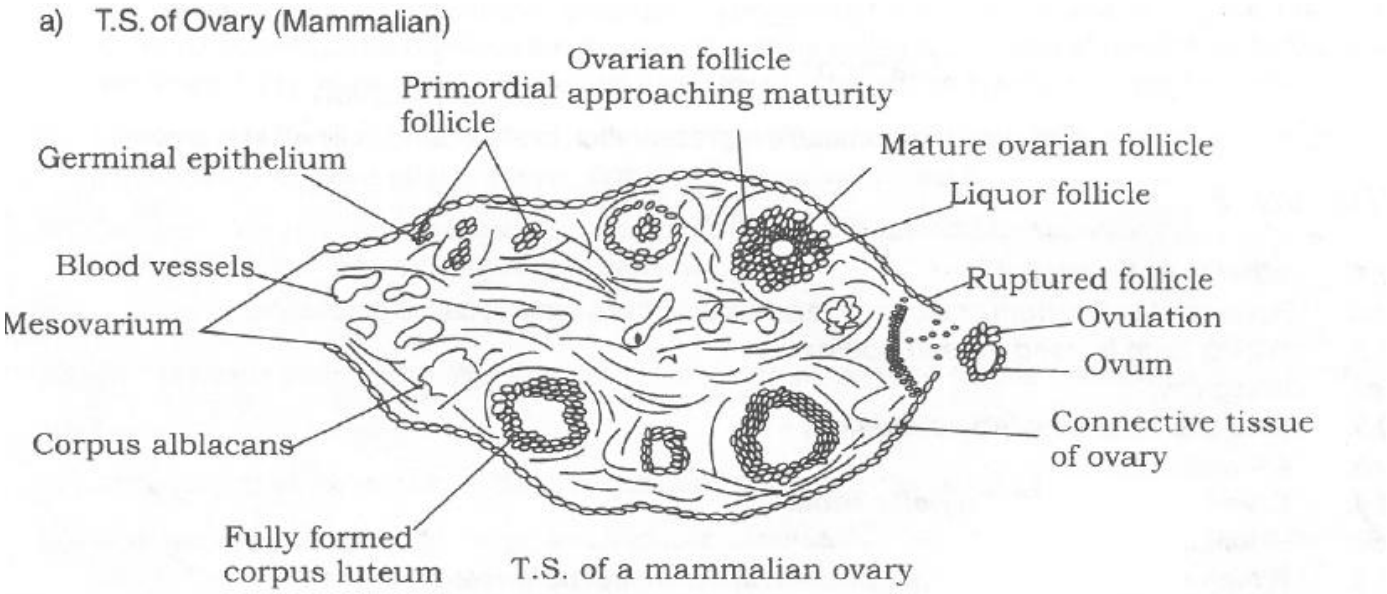


Fig. 3.1 : T.S. of a mammalian ovary

Comments:

(1) A mammalian ovary is a solid structure bounded by germinal epithelium followed by a thick layer of fibrous tissue, the tunica albuginia.

(2) The ovary consists of outer cortex and inner medulla.

(3) In the stroma, graffian follicles in various stages of development like primary oocytes and secondary oocytes are found.

(4) A graffian follicle consists of an ovum, surrounded by a group of follicular cells.

(5) A Mature follicle ruptures and releases the ovum out of the ovary. At the point of rupture corpus luteum is formed which secretes the hormone progesterone.

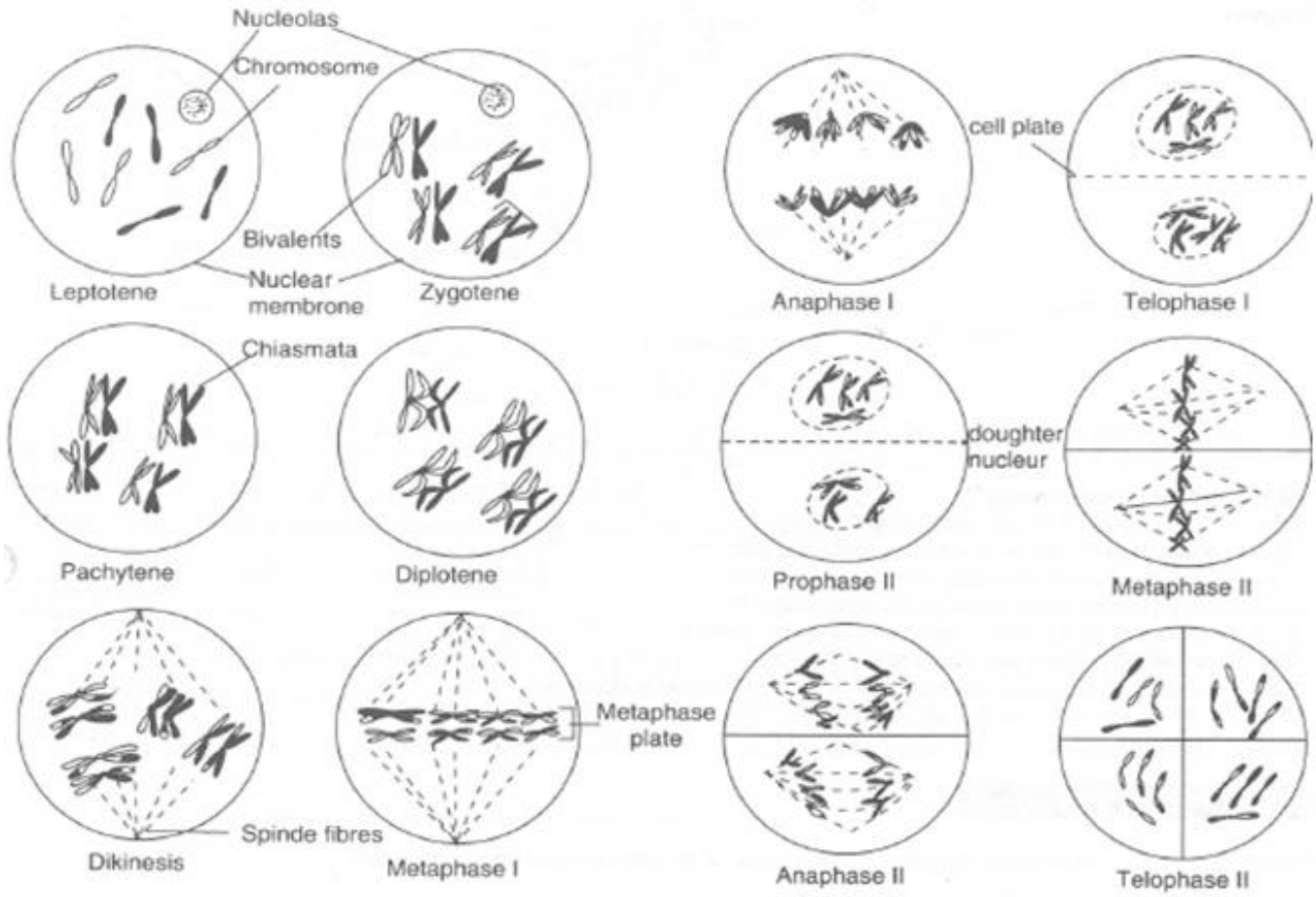
(6) The cortex may also contain a large mass of yellow cells termed corpus luteum, formed in an empty graffian follicle after the release of its ovum.

Spot - 4

Identification: Meiosis in onion bud cells.

Comments:

(A) Meiosis –I



Stages of mitosis in animal cells.

(1) Prophase 1 : It is slightly of longer duration and is different from prophase of mitosis. **It** can further be subdivided into the following five substages-

(a) Leptotene:

(i) Chromatin fibres condense and form thick thread like structures called chromosomes.

(ii) Nuclear envelope and nucleolus are distinct.

(iii) The nucleus increases in size and volume by absorbing water.

(b) Zygotene :

(i) The two homologous chromosomes lie side by side. This is known as pairing or synapsis.

(ii) Each pair of chromosome is known as bivalent.

(c) Pachytene:

(i) Each chromosome of a bivalent splits - longitudinally into two sister chromatids so that the bivalent becomes a tetrad.

(ii)Crossing over occur in a homologs pair.

(iii)The points of crossing over are known as chiasmata.

(d) Diplotene:

(i) As the chromosomes are showing gradual condensation. So there is a tendency that chiasmata tend to slip out of the chromosomes. This is known as terminalisation of chiasmata.

(ii)Chromosomes start separating out but the separation is not complete.

(iii)Nuc1ear Membrane and nucleolus start degenerating.

(e) Diakinesis :

(i) Homologous chromosomes appear thick and ring shaped.

(ii) Nucleolus and nuclear envelope disappear and spindle begins to be formed.

(2) Metaphase - I

(i) The bivalent arrange themselves at the equator of the spindle. (ii)The spindle get attached to the centromere of the chromosome.

(3) Anapbase - I

(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) Telopbase - I

(i) The Chromosome at each pole uncoil, and nucleolus and nuclear envelope reappear.

(ii) Cytokinesis occurs to form two haploid daughter cells.

(B) Meiosis II : It includes following four stages.

(a) Prophase II

(i) The chromosomes of daughter cell begin to condense and become thick.

(ii) Nuclear envelope and nucleolus begin to disappear.

b) Metaphase II

(i) The chromosomes are arranged on the equator of the spindle.

(ii) Nucleolus and nuclear membrane disappear.

(c) Anaphase II

(i) The sister chromatids of each chromosomes separate and migrate towards the opposite ph

(ii)Each pole thus receives haploid number of chromosomes.

(d) Telophase II

(i) The chromosomes begin to uncoil and become thin.

(ii) The nuclear envelope and nucleolus are reconstituted.

Spot No – 5

Identification: T.S of Blastula.

Comments:

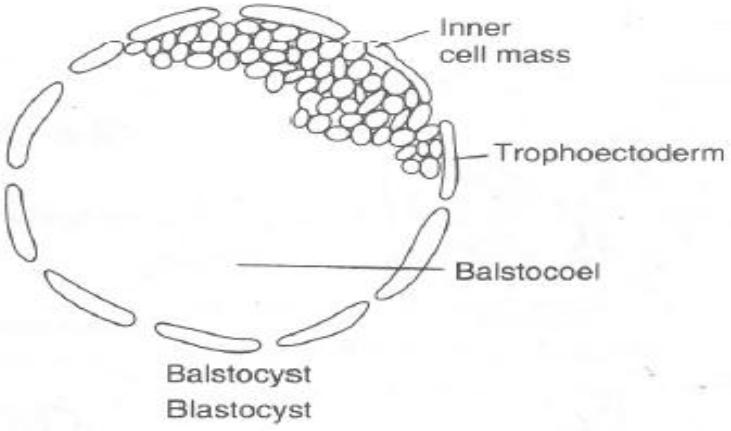
(1) **It** is a spherical mass of about 32 or 64 cells.

(2) **It** is composed of an outer envelope of cells, the trophoblast or trophoectoderm and inner cell mass (embryoblast).

(3) Within the envelope there is a fluid filled cavity called blastocoel.

(4) The side of the blastocyst to which the inner cell mass is attached is called the embryonic or animal pole, while the opposite side is the abembryonic pole.

(5) The inner cell mass is the precursor of the embryo.
(6) In this state it forms the connection with mother's uterus wall which is called implantation.

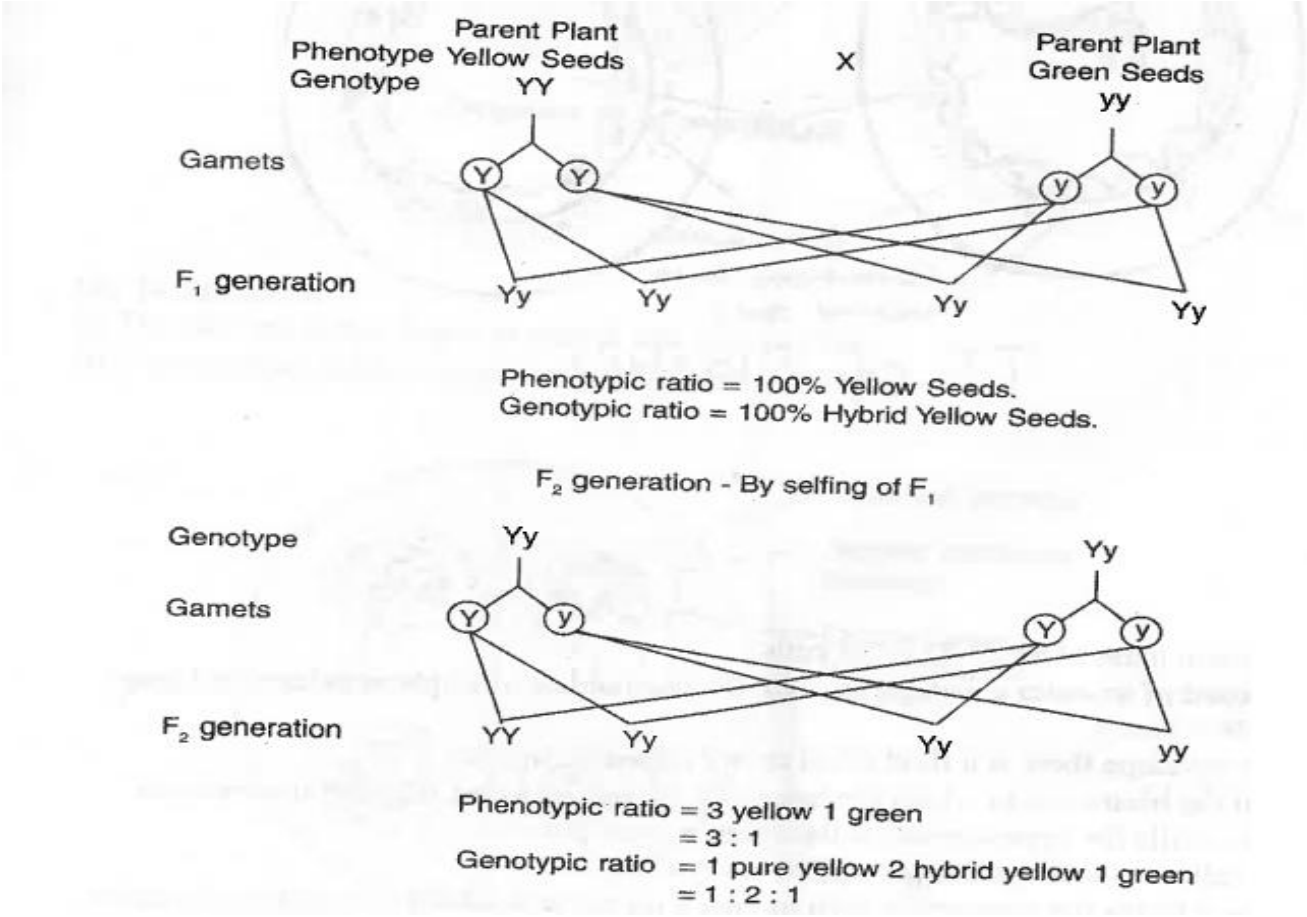


Spot - 6.

Identification- Mendelian inheritance.

Object : Study of Mendelian inheritance using seeds of different color f.size of any plant.
Requirements : Seeds of any plant (like pea), pencil, eraser, note book.
Observation .

(i) Collect the seeds of any plant (pea).
(ii) Now count the number of seeds which are yellow and green in colour.
(iii) The ratio were analysed on the basis of law of probability.
(iv) Monohybrid cross can be shown by following cross.



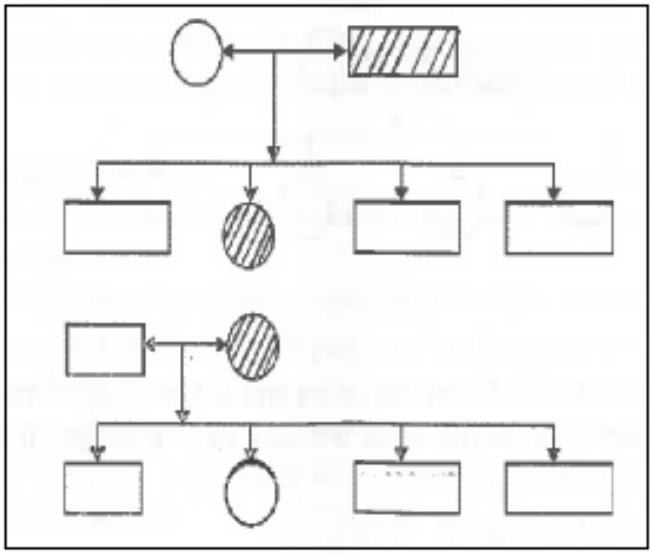
Observation : Ratio of seed colour in plant in Fl generation is ----------
Ratio of seed colour in plant in F2 generation is ----------

Result : **Above ratio matches with Mendelian ratio.**

Spot- 7 (a)

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

Aim- Study and analyse the given pedigree chart for genetic trait of blood group.



1. Pedigree Chart is a record of occurrence of a trait in several generations of a human family. In this case the blood group is a given genetic trait.

2, In this pedigree chart male members of the family are shown by squares and females by circles. Parents are joined by horizontal lines and their off springs through a vertical line below the parents in order of their birth.

3. The given pedigree chart shows that a male parent with blood group A' marries a female without blood group 'A' they have four children of which only one female is with blood group 'A'.

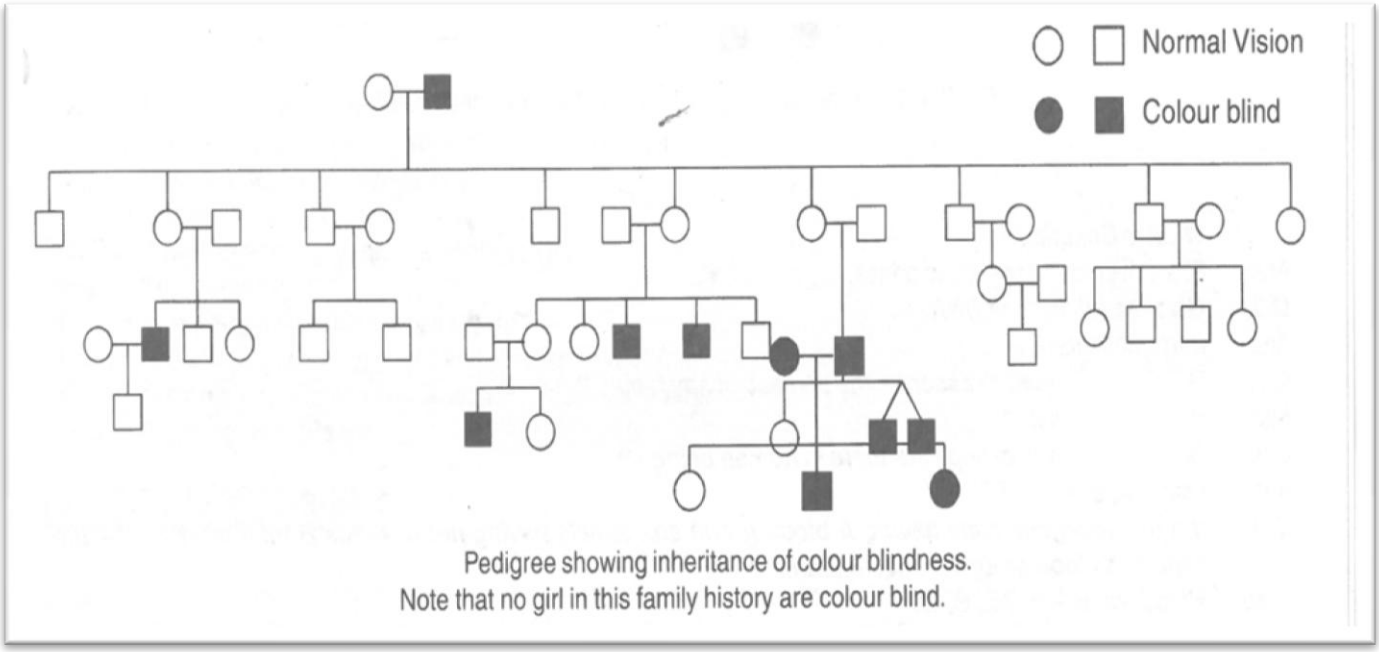
4. Marriage between blood group 'A' female with male without blood group 'A' produces three sons and one daughter. None of the off spring have blood group' A'.

5. Following conclusions can be drawn from the pedigree analysis. (a) Inheritance of blood group is not related to sex~

(b) Male parent with blood group 'A' is - heterozygous (I_AI_o)

(c) Daughter with blood group 'A' is also heterozygous (I_AI_o)

Spot -7(b)



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

Aim -Study and analyse the given pedigree chart for genetic trait of colour blindness.

(1) Pedigree chart is a record of occurrence of a trait in several generations of a human fami colour blindness is a given genetic trait in this cases.

(2) Male members of the family are shown by squares and female members by circles. Pare and their off springs are joined by vertical lines in order of their birth.

(3) The given pedigree chart shows that phenotypically normal parents for colour blindne produces four children, of which three are daughters and one is son. Only son is colour blin~

(4) Marriage between colour blind male and phenotypically normal female produces - f(l children, two sons and two daughters. None of the offsprings exhibits the trait of colo blindness.

Following conclusions can be drawn from the pedigree analysis-

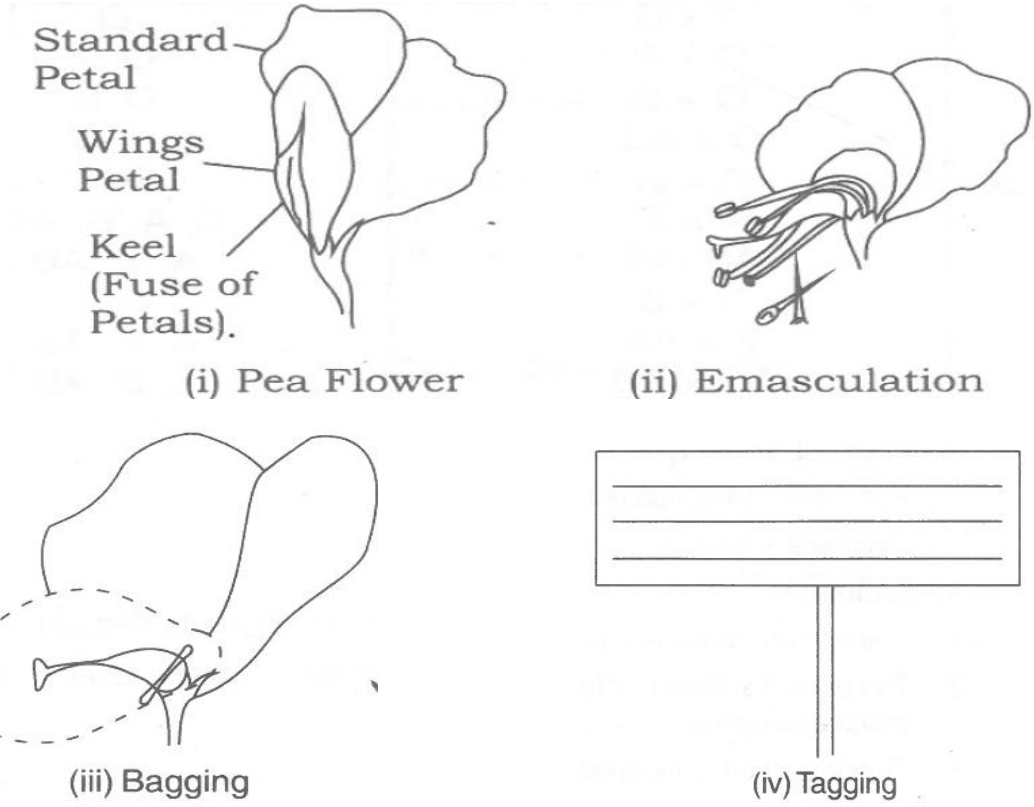
(a) Colour blindness is related to sex.

(a) Colour blindness is related with X chromosomes and is homozygous recessive trait. Hen female is either normal carrier or colour blind whereas male is either sufferer or normal b never a earner.

(b) Female parent in this chart is a carrier trait.

Spot – 8

Identification: Controlled pollination.



(1) A. Emasculation:

(i) In this process anthers are removed from the flowers before their maturation .

(ii) The anthers are cut with the help of sterilized forceps or scissors.

(iii) The Instrument used in this method - Include Pocket lens, forceps, needle, scissors, scalpel etc.

(iv) Method of emasculation is·employed to the crops having small flowers like paddy.

(2) Bagging and tagging:

(i) After emasculation, the flowers are covered with small bags to prevent pollination with undesired pollen grains.

(ii) These bags are made up ofpolythene, paper, muslin cloth or parchment paper.

(iii)The flowers of male parents are also protected in bags to prevent mixing of their pollen grain with foreign pollens. .

(iv) After dusting of the desired pollen grains on the emasculated flowers. The bags are retagged.

(v) A label of paper is tagged on the plant which displays the date of emasculation, crossing and brief account of the parents

Common disease causing organisms

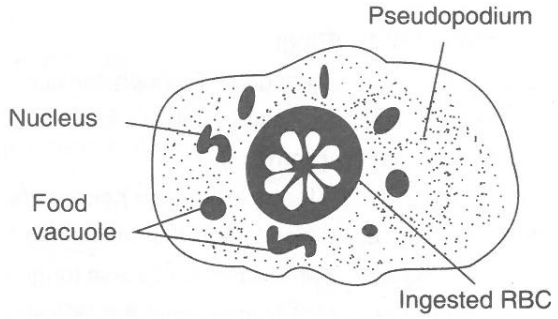
Spot - 9 (a)

Identification: Entamoeba

Comments:

(l) It is a human parasite that resides in the upper part of the large Intestine.

(2) It causes the disease called amoebic dysentery or amoebias is.
(3) The symptoms of the diseases Include abdominal pain, repeated motions with blood and mucus.
(4) The parasite is unicellular and has a blunt pseudopodium.
(5) There is a single nucleus and a number of food vacuoles.
(6) It feeds on red blood corpuscles by damaging the wall of large intestine and reaching the blood capillaries.
(7) It produces ulcers and can also reach other body organs.



Spot - 9(b)

Identification : Plasmodium vivex (Malarial parasite)

Comments:

(I) It is a protozoan digenic endoparasite of man.
(2) Its primary host is man and female anopheles is its secondary host.
(3) Plasmodium enters human body in sporozoite stage by the bites of female anopheles.
(4) The sporozoite is spindle shaped and uninucleate organism capable of wriggling movement.
(5) The sporozoites infect liver cell and produce meta-cryptomerozoites.
(6) The metacryptomerozoites enter RBCs, and passes trophozoite signet ring stage and amoeboid stage and produce schizont and merozoites.
(7) The merozoites enter fresh RBCs and produce gametocytes.

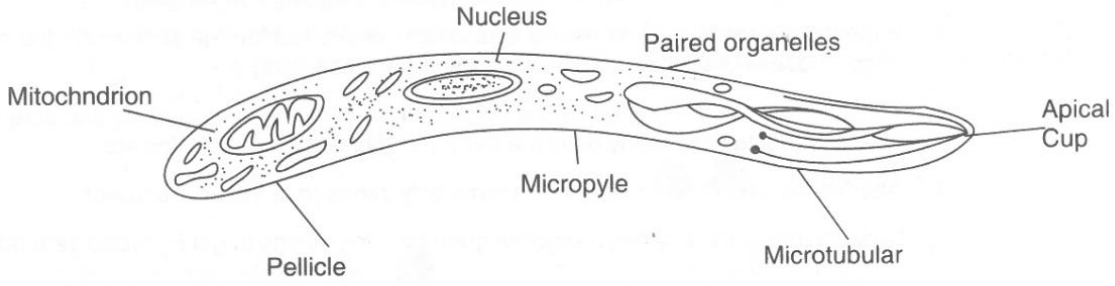


Fig. 9.2 : Plasmodium – Ultrastructure of sprozoite

Spot -9(c)

Identification: Ascaris

Comments:

(1) It is an endoparasite of the small Intestine of human beings and is more common in childre
(2) The animal shows sexual dimorphism with separate male and female individuals.
(3) The life history is simple and without any intermediate host. The infection occurs through contaminated food and water.
(4) Ascaris causes abdoininal discomfort and colic pain.
(5) The patient may also suffer from impaired digestion, diarrhoea and vomiting. (6) In children mental efficiency is affected and body growth is retarded.
(7) It causes ascariasis.

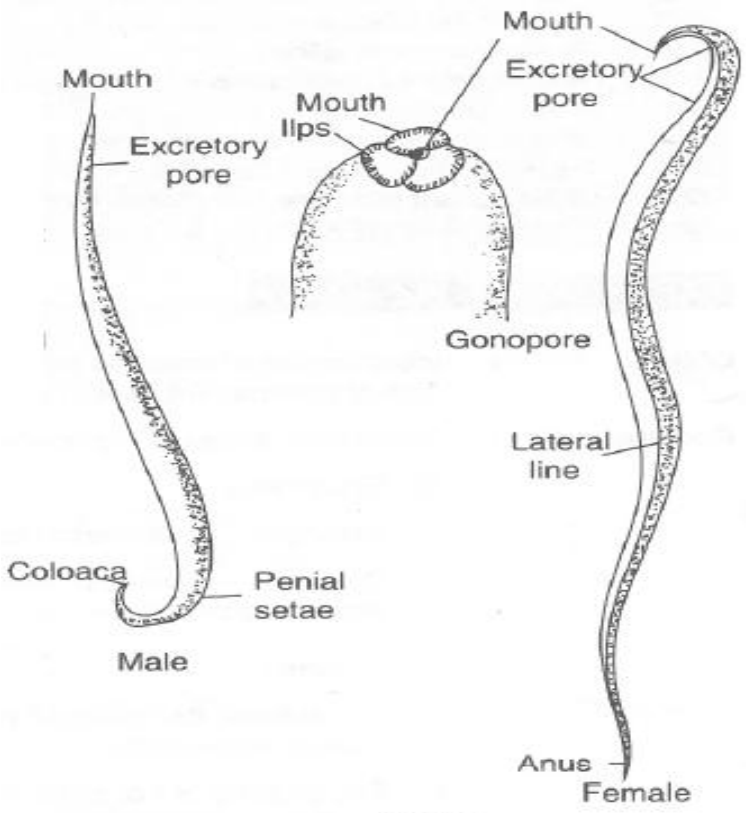


Fig. 9.3

Spot 9(d)

Identification- Ringworm
Pathogen - Trichophyton sp.
Disease - Athelete foot

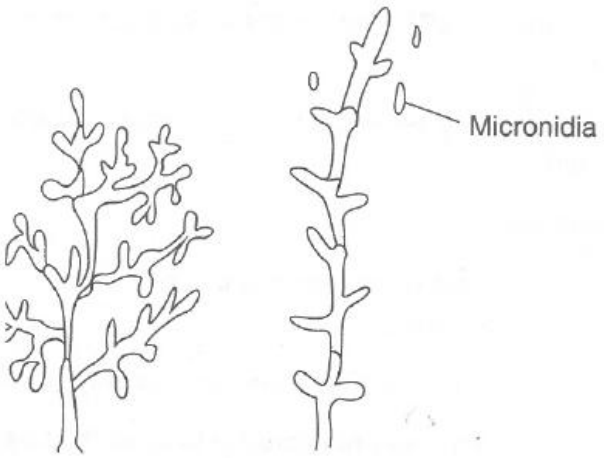


Fig. 9.4 : Trichophyton

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.

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 disease are called dermatomycoses.
5. Skin becomes dry and whitish in colour with keratin substances.

Study of adaptations in plants and animals found in Xerophytic conditions

Spot - 10(a) Identification: Opuntia

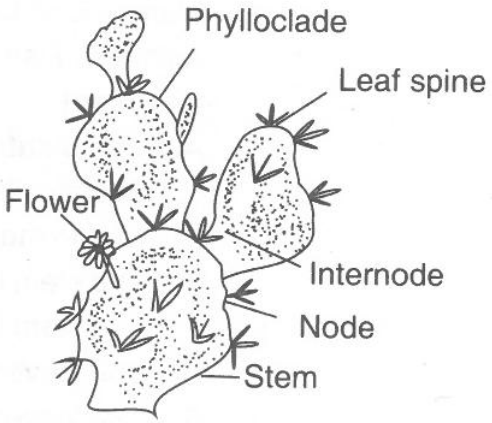
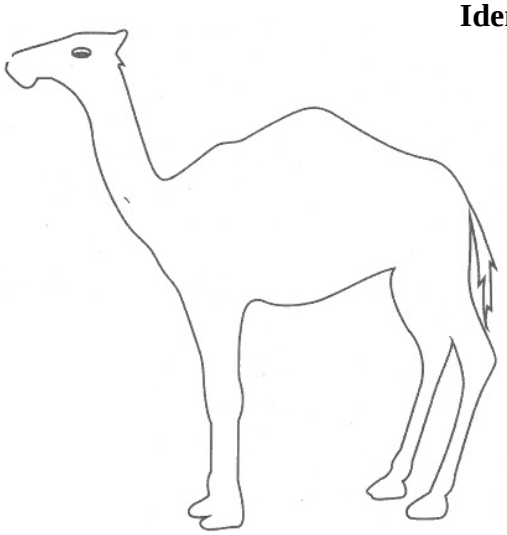


Fig. 10.1: Xerophytic Plant

Comments:

(1) It is a succulent or drought resisting xerophyte, which grows wild in arid areas.
(2) Leaves are modified into spines so as to reduce the surface area.
(3) Leaves are caduceus (leaves fall down as they are formed).
(4) The stem is jointed, flattened and green called phylloc1ades to reduce transpiration and takes over the function of photosynthesis.
(5) The stem becomes fleshy due to storage of water.
(6) The stem possesses abundant mucilage which helps in retaining water.
(7) Stomata are deep seated or sunken.
(8) Roots are spread near soil surface so as to rapidly absorb water from superficial strata of soil.
(9) Thick layer of cuticle over the stem help to check evaporation of water.

Spot -10 (b)
Identification - Camel.



Comments

(I) It is a desert mammal.

(2) It can store water in its stomach and one drink of water is sufficient for one to two weeks.

(3) Its vital organs such as nose, ear eyes and mouth are situated very high on the body which provides protection.

(4) Eyes have long eyelashes, ears have hair and nose has flaps which protects it from desert sand.

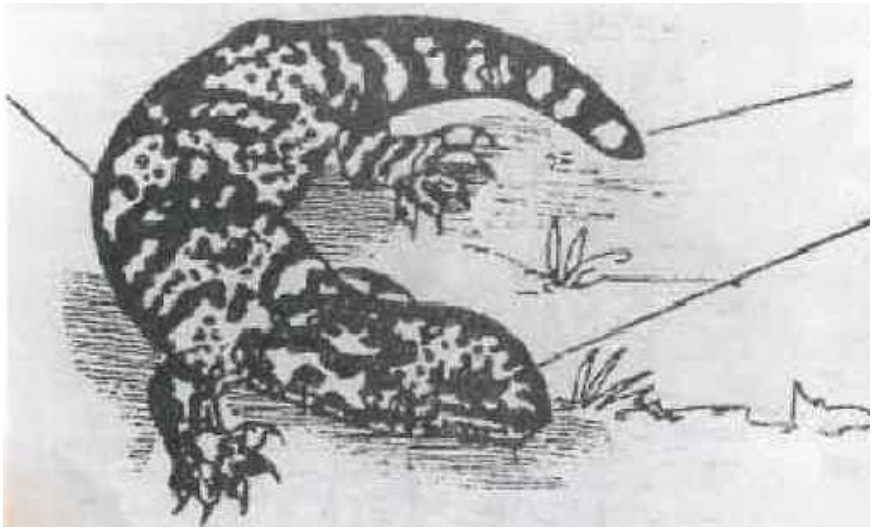
(5) It excretes out highly concentrated urine.

(6) Its long legs with pads are adapted for desert life.

(7) **It** accumulates its fat in the hump rather than all over the body,

Spot -10(d)

Identification- Gila – Monster



Comments

(1)11 is a giant poisonous lizard commonly found in deserts.

(2) Its body is covered by dry epidermal scales to prevent any loss of water from body surface.

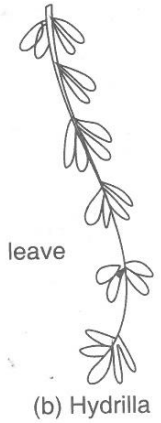
(3) **It** excretes uric acid.

(4) It can also blend its body colour with the colour of its surrounding.

Study of adaptations in plants and animals found in Hydrophytic conditions

Spot -11(a)

Identification – Hydrilla



(b) Hydrilla

Comments

(l) **It** is a submerged hydrophyte found attached to the substratum by adveraitious roots in fresh water pond.

(2) The stem is soft and slender and bears thin and membranous leaves in whorls,pf3-8.

(3) Root system is absent.

(4) Mechanical tissue absent.

(5) Stomata is absent and diffusion of water and air directly takes place from the surface.

(6) The leaves are thin and narrow in submerged plant.

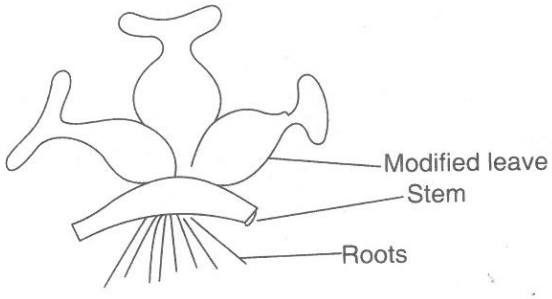
(7) Leaves may be large and flat with their upper surface coated with wax in floating type like lotus and water lily.

Spot -11 (b)

Identification- Eichomia

Comments

(1) **It** is a free floating hydrophyte that grows in ponds, lakes and water bodies containing fresh water.
(2) Roots are poorly developed with few minute root hairs.
(3) Root pocket is present in place of root cap.
(4) The stem is offset that grows prostrate below the surface of water. **It** is spongy and stores air.
(5) The emerged leaves have water-proof, waxy and cuticular coating to prevent wetting"
(6) The nodes also bear clusters of brown adventitious roots in water.



(a) Eichhornia

Fig. : Aquatic animals

Spot -11 (c) Identification – Rohu

Comments

(1) Its body is compressed laterally. To reduce friction and to allow swift passage in water while swimming.
(2) Appendages are in form of pectoral, pelvic, dorsal, anal, lateral and caudal fms which all help **in** swimming.
(3). Gills are present for breathing.
(4) Lateral line sense organs are present for equilibrium.
(5) **It** has air bladder or swim bladder which maintains buoyancy.
(6) Body is covered by dermal-scales.

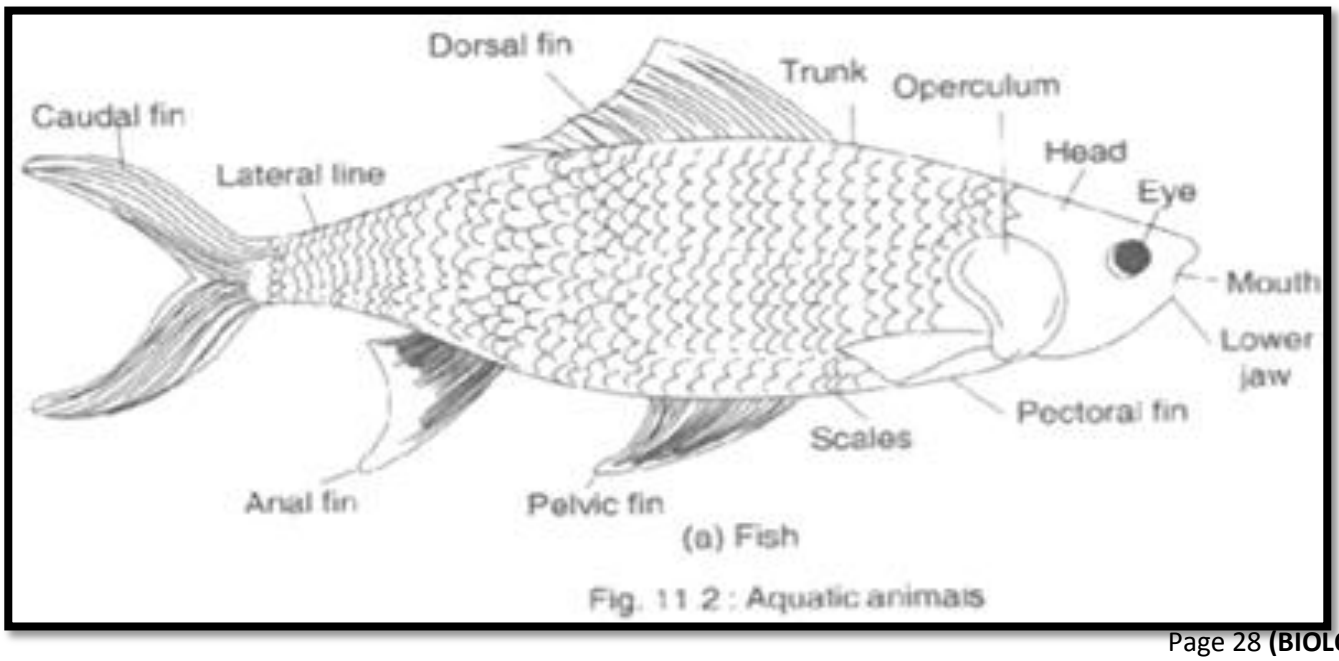


Fig. 11.2 : Aquatic animals