

Sl.No.	Name of the Experiment	Page No.	Sign.
	<b>Major Experiments</b>		
1.	Study and describe a plant from Solanaceae family- Petunia		
2.	Separation of plant pigments through paper chromatography		
	<b>Minor Experiments</b>		
3.	Test for presence of sugar in urine		
4.	Test for presence of albumin in urine		
	<b>Slide Preparation</b>		
5.	Study of distribution of stomata in the upper and lower surfaces of leaves		
	<b>Spotting-Identification with reasons</b>		
	<b>MONERA</b>		
6.	Bacteria		
7.	Oscillatoria		
	<b>ALGAE</b>		
8.	Spirogyra		
	<b>FUNGI</b>		
9.	Rhizopus		
10.	mushroom		
11.	yeast		
	<b>PTERIDOPHYTA</b>		
12.	fern		
	<b>GYMNOSPERMS</b>		
13.	Pinus Male cone		
14.	Pinus Female cone		
	<b>COELENTERATA</b>		
15.	Hydra		
	<b>ASCHELMINTHES</b>		
16.	Ascaris		
	<b>ANNELIDA</b>		
17.	Leech		
	<b>ARTHROPODA</b>		
18.	Prawn		
	<b>ECHINODERMATA</b>		
19.	Starfish		
	<b>PISCES- OSTEICHTHYES</b>		
20.	Rohu		
	<b>Tissues in ANIMALS</b>		
21.	Squamous epithelium		
22.	Smooth muscles		
23.	Skeletal muscles		
24.	Cardiac muscle fibers		
	<b>Cell Division</b>		
25.	Mitosis in onion root tip cells from permanent slides		

### Identification:

- The given material is *Agaricus* with basidiocarp

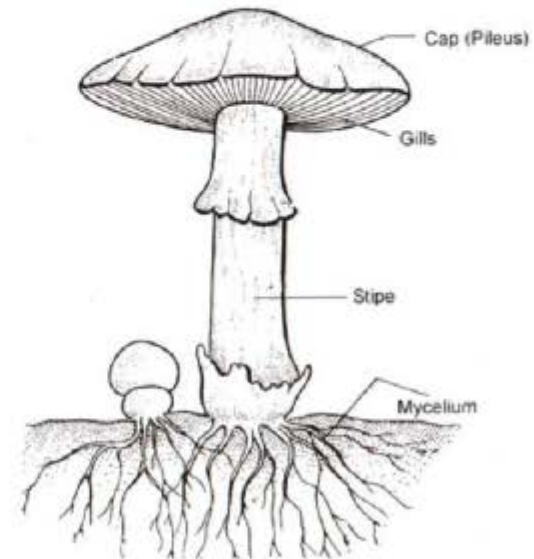
### Identification Features:

- It consists of a fruiting body called basidiocarp.
- It consists of rhizoids, a stipe, and a cap.
- A number of gills are present at the lower side of the cap.
- A number of basidiospores are produced in gills.

## AGARICUS

### Systematic position

Kingdom	-	Fungi
Division	-	Eumycota
Class	-	Basidiomycetes
Order	-	Agaricales
Family	-	Agaricaceae
Genus	-	<i>Agaricus</i>



## COMMENTS:

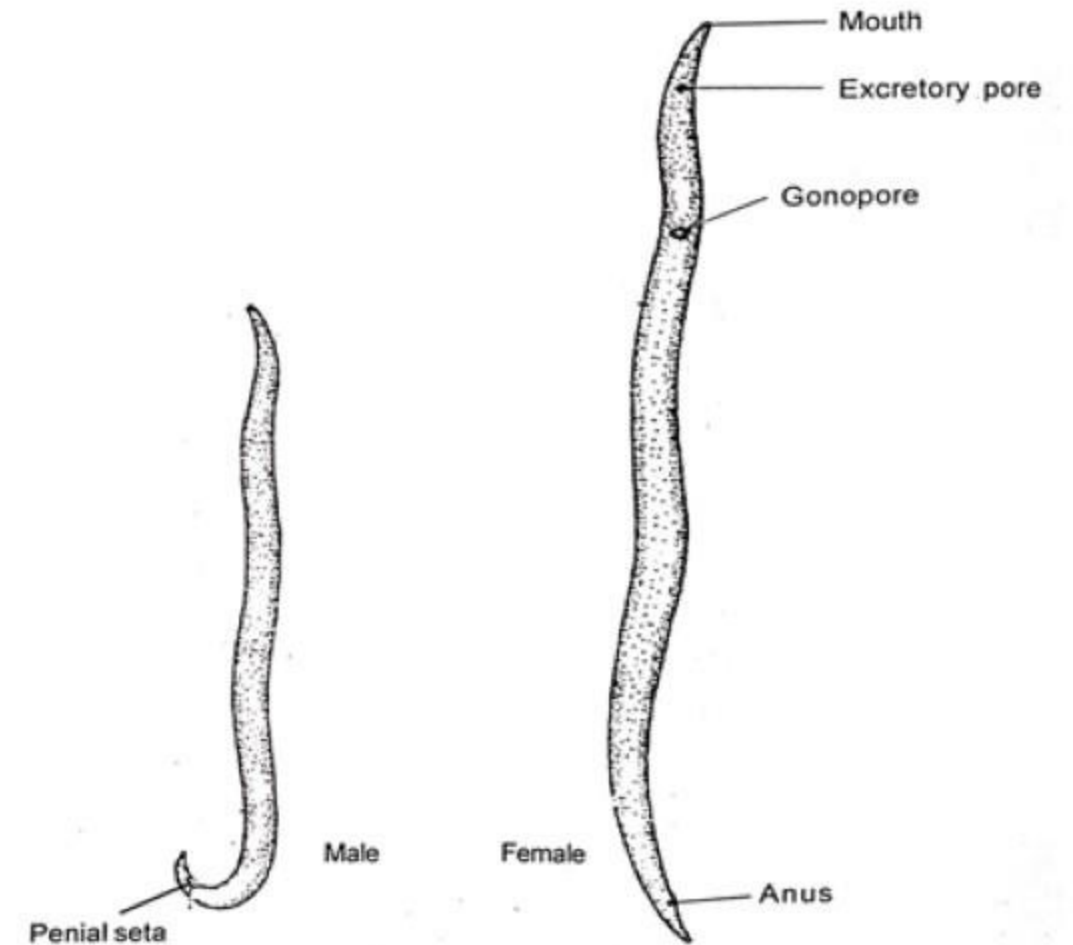
- It is an endoparasite of man, commonly called roundworm.
- The body is cylindrical and unsegmented.
- Mouth is at the tip and is surrounded by lips.
- Sexual dimorphism is distinct. Male is smaller than the female. Tail end of the male is curved while pointed in female. Male possesses a pair of penial setae. Genital aperture and anus are separate in females, while in male both open through a single opening, the cloaca.

## PARASITIC ADAPTATION:

- Presence of cuticular covering.
- Suctorial pharynx for sucking in fluid food.
- Absence of locomotory, circulatory systems and digestive glands.
- Anaerobic respiration.
- Power of reproduction is great.

## 3. ROUND WORM

Phylum	-	Aschelminthes
Class	-	Nematoda
Genus	-	<i>Ascaris</i>
Species	-	<i>lumbricoides</i>



### Identification:

- The given material is *Lactobacillus* bacteria.

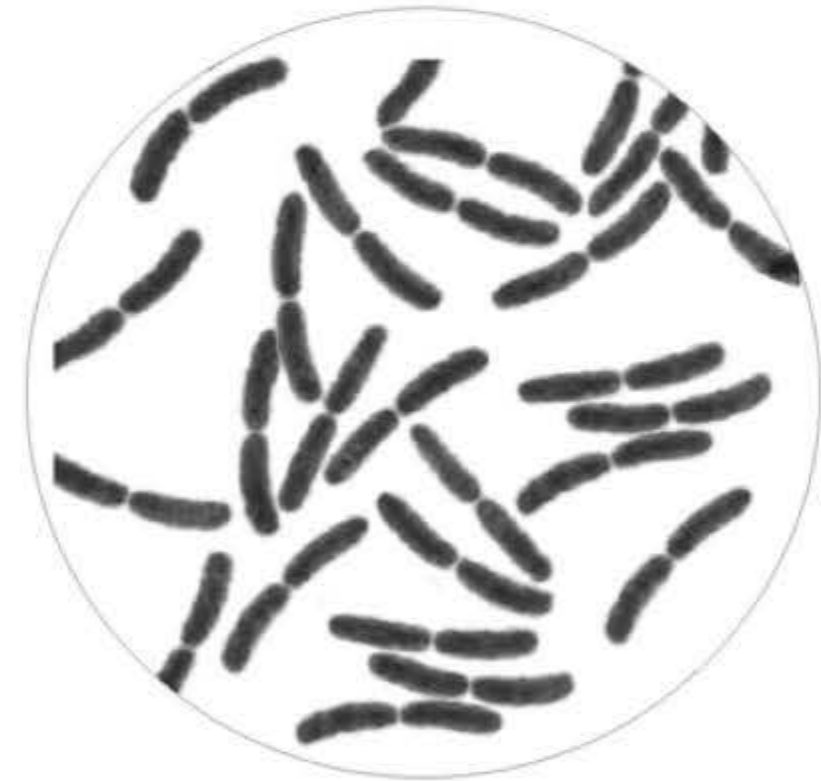
### Identification features:

- They are rod shaped, non-motile bacteria found in curd.
- They are unicellular and prokaryotic.
- They reproduce by binary fission.

## BACTERIA (LACTOBACILLUS)

### Taxonomic Position

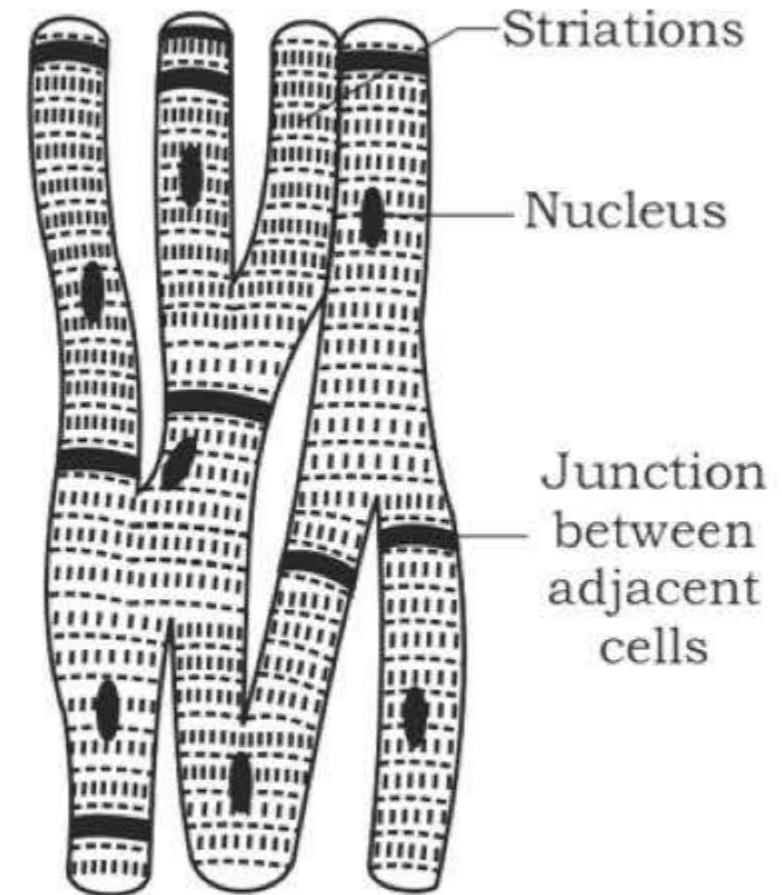
Kingdom	:	Monera
Group	:	Eubacteria
Family	:	Lactobacillaceae
Genus	:	<i>Lactobacillus</i>

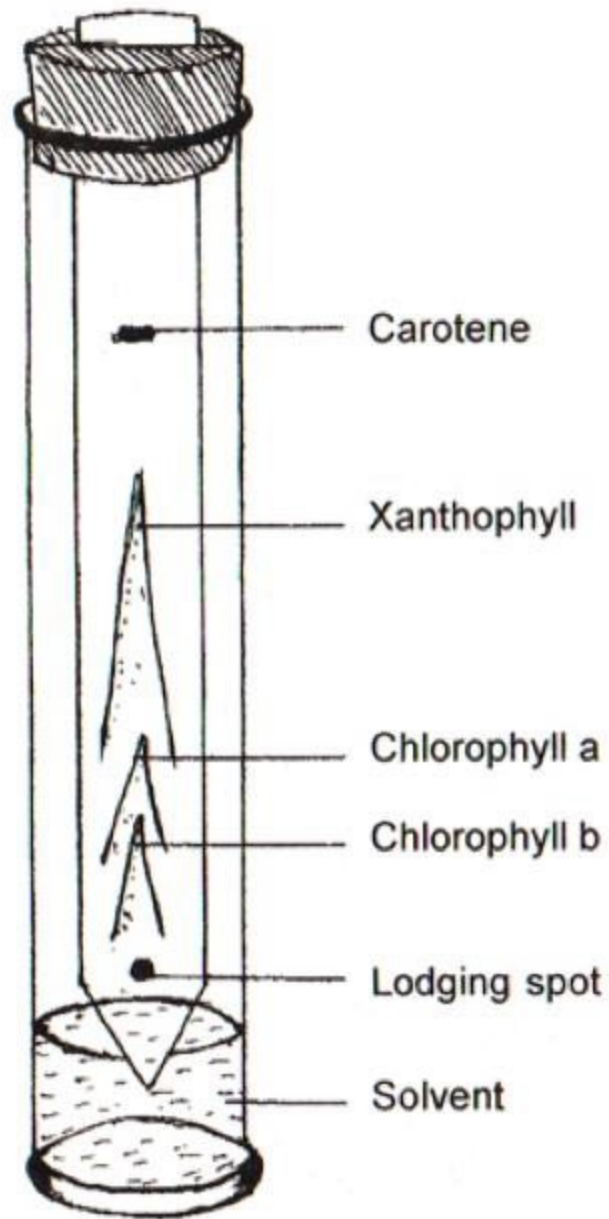


## FEATURES OF CARDIAC MUSCLE

- *Cylindrical branched fibres.*
- *Involuntary in action.*
- *Found in heart wall only.*
- *Uninucleate.*
- *Abundant mitochondria and myoglobin.*
- *Striations are present.*
- *Intercalated discs are present.*
- *Non-fatigue muscles.*

## 3. CARDIAC MUSCLE





## STUDY OF PLANT PIGMENT BY PAPER CHROMATOGRAPHY

**Aim:** To separate the photosynthetic pigments by paper chromatography.

**Materials required:** Petroleum ether, acetone, Whatman's No. 1 filter paper, glass rod, measuring jar, split cork, leaf extract etc.

**Procedure:** Take 2 ml of running solvent (petroleum ether and acetone in 9:1 ratio) in a large measuring jar. It is closed tightly with a split cork. Cut one end of Whatman's No. 1 filter paper to prepare a 'V' shaped tip. A pencil line is drawn about 2cm above the tip. Prepare a leaf extract by grinding green leaves with acetone. Apply the leaf extract at the marked region of filter paper. Dip the lower end of the filter paper in the solvent and fix the upper end in the split cork in the jar. Place the set up for 20-30 minutes.

**Observation:** The pigments of the extract get separated due to their differential solubility in a moving phase. Different colours are developed in the paper.

**Inference:** The lower most layer is chlorophyll 'b' (yellow green), then chlorophyll 'a' (blue green), Xanthophyll (yellow orange), and Carotene (orange red) respectively.

### Identification:

- The given material is *Nephrolepis* sporophyte.

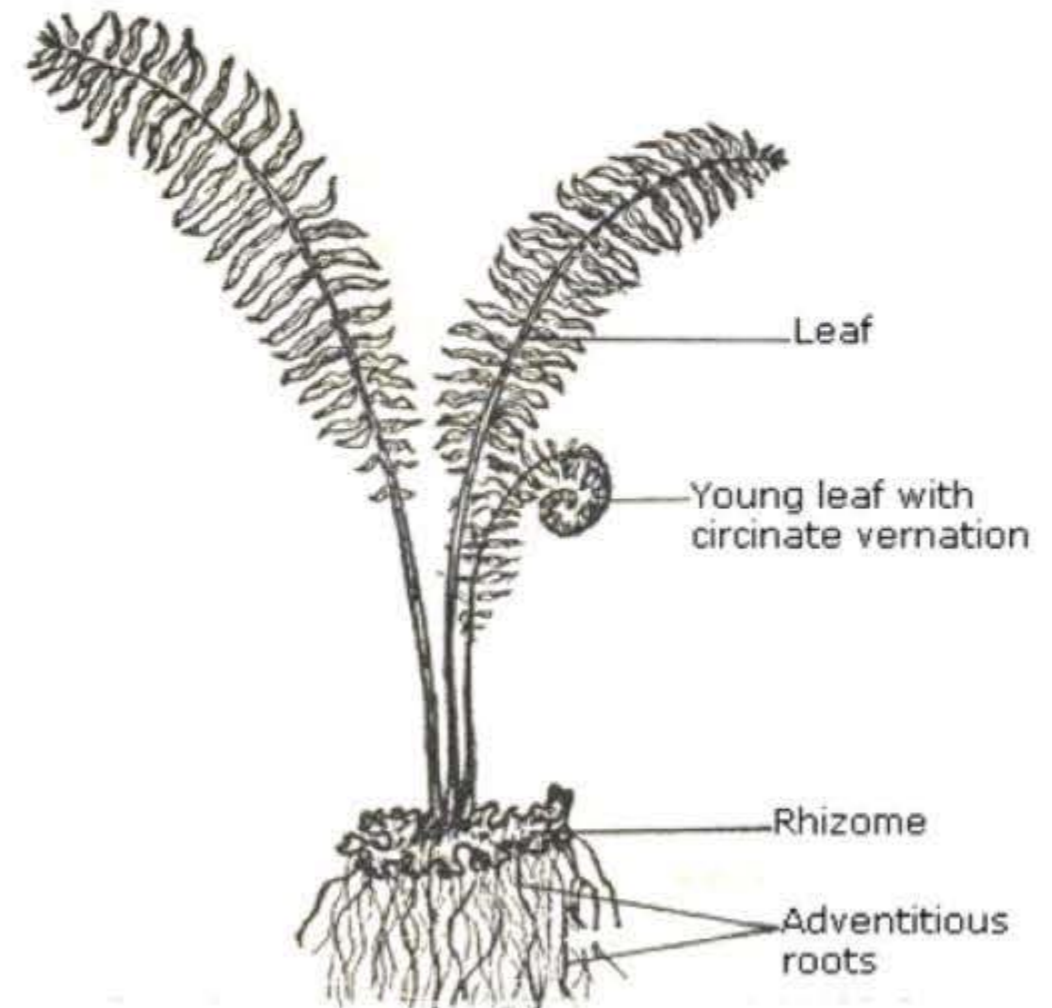
### Identification Features:

- The sporophyte of *Nephrolepis* is differentiated into roots, rhizome and leaves.
- The leaves are pinnately compound.
- The mature leaves bear sporangia and are called sporophylls.

# NEPHROLEPIS - Sporophyte

### Systematic position

Kingdom	-	Plantae
Division	-	Pteridophyta
Class	-	Filicopsida
Order	-	Filicales
Family	-	<i>Polypodiaceae</i>
Genus	-	<i>Nephrolepis</i>

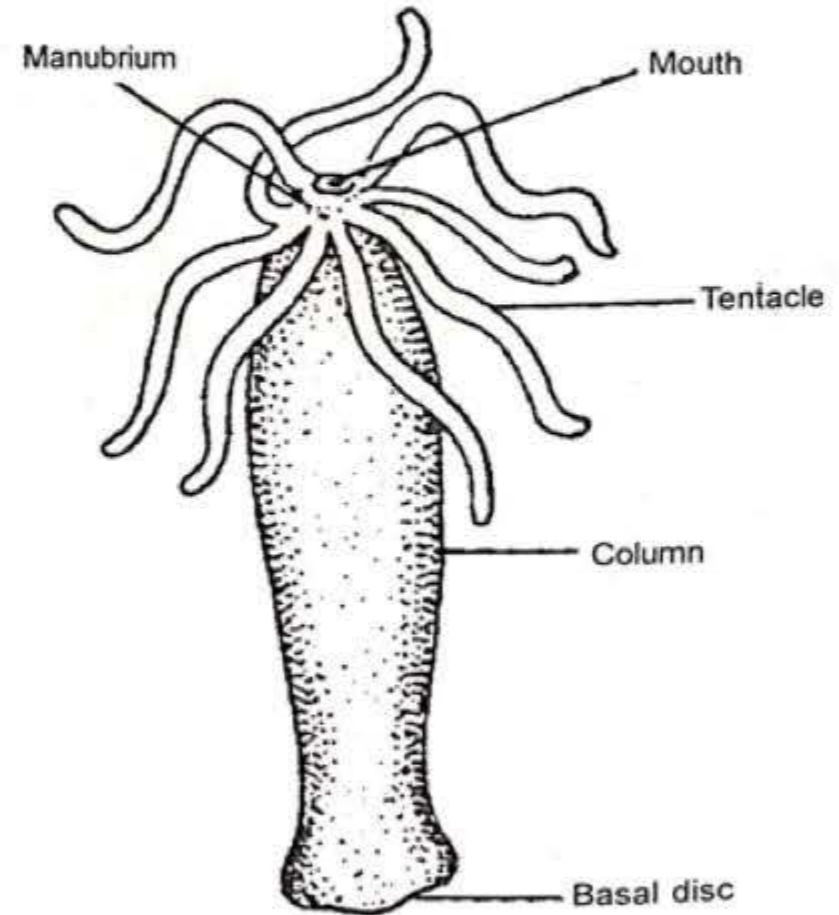


## COMMENTS:

- *Hydra* is a fresh water solitary coelenterate.
- The body is tubular and cylindrical and is divisible into basal disc, column and oral disc.
- Mouth leads into a gastrovascular cavity.
- Mouth is surrounded by 6-8 tentacles with stinging cells for defense.
- The body and tentacles are highly retractile.
- Reproduction is asexually by budding and sexually by the formation of gametes.

## 1. HYDRA

Phylum	-	Cnidaria
Class	-	Hydrozoa
Genus	-	<i>Hydra</i>
Species	-	<i>vulgaris</i>





## COMMENTS:

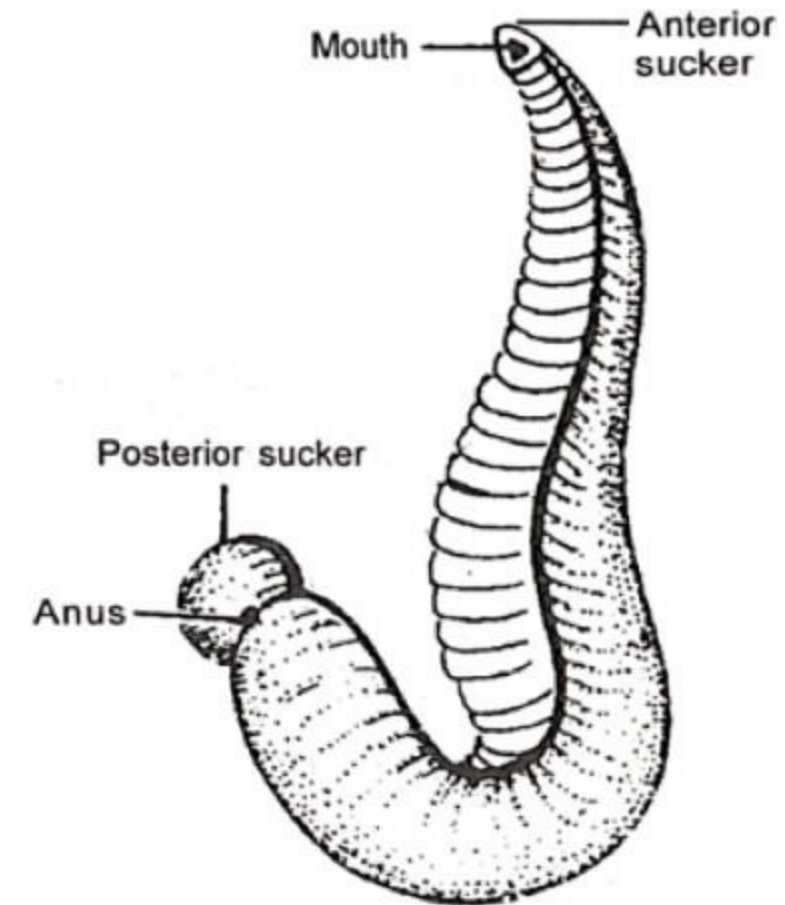
- It is commonly called Indian cattle leech.
- Body is metamerically segmented, dorsoventrally flattened and elongated.
- Mouth has toothed jaws.
- Presence of two suckers- anterior and posterior.
- The saliva contains an anticoagulant known as hirudin.
- The intestine of leech can store large amount of blood.

## PARASITIC ADAPTATIONS:

- Presence of suckers for attachment.
- Presence of toothed cutting plates in the mouth.
- Presence of an anticoagulant known as hirudin in the saliva to prevent blood coagulation while sucking.
- Well developed crop for storing blood..

## 5. LEECH

Phylum	-	Annelida
Class	-	Hirudinea
Genus	-	<i>Hirudinaria</i>
Species	-	<i>granulosa</i>



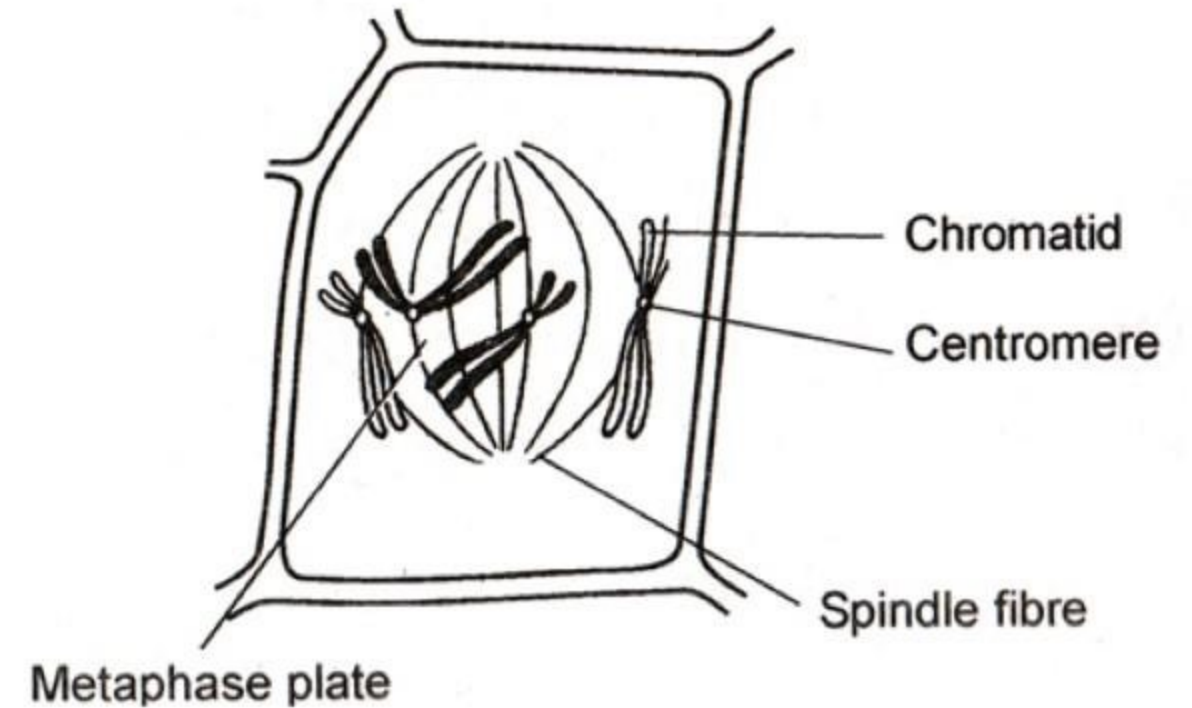
### Identification:

- The given stage is Metaphase of Mitosis.

### Reasons:

- Chromosomes are arranged at the equator of the cell.
- The spindle fibers are attached at the centromere of chromosome.
- The nuclear membrane and nucleolus absent.
- The arms of the chromosomes are directed towards the opposite poles.

## METAPHASE



## Identification:

- The given material is Nostoc.

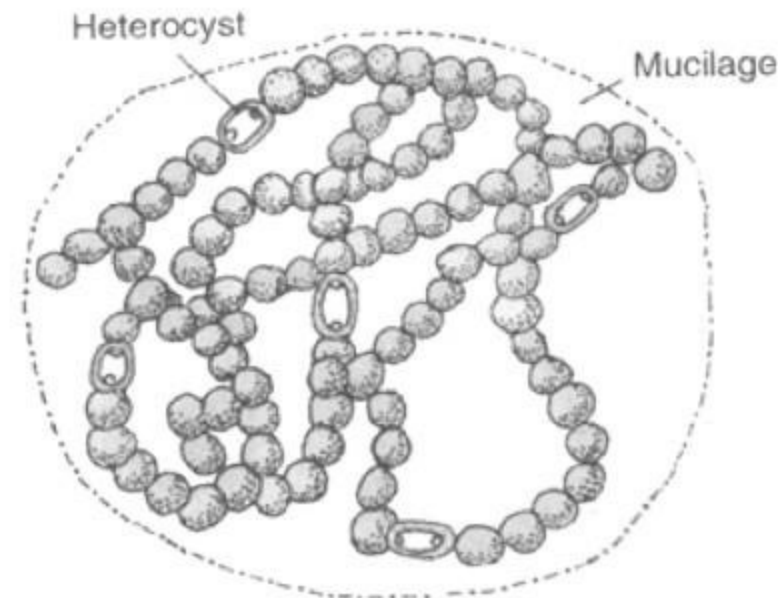
## Identification features:

- It is free living, fresh water, filamentous and colonial cyanobacterium.
- It is a prokaryotic Monera.
- Several filaments enclosed in a mucilaginous mass forming a colony
- Some cells are barrel shaped, large, and are called heterocysts and are special cells meant for nitrogen fixation.

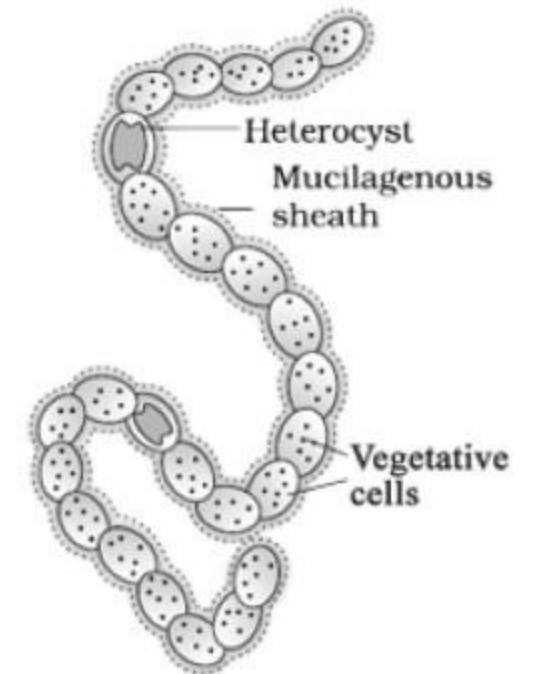
# NOSTOC

## Systematic position

Kingdom	-	Monera
Division	-	Cyanobacteria
Order	-	Nostocales
Family	-	Nostocaceae
Genus	-	Nostoc



A few filaments under low power microscope



A single filament

## Identification:

- The given material is filaments of *Oscillatoria*.

## Identification Features:

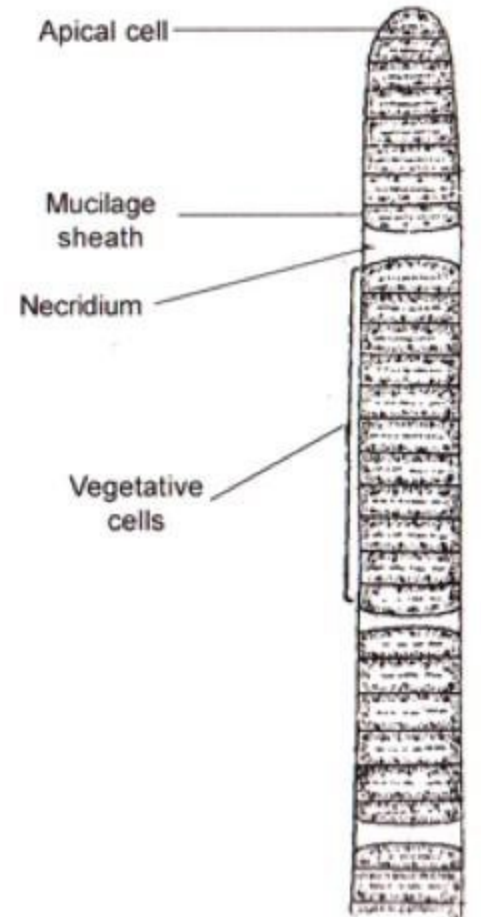
- *Oscillatoria* is a simple filamentous prokaryotic Monera.
- It occurs in fresh water ponds, pools, ditches and on the banks of streams.
- The filament is long and unbranched.
- Some cells are dead, biconcave, mucilaginous discs called necridia.
- Filaments show oscillating movement.

# OSCILLATORIA

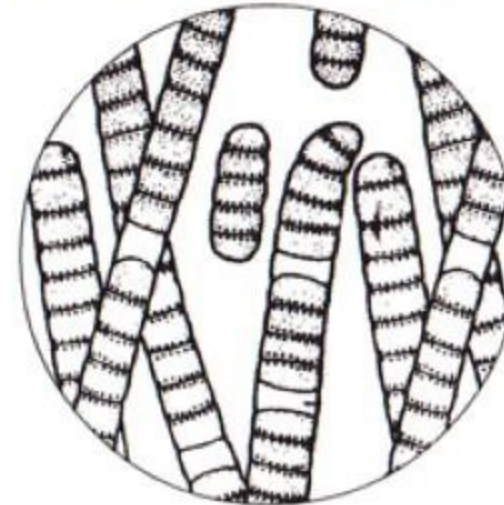
## Taxonomic Position

Kingdom	: Monera
Division	: Cyanobacteria
Order	: Oscillatoriales
Family	: Oscillatoriaceae
Genus	: <i>Oscillatoria</i>

## A single filament enlarged



## A few filaments under low power



### Identification:

- The given material is the female cone of Pinus.

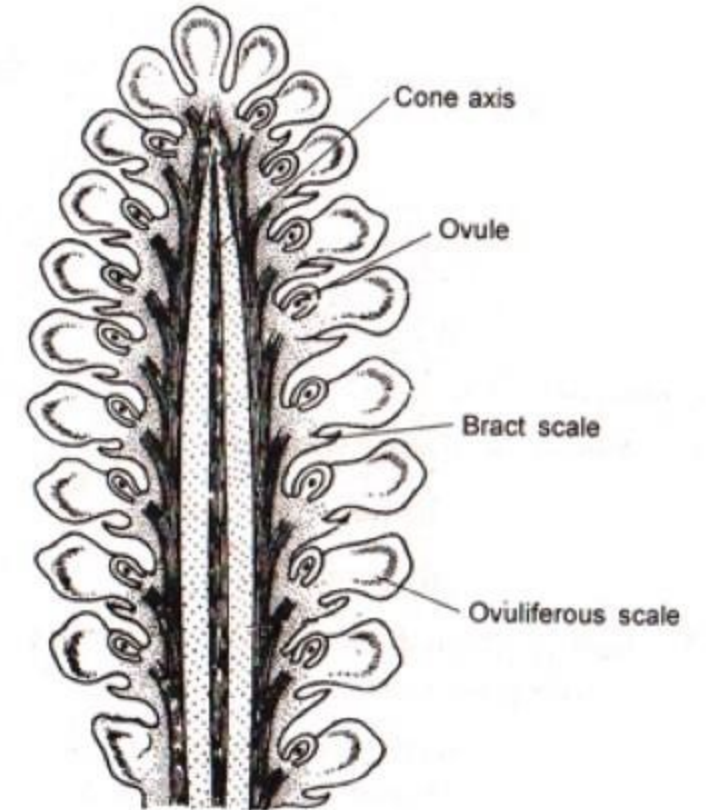
### Identification Features:

- It consists of an axis and megasporophylls are arranged spirally on it.
- Each megasporophyll has two ovules.
- Each ovule contains a megasporangium.

## PINUS - Female Cone



Single Female cone



L.S. of Female cone

### Identification:

- The given material is the male cone of *Pinus*.

### Identification Features:

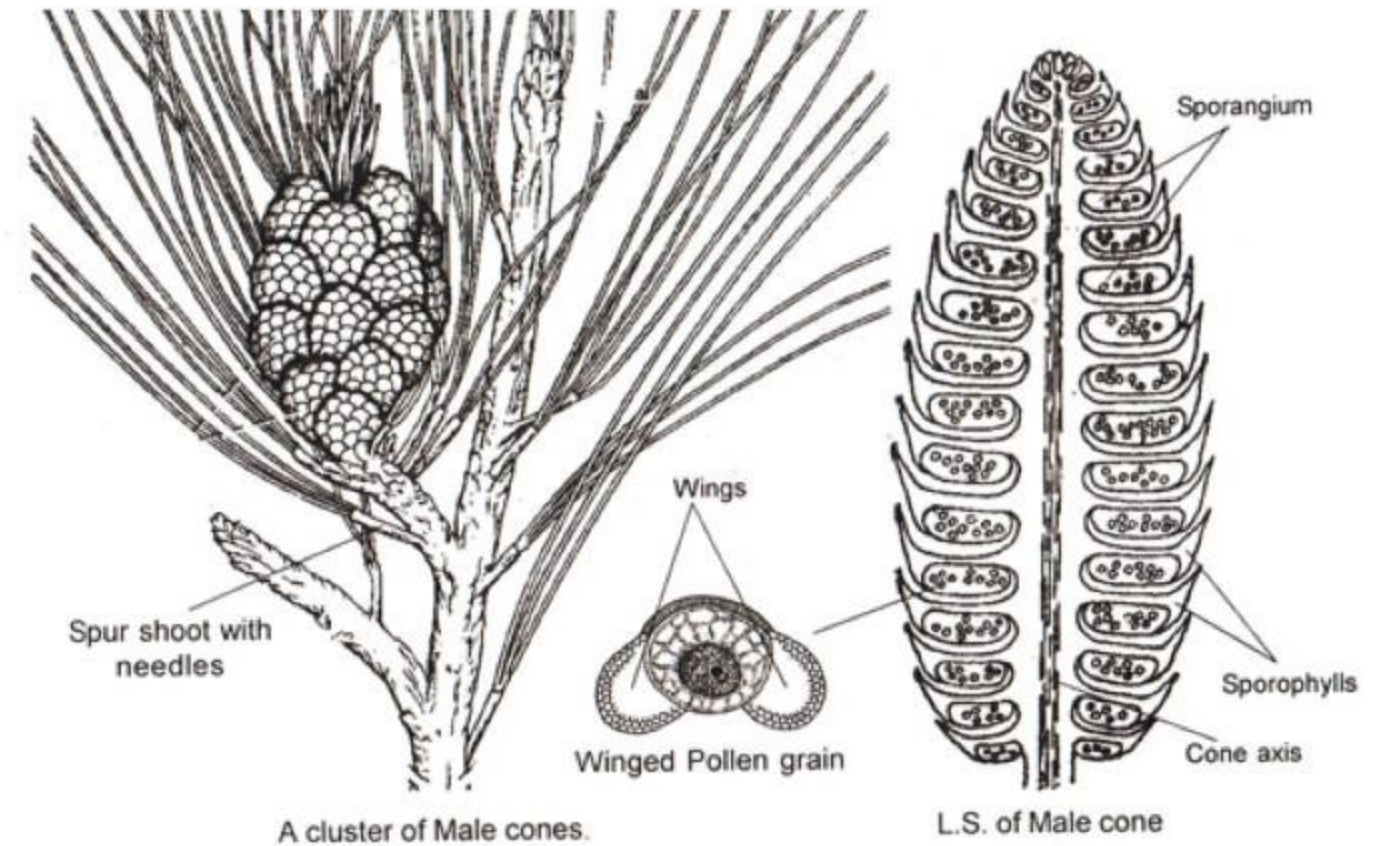
- It consists of an axis, and microsporophylls are arranged spirally on it.
- Each microsporophyll bears two small microsporangia on the lower side.

**Each microsporgium contains microspores**

# PINUS - Male Cone

### Systematic position

Kingdom	-	Plantae
Division	-	Gymnospermae
Class	-	Coniferopsidae
Order	-	Coniferales
Family	-	Pinaceae
Genus	-	<i>Pinus</i>



## COMMENTS:

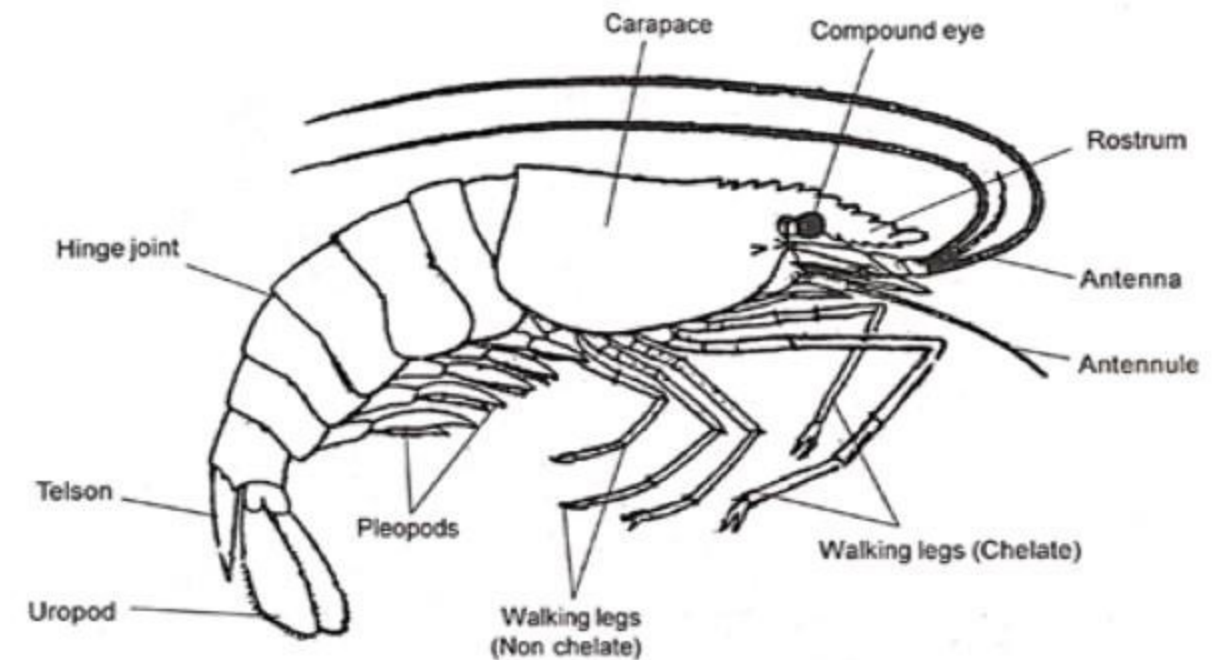
- Body is divisible into cephalothorax (13 segments) and abdomen (6 segments).
- There are 19 pairs of appendages: 5 pairs of cephalic, 8 pairs of thoracic and 6 pairs of abdominal.
- The abdominal legs are meant for swimming, hence called swimmeretes or pleopods. The last abdominal legs are called uropod.
- In the male prawn, the endopodites of first abdominal legs are membranous and hooked and form a structure known as petasma by which the male deposits the sperms into the body of female. In the female a cup like structure known as thelycuin is in the last thoracic segment. It receives the sperms during copulation.

## ECONOMIC IMPORTANCE:

- It is used as food.
- It is exported in dried, canned and frozen forms.
- Prawn culture provides employment opportunities.

## 8. PRAWN

Phylum	-	Arthropoda
Class	-	Crustacea
Genus	-	<i>Penaeus</i>
Species	-	<i>indicus</i>



## Observation Table

Procedure (Sulphosalicylic acid test)		Observation	Inference
Sample A	Take 2 ml of given sample in a test tube and add 2 drops of Sulphosalicylic acid.	Cloudy ppt	Presence of protein (albumin).
Sample B		No colour change	No protein.

Procedure (Biuret test)		Observation	Inference
Sample A	Take 1 ml of given sample in a test tube and add biuret reagent (1 ml of 5% NaOH + 1% CuSO <sub>4</sub> ). Mix well.	Violet or bluish pink colour	Presence of protein (albumin).
Sample B		No colour change	No protein.

## 3. TEST FOR PROTEIN/ PRESENCE OF ALBUMIN IN URINE

- **Aim:** To detect the presence of protein/albumin in the given sample solution.
- **Materials required:** Sample solution, Test tubes, Sulphosalicylic acid, Biuret reagent.
- **Procedure:**  
**Sulphosalicylic acid Test:** Take 2 ml of sample A and B in 2 test tubes and add 2 drops of Sulphosalicylic acid.  
**Biuret reagent:** Take 1 ml of given sample in a test tube and add biuret reagent (1 ml of 5% NaOH + 1% CuSO<sub>4</sub>). Mix well.

**Result:** The sample A contains protein/ The sample A is the urine containing albumin.



## Observation Table

Procedure (Benedict's test)		Observation	Inference
Sample A	Take 2 ml of given sample in a test tube and add equal amount of Benedict's reagent. Boil for 2 minutes.	Solution turns greenish to brick red ppt	Presence of glucose
Sample B		No colour change	No glucose

Procedure (Fehling's test)		Observation	Inference
Sample A	Take equal amount of Fehling's A & B solutions in a test tube and add 2 ml of given solution. Heat to boil.	Solution turns orange to brick red ppt	Presence of glucose
Sample B		No colour change	No glucose

## 2. TEST FOR GLUCOSE/ PRESENCE OF SUGAR IN URINE

- **Aim:** To detect the presence of glucose in the given sample solution or urine sample.
- **Materials required:** Sample solution, Test tubes, Benedict's reagent, Spirit lamp, Fehling's solution A and B, Test tube holder.

- **Procedure:**

**Benedict's Test:** Take 2 ml of sample A and B in 2 test tubes and add equal amount of Benedict's reagent. Boil for 2 minutes.

**Fehling's Test:** Take equal amount of Fehling's A & B solutions in 2 test tubes. Add 2 ml of sample A and B solution. Into both test tubes. Heat to boil.

**Result:** The sample A contains glucose/ The sample A is the urine of diabetic patient.

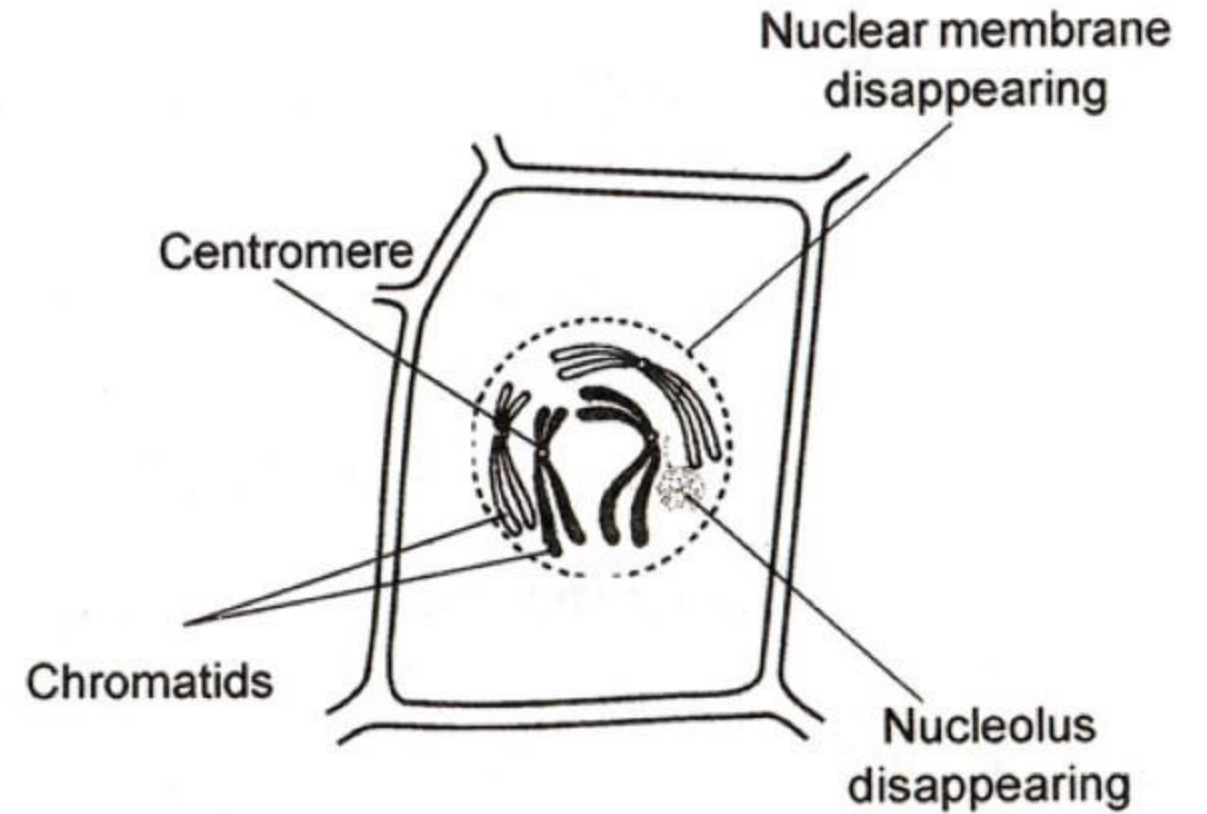
### Identification:

- The given stage is Prophase of Mitosis

### Reasons:

- Chromosomes are thickened and distinct.
- Spindle fibers start to originate.
- Nuclear membrane and nucleolus starts disappear.

## PROPHASE



## Identification:

- The given material is *Rhizopus* with sporangia.

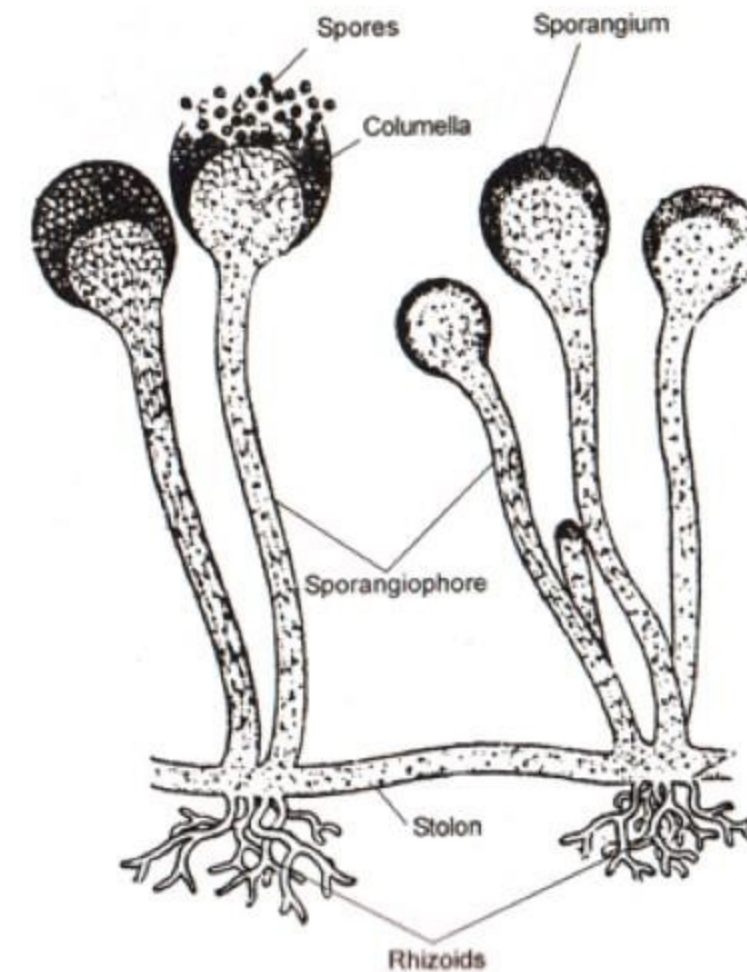
## Identification Features:

- The fungal hyphae is highly branched, colourless and coenocytic (aseptate).
- Hyphae is differentiated into rhizoids, stolons and sporangiophores.
- A sporangiophore consists of a sporangium
- A number of spores are produced inside the sporangium.

# RHIZOPUS

## Systematic position

Kingdom	-	Fungi
Division	-	Eumycota
Class	-	Zygomycetes
Order	-	Mucorales
Family	-	Mucoraceae
Genus	-	<i>Rhizopus</i>



## IDENTIFYING CHARACTERS:

- Triploblastic, coelomate, and bilaterally symmetrical.
- Presence of terminal mouth.
- Presence of cycloid scales.
- Presence of post anal tail.
- Dorsal nerve cord.

## ECONOMIC IMPORTANCE:

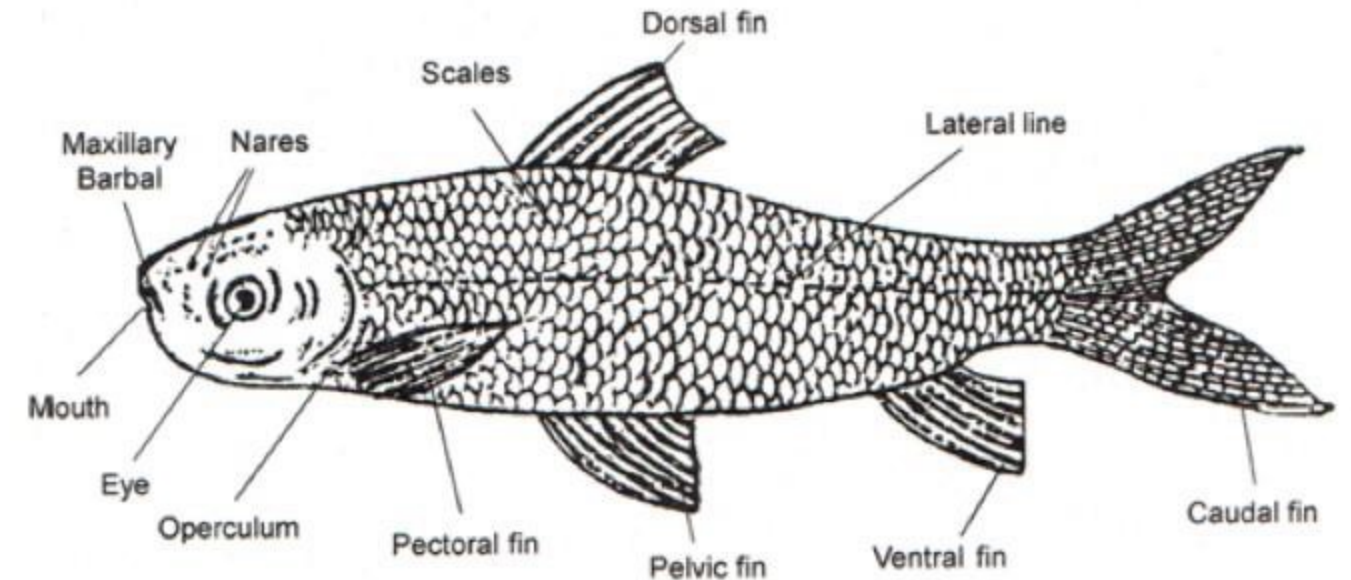
- Used as food.

## ADAPTATIONS:

- Presence of fins for locomotion.
- Presence of lateral line sense organs.
- Presence of operculum.

## 1. ROHU

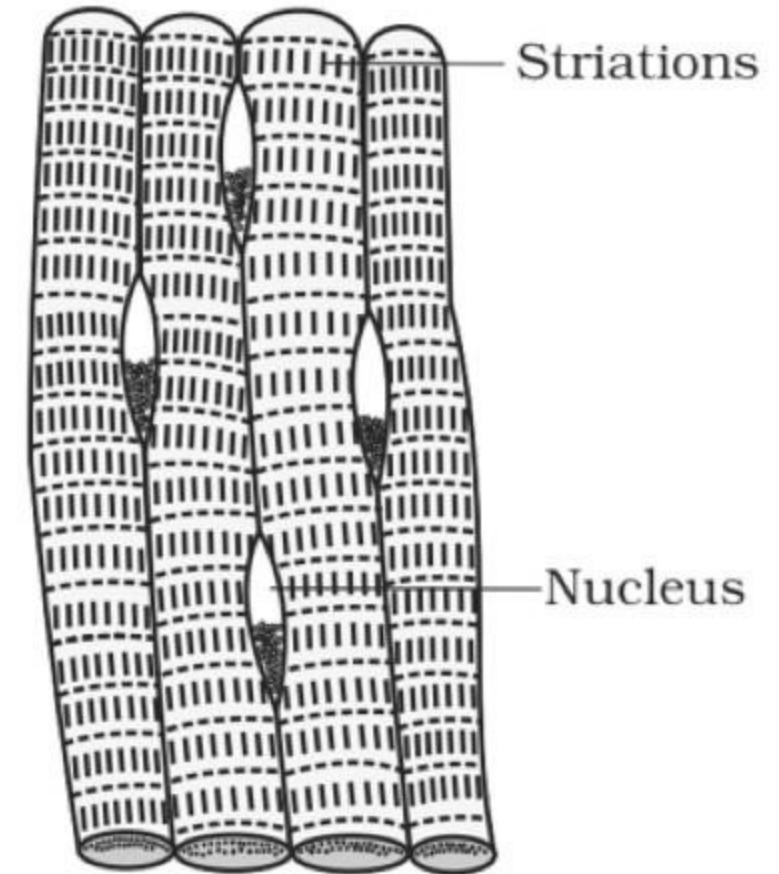
Phylum	-	Chordata
Class	-	Osteichthyes
Genus	-	Labeo
Species	-	rohita



## FEATURES OF STRIATED MUSCLE

- Muscle fibres are cylindrical and unbranched.
- Striations are present.
- Found attached to skeleton.
- Voluntary in action.
- Multinucleate.
- Fatigue muscle.
- Abundant mitochondria and myoglobin.

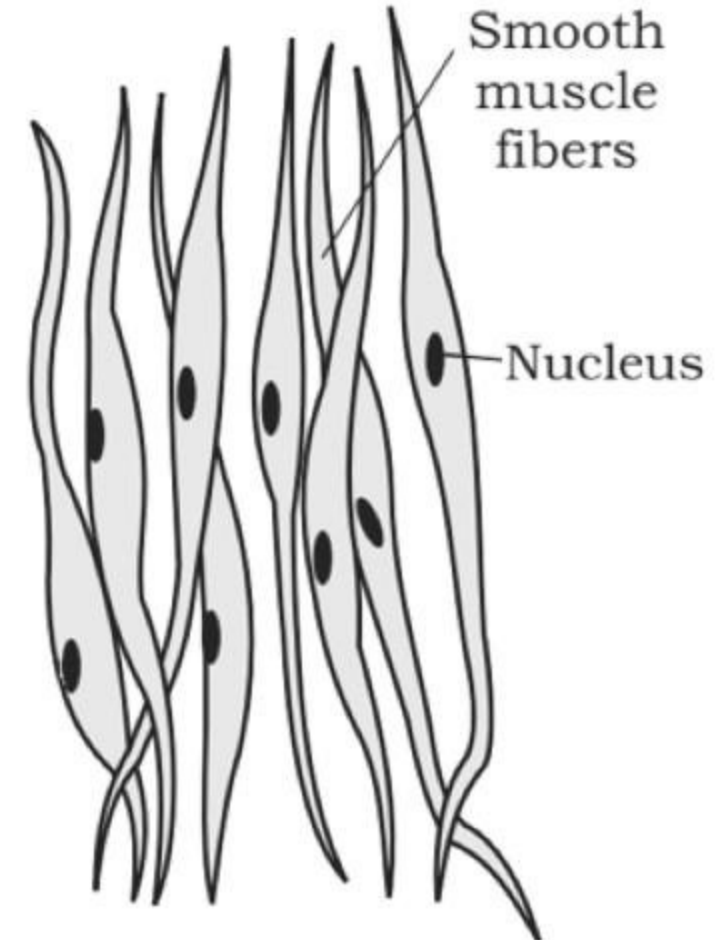
## 1. STRIATED MUSCLE



## FEATURES OF NON-STRIATED MUSCLE

- *Spindle shaped and unbranched fibres.*
- *Striations are absent.*
- *Found in visceral organs such as stomach, intestine, blood vessels etc.*
- *Involuntary in action.*
- *Uninucleate.*
- *Lesser amount of mitochondria and myoglobin.*
- *Non-fatigue muscles.*

## 2. SMOOTH MUSCLE



### Identification:

- The given material is *Spirogyra* filament.

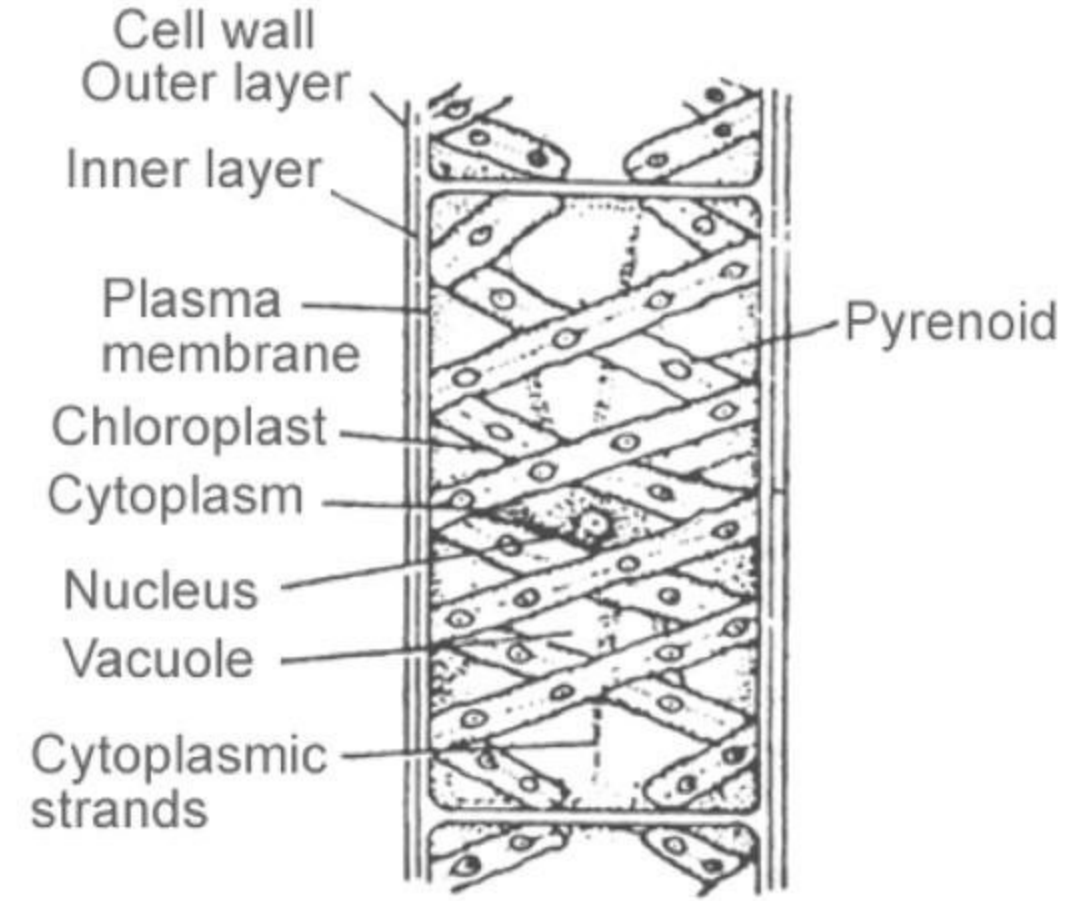
### Identification Features:

- *Spirogyra* is a filamentous fresh water green algae.
- Each cell consists of a ribbon shaped spirally arranged chloroplast.
- The filament is unbranched.
- Nucleus and pyrenoids are also present in the cell.

## SPIROGYRA - Vegetative Filament

### Systematic position

Kingdom	-	Plantae
Division	-	Chlorophyta
Class	-	Chlorophyceae
Order	-	Conjugales
Family	-	Zygnemaceae
Genus	-	<i>Spirogyra</i>

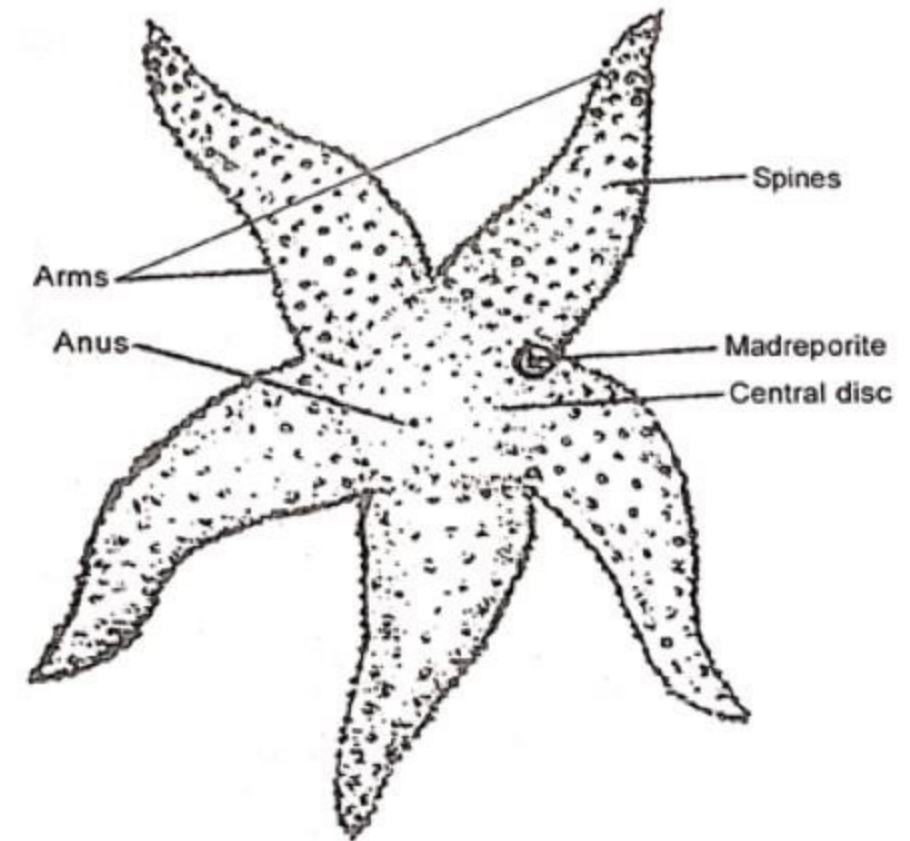


## COMMENTS:

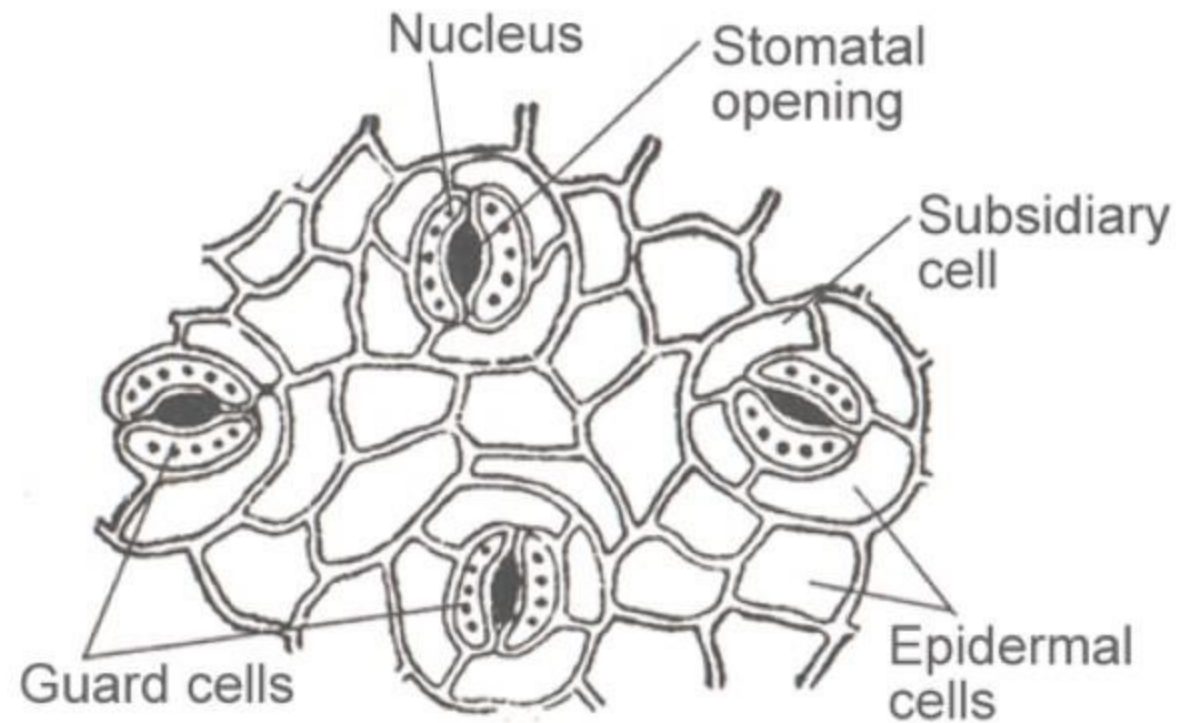
- It is a marine animal.
- Body is star shaped with a central disc and five arms.
- The oral surface bears mouth and aboral surface bears anus.
- Presence of water vascular system.
- Locomotion takes place by tube feet.
- Shows a high power of regeneration

## 10. STARFISH

Phylum	-	Echinodermata
Class	-	Asterozoa
Genus	-	<i>Asterias</i>







## STUDY OF DISTRIBUTION OF STOMATA

Aim: To study the distribution of stomata on upper and lower surfaces of leaves.

Materials required: Fresh dicot leaf, forceps, needle, blade, brush, watch glass, stain, petri dish, slides, microscope etc.

Procedure: Remove upper and lower epidermal peels of a dicot plant (e.g. Hibiscus) into separate watch glass containing water. Take a square piece of each peel and stain them. Each peel is mounted on separate slides and observe under microscope. Count the number of stomata in upper and lower epidermis.

Observation: In dicot leaf, the number of stomata present in upper epidermis is less than the number on the lower epidermis.

Inference: In dicot plant, usually the number of stomata in lower side of the leaf is more than that in the upper side.

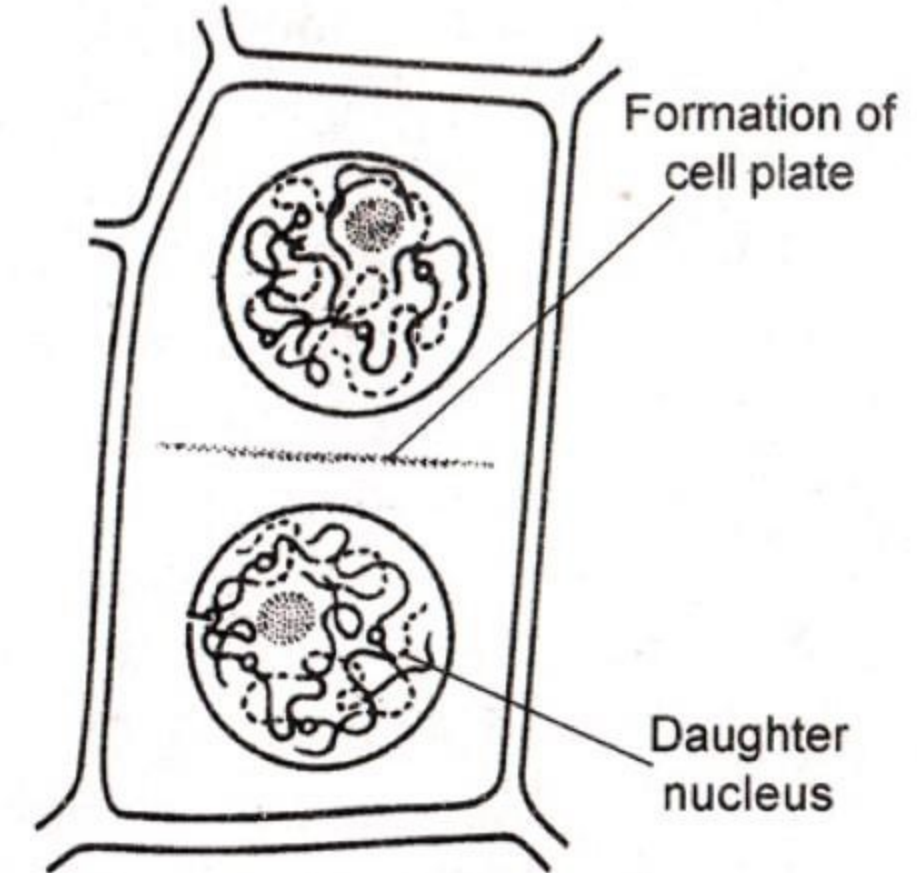
### Identification:

- The given stage is Telophase of Mitosis

### Reasons:

- The two sets of chromosomes reach at opposite poles of the cell.
- The chromosomes are grouped and forms into two daughter nuclei.
- Nucleus and nuclear membrane reappear

## TELOPHASE



## Identification:

- The given material is Yeast (*Saccharomyces cerevisiae*).

## Identification Features:

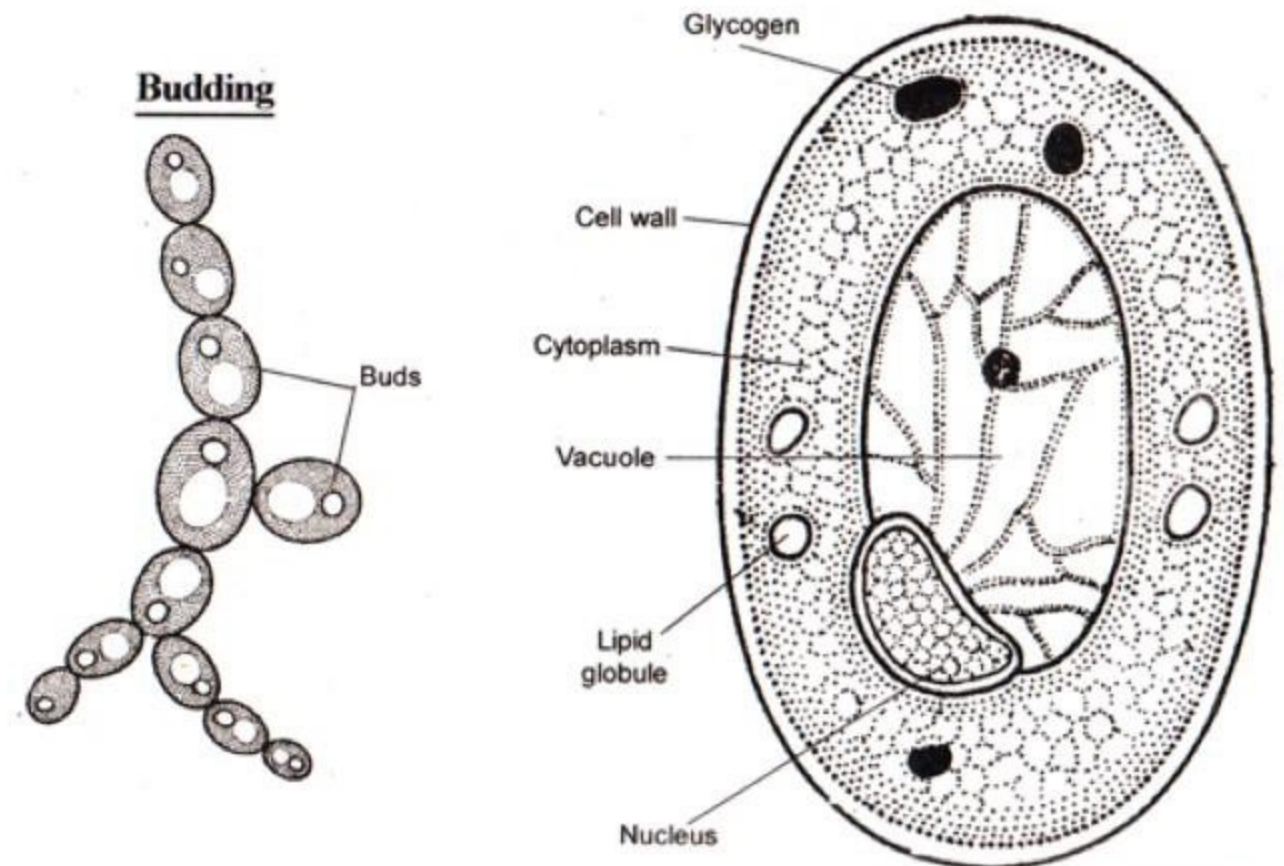
- It is a unicellular fungus.
- Fungal body is ovoid or spherical in shape.
- Asexual reproduction is by budding.

# YEAST

## Systematic position

Kingdom	-	Fungi
Division	-	Eumycota
Class	-	Hemiascomycetes
Order	-	Endomycetales
Family	-	Saccharomycetaceae
Genus	-	<i>Saccharomyces</i>

## Single cell enlarged



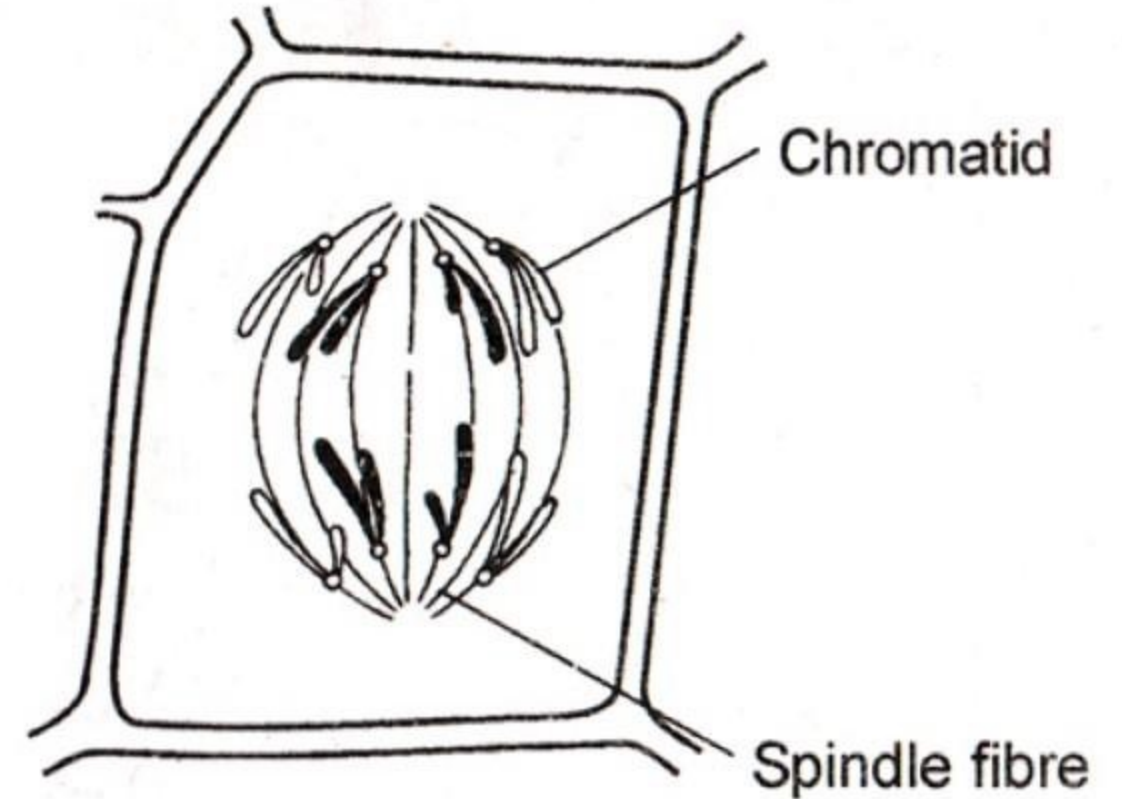
### Identification:

- The given stage is Anaphase of Mitosis

### Reasons:

- The chromatids separate.
- Chromosomes move to opposite poles of the cell.
- The arms of the chromosomes are directed towards the equator of the cell.

## ANAPHASE

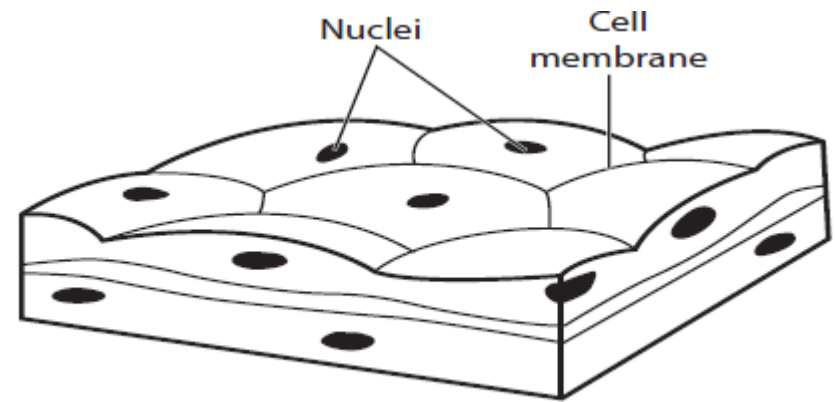


# SQUAMOUS EPITHELIUM

The given slide/picture is identified as **squamous epithelium**.

## Notes:

- Squamous epithelium is a type of simple epithelium
- It is made of a single thin layer of flattened cells with irregular boundaries.
- Found in cheek, kidney glomeruli, air sacs of lungs, lining of heart and blood vessels.
- It is involved in diffusion and filtration.



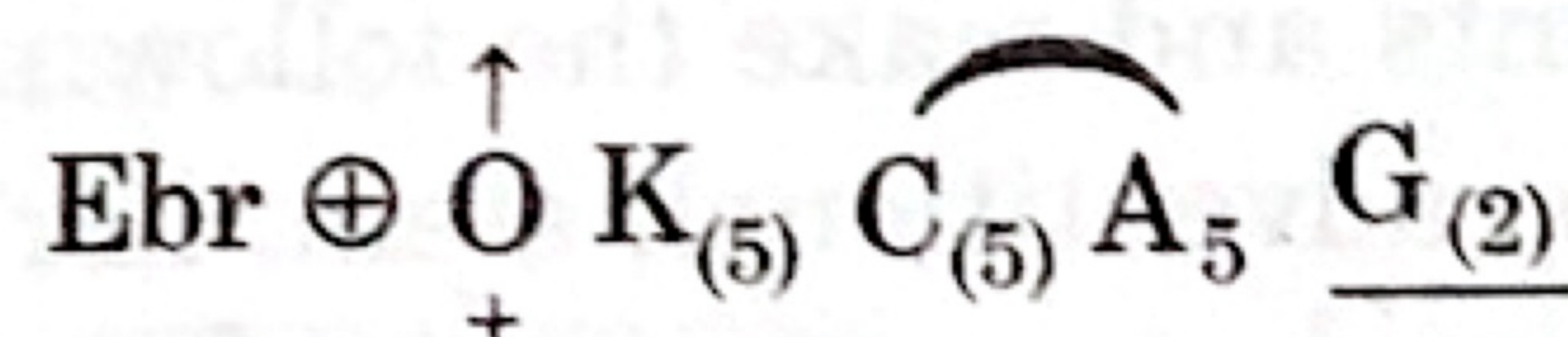
# TYPE 1. PETUNIA ALBA—PETUNIA

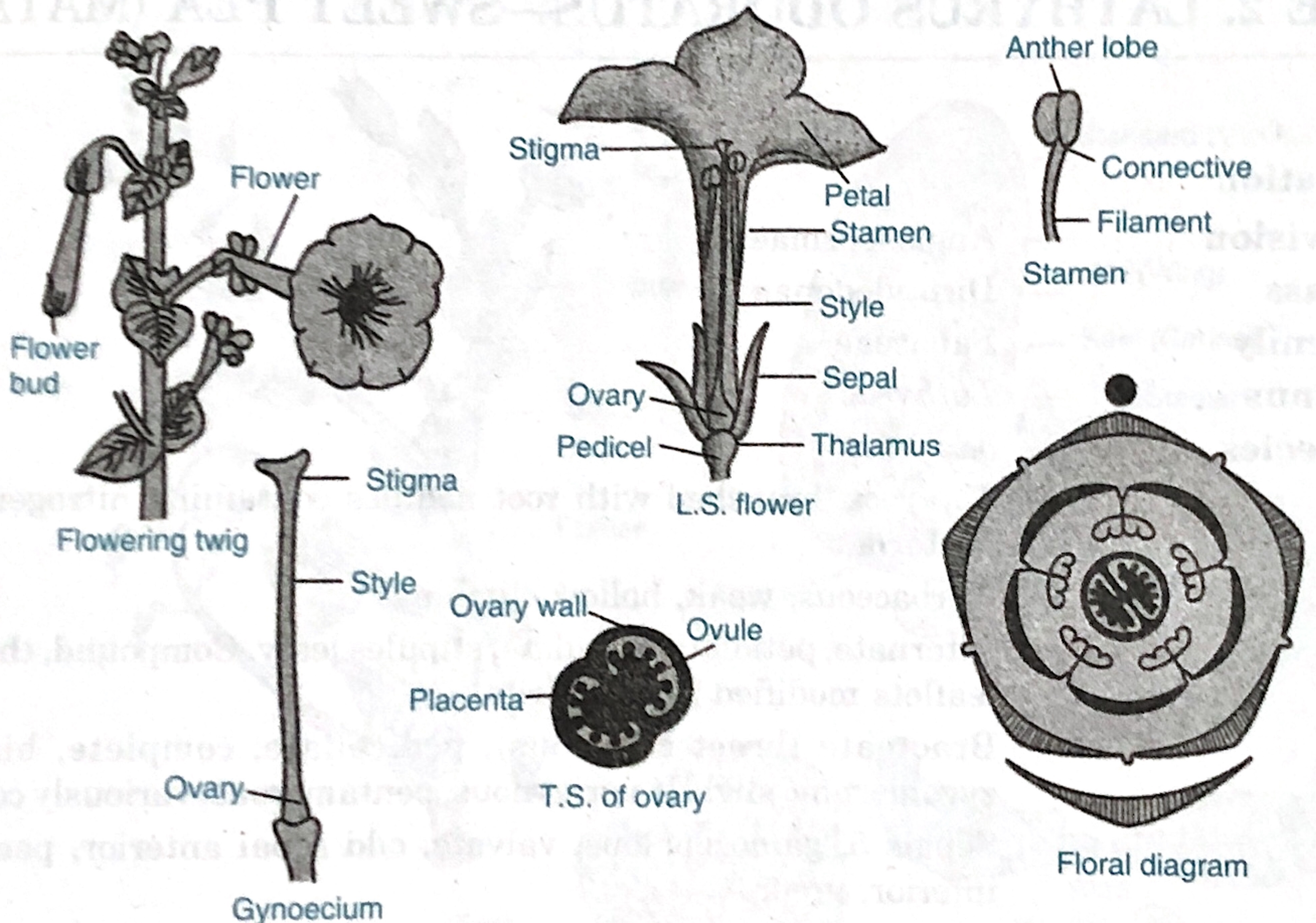
## Classification

Division	— Angiospermae
Class	— Dicotyledonae
Family	— Solanaceae
Genus	— <i>Petunia</i>
Species	— <i>alba</i>

Root	— Tap root, branched
Stem	— Herbaceous, erect, hairy
Leaf	— Alternate, opposite in the floral region, petiolate, simple, ovate, hairy.
Inflorescence	— Solitary, axillary.
Flower	— Ebracteate, pedicellate, complete, bisexual, actinomorphic, pentamerous, hypogynous.
Calyx	— Sepals 5, gamosepalous, valvate aestivation, persistent, inferior, green, hairy.
Corolla	— Petals 5, gamopetalous, infundibuliform, valvate aestivation, white or purplish in colour.
Androecium	— Stamens 5, alternipetalous, epipetalous, anther bithecous, basifixed.
Gynoecium	— Bicarpellary, syncarpous, ovary superior, obliquely placed, bilocular with axile placentation, swollen placenta, style long, stigma bifid.

## Floral Formula





A flowering twig, parts of flower and floral diagram