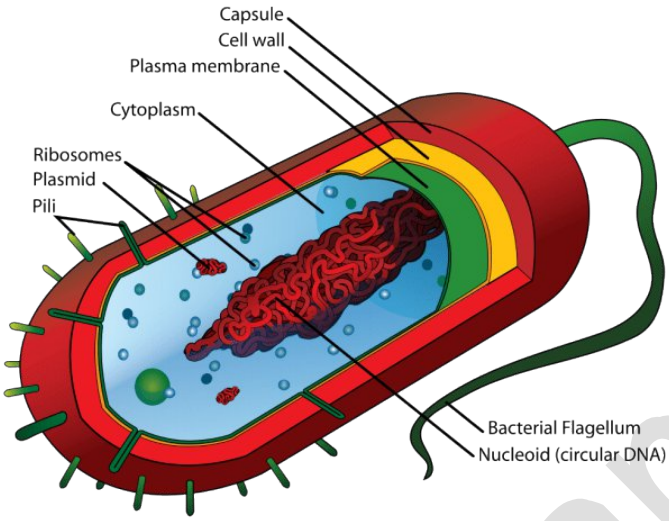
Question 2

Identify specimen/model and write characteristics features:

1. Bacteria

- Prokaryotic cells (lack a nucleus and membrane-bound organelles).

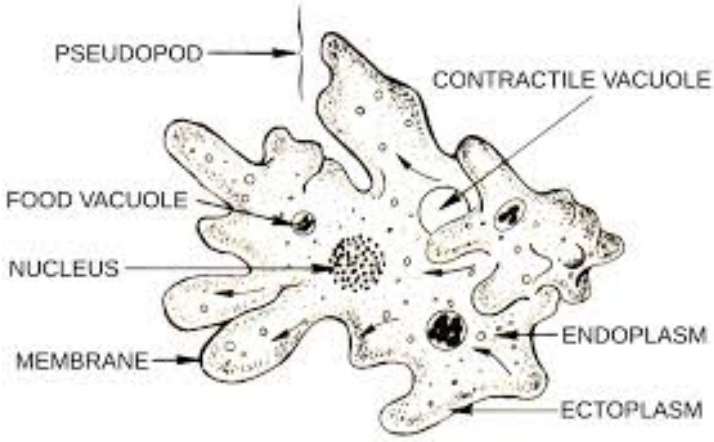
- Reproduce asexually through binary fission.



2. Amoeba

- Moves using pseudopodia

- Engulfs food via phagocytosis (forms food vacuoles).

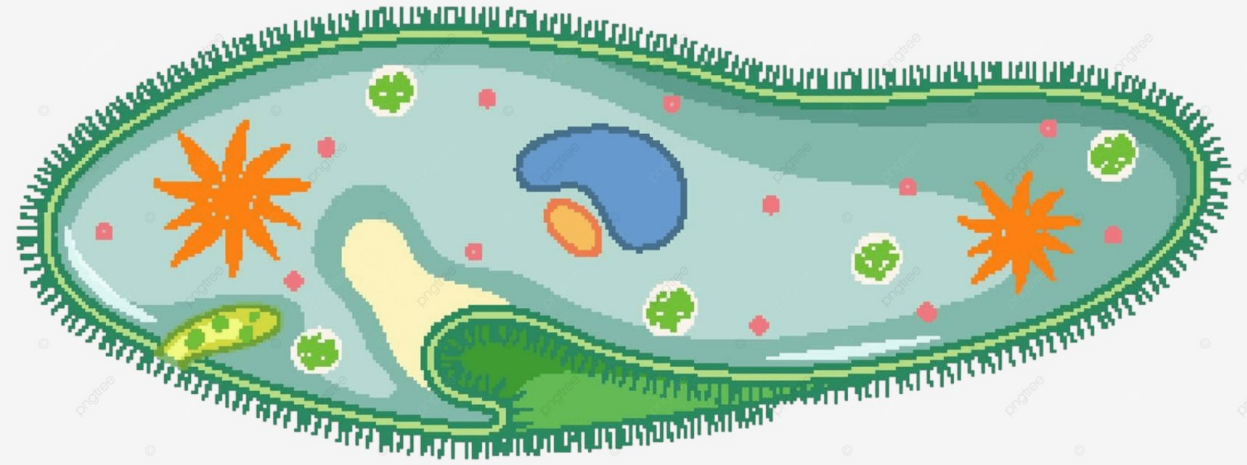


3. Paramecium

Slipper shaped

- Moves using cilia (hair-like structures for locomotion).

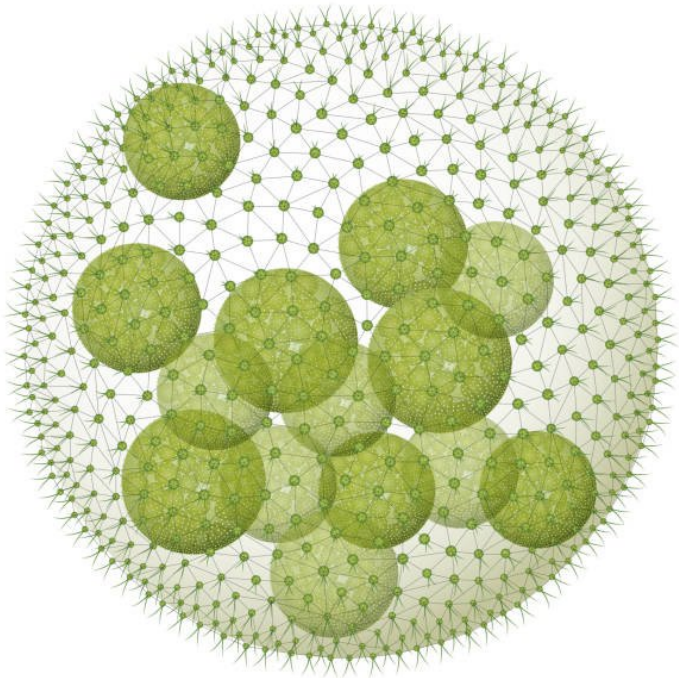
- Has two nuclei: a macronucleus (controls metabolism) and a micronucleus (involved in reproduction).



4. Volvox

- Colonial green algae (forms spherical colonies of cells).

- Exhibits division of labor (some cells are specialized for reproduction).

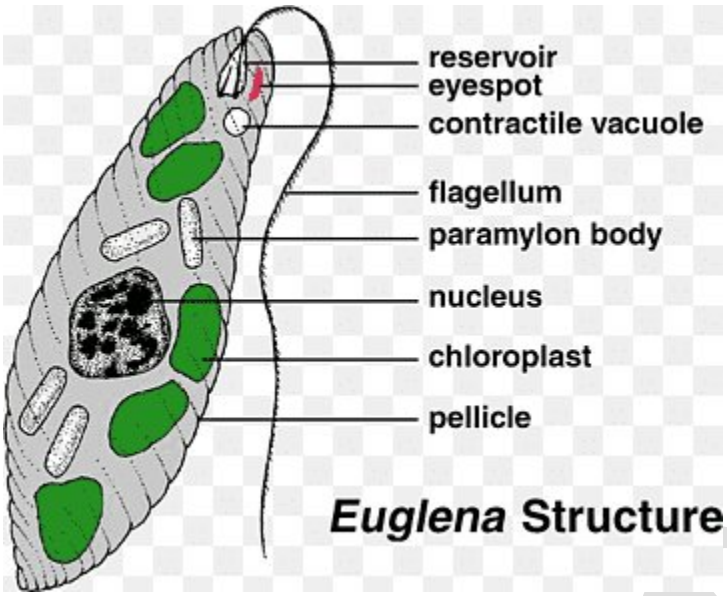


Euglena:

Pear shaped

Eye spot is present

Chloroplast is present

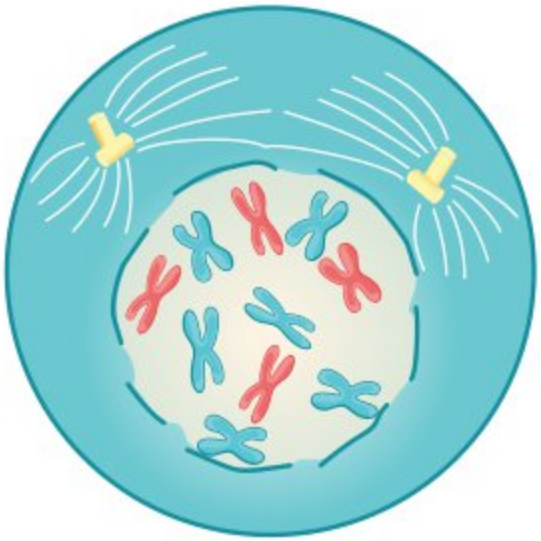


Stages of mitosis

1. Prophase

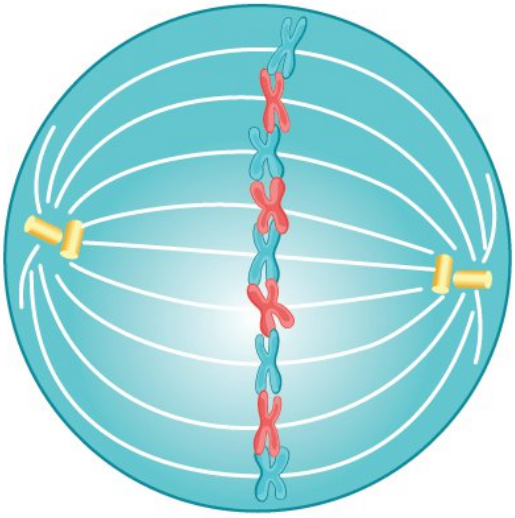
- Chromatin condenses into visible chromosomes (each consists of two sister chromatids).

- Nuclear envelope breaks down, and spindle fibers begin to form.



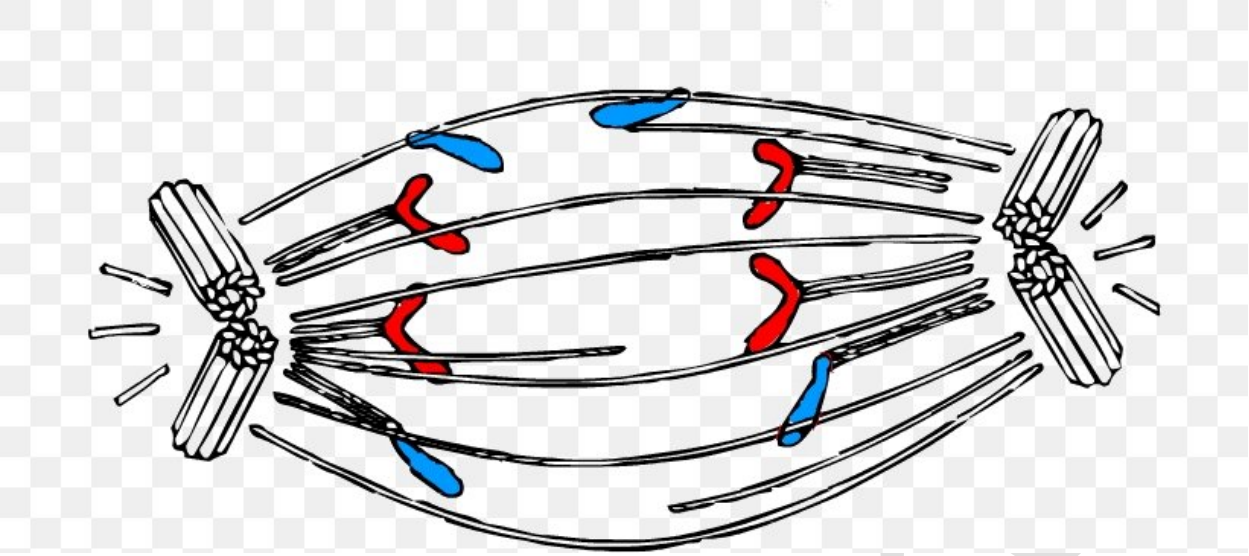
2. Metaphase

- Presence of metaphase plate (center of the cell).
- Spindle fibers attach to kinetochores of each chromosome.



3. Anaphase

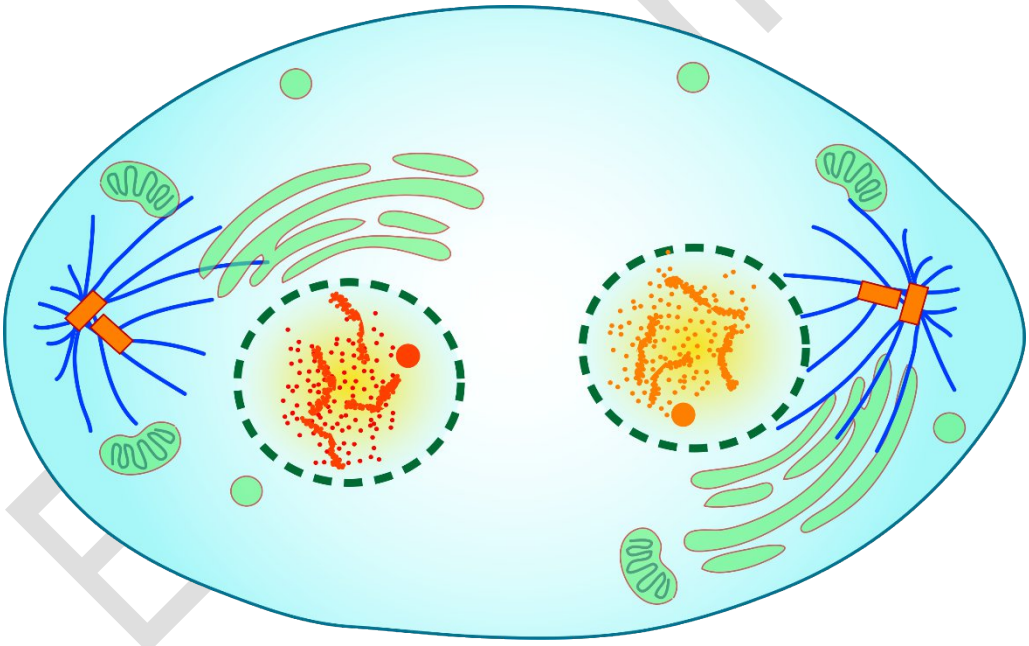
- Sister chromatids separate and move toward opposite poles.
- Spindle fibers shorten, pulling chromatids apart.



4. Telophase

- Chromosomes decondense back into chromatin.

- Nuclear envelopes reform around the two new nuclei.



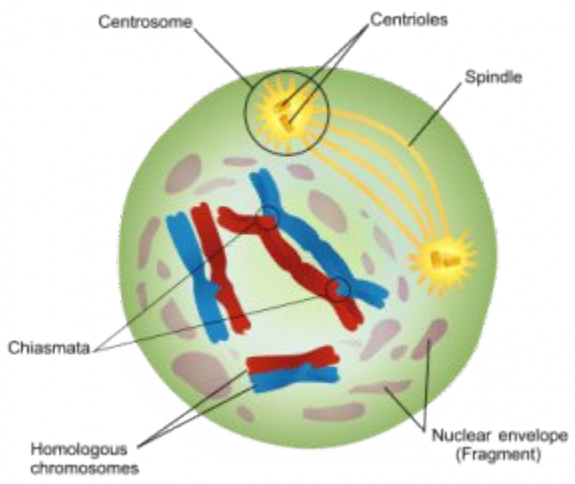
MEIOSIS I (Reduction Division – Diploid → Haploid)

1. Prophase I

- Homologous chromosomes pair up (synapsis) and form tetrads,

Crossing over

- Chiasmata become visible

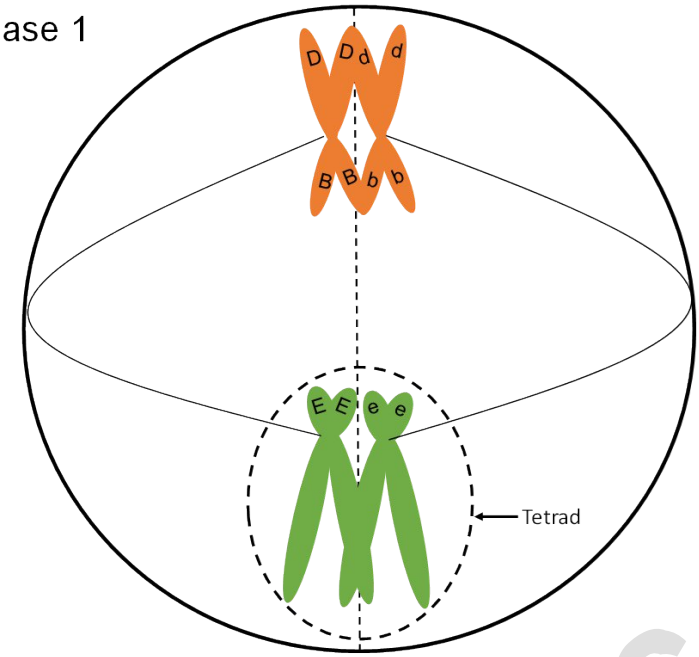


2. Metaphase I

- Homologous pairs (tetrads) align at the metaphase plate (random orientation → independent assortment).

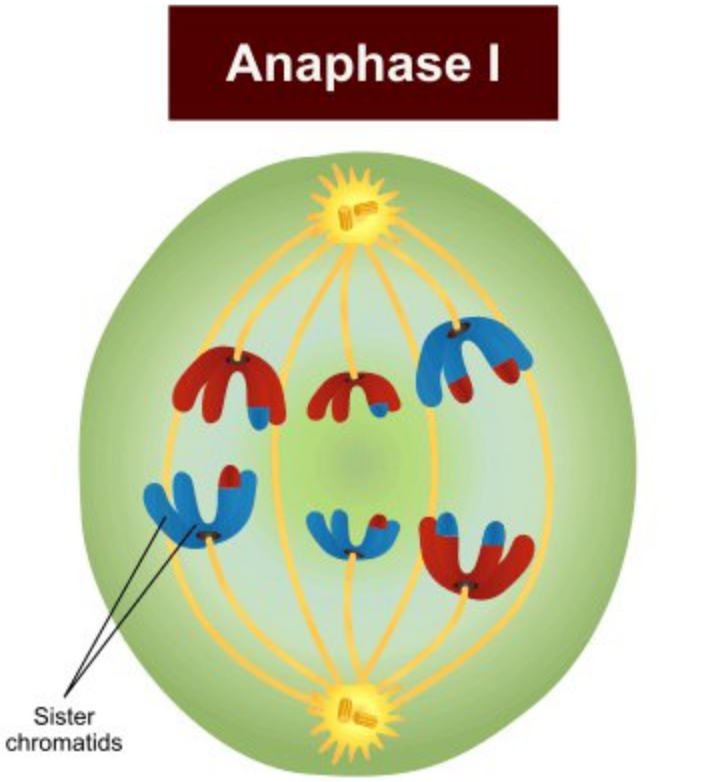
- Spindle fibers attach to kinetochores (one from each pole per homologous pair).

Metaphase 1



3. Anaphase I

- Homologous chromosomes separate (sister chromatids remain attached).
- Reduction in chromosome number (diploid → haploid).



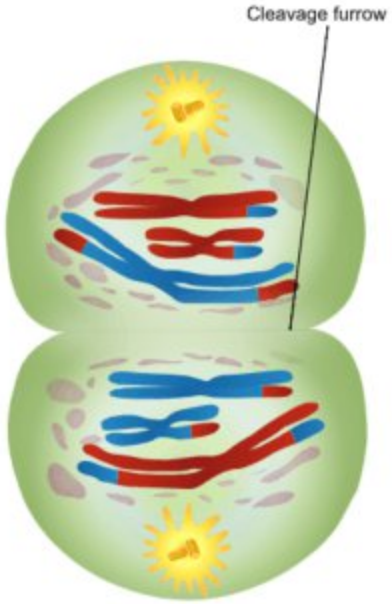
Homologous chromosomes move to the opposite poles of the cell.

4. Telophase I & Cytokinesis

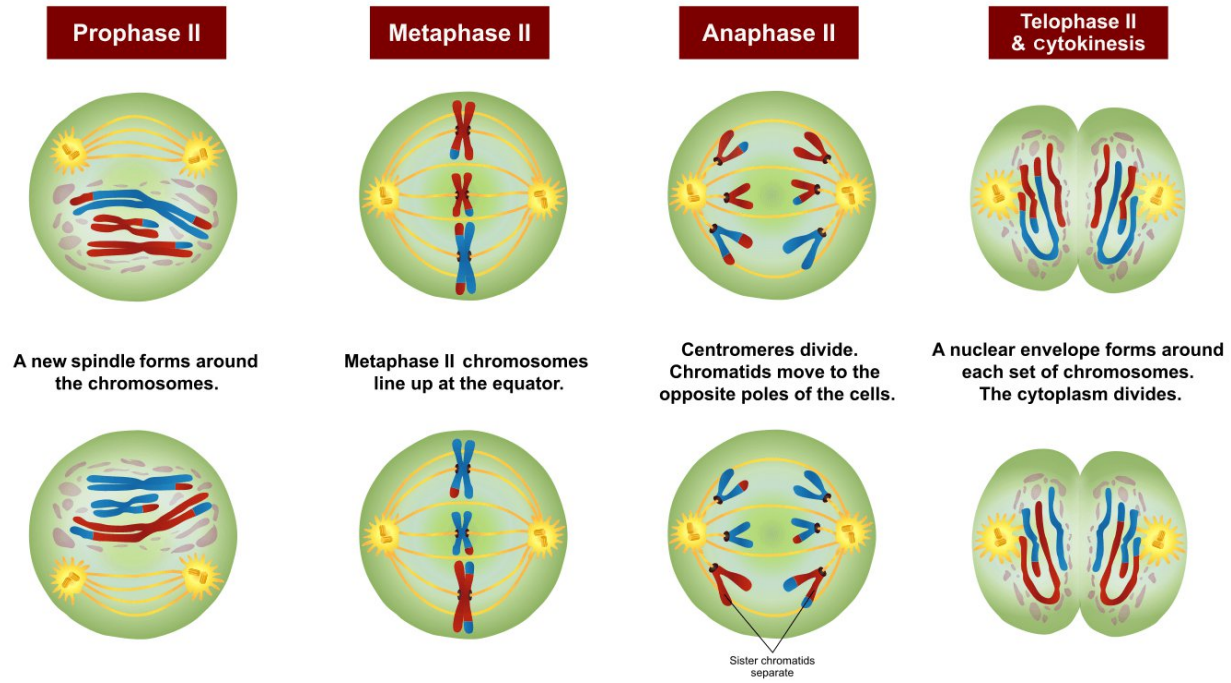
- Two haploid cells form, each with duplicated chromosomes (sister chromatids still connected).

- Nuclear envelopes may briefly reform before Meiosis II.

Telophase I & cytokinesis



Chromosomes gather at the poles of the cells. The cytoplasm divides.



1. Prophase II

- Chromosomes recondense (no DNA replication occurs).
- Spindle fibers reform in each haploid cell.

2. Metaphase II

- Chromosomes align singly at the metaphase plate (not as pairs).
- Spindle fibers attach to kinetochores of sister chromatids.

3. Anaphase II

- Sister chromatids finally separate and move to opposite poles.
- Each chromatid becomes an independent chromosome.

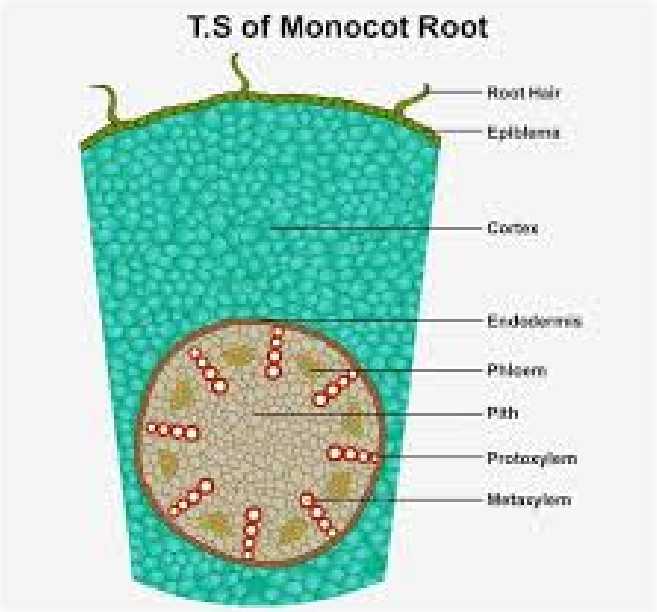
4. Telophase II & Cytokinesis

- Four genetically unique haploid gametes (or spores) form.
- Nuclear envelopes re-form, and chromosomes decondense.

1. Monocot Root

- Lack of secondary growth (no vascular cambium → no wood or bark).

- Polyarch xylem (multiple alternating strands of xylem and phloem in a radial arrangement).



Other Features:

- Epidermis with root hairs.

- Large parenchymatous cortex with intercellular spaces.

- Endodermis with Casparian strips.

- Pericycle (gives rise to lateral roots).

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2. Monocot Stem

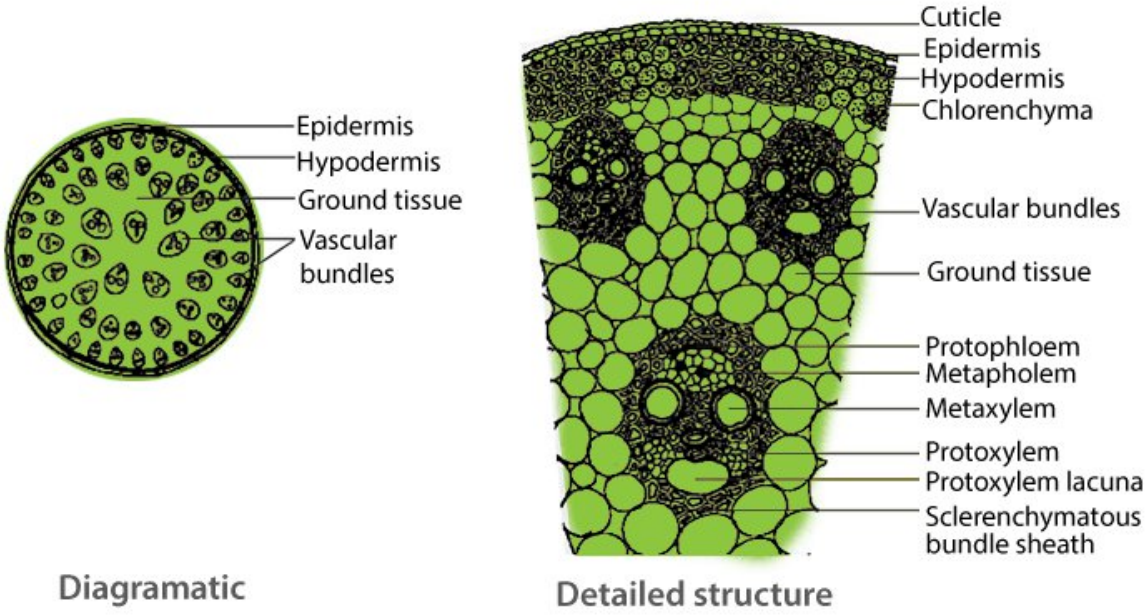
Distinctive Features:

- Scattered vascular bundles (not arranged in a ring like dicots).

- No distinct cortex or pith (ground tissue is undifferentiated).

Other Features:

- Epidermis with cuticle (reduces water loss).
- Vascular bundles are closed (no cambium → no secondary growth).
- Sclerenchyma bundle caps (for mechanical support).



Diagramatic

Detailed structure

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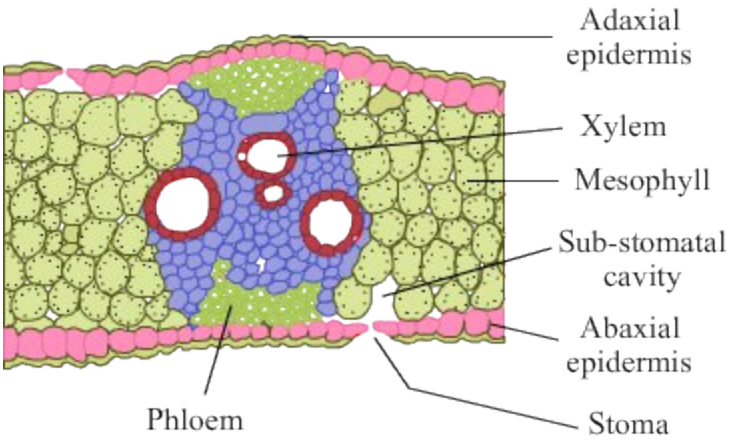
3. Monocot Leaf

Distinctive Features:

- Parallel venation (veins run parallel to each other).
- Isobilateral structure (similar upper and lower epidermis, unlike dicots).

Other Features:

- Stomata on both surfaces (amphistomatic).
- Bulliform cells (in grasses for rolling leaves during water stress).
- Mesophyll not differentiated (no palisade/spongy layers).



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1. Dicot Root

Distinctive Features:

1. Radial vascular arrangement – Xylem is exarch (protoxylem towards periphery) and tetrarch (4 xylem arms).

2. Presence of cambium – Secondary growth occurs, leading to thickening.

Other Features:

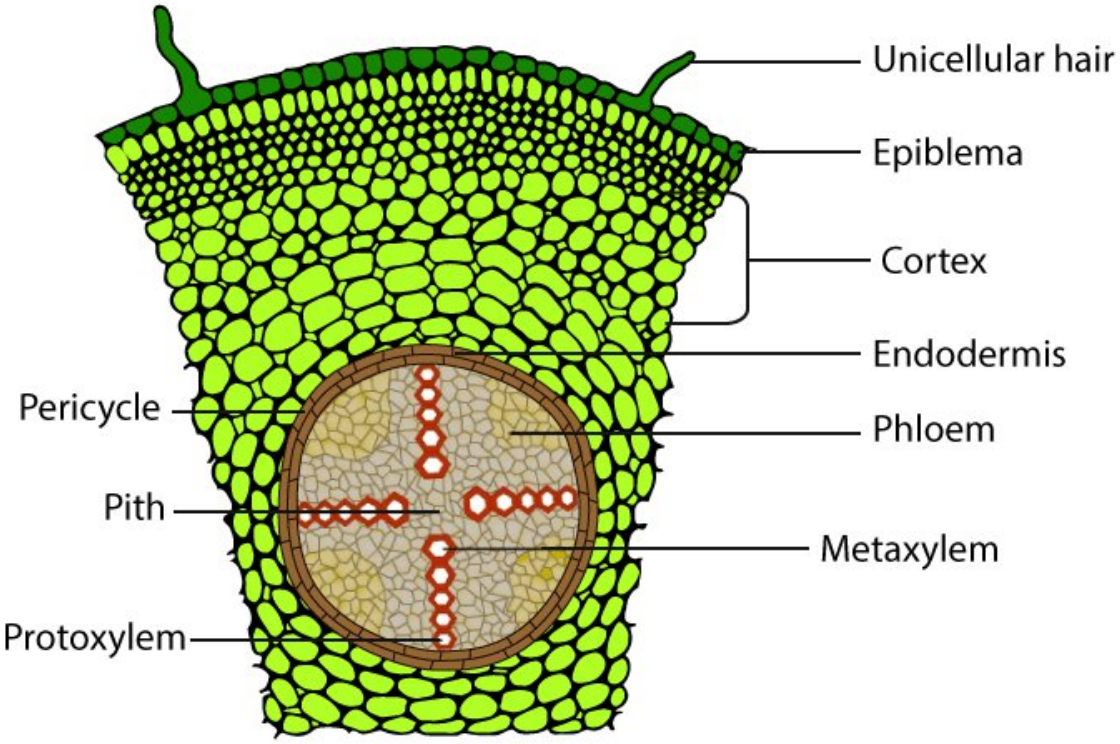
- Epidermis with root hairs.

- Cortex with parenchyma and endodermis (Casparian strips).

- Pericycle (lateral root formation).

- Conjunctive tissue (parenchyma between xylem & phloem).

DICOT ROOT



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2. Dicot Stem

Distinctive Features:

1. Vascular bundles in a ring – Organized in a circular pattern.

2. Open vascular bundles – Presence of cambium for secondary growth.

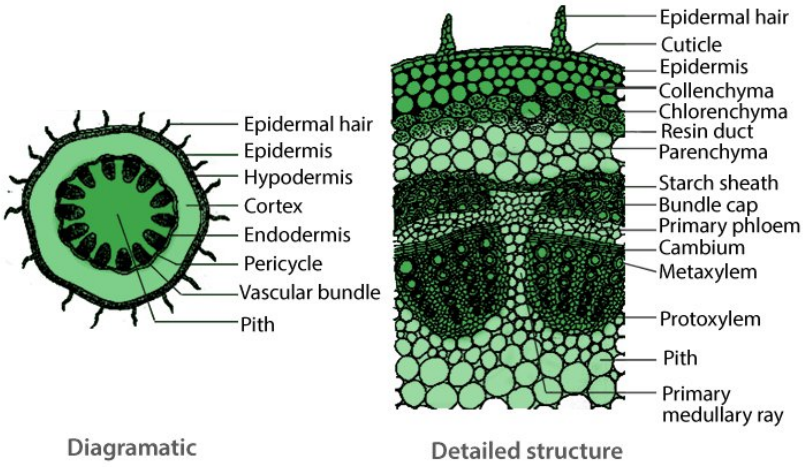
Other Features:

- Epidermis with cuticle and multicellular trichomes.

- Cortex (hypodermis = collenchyma, general cortex = parenchyma).

- Pith (central parenchymatous region).

- Medullary rays (connect pith and cortex).



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3. Dicot Leaf (Dorsiventral)

Distinctive Features:

1. Reticulate venation – Network-like vein arrangement.

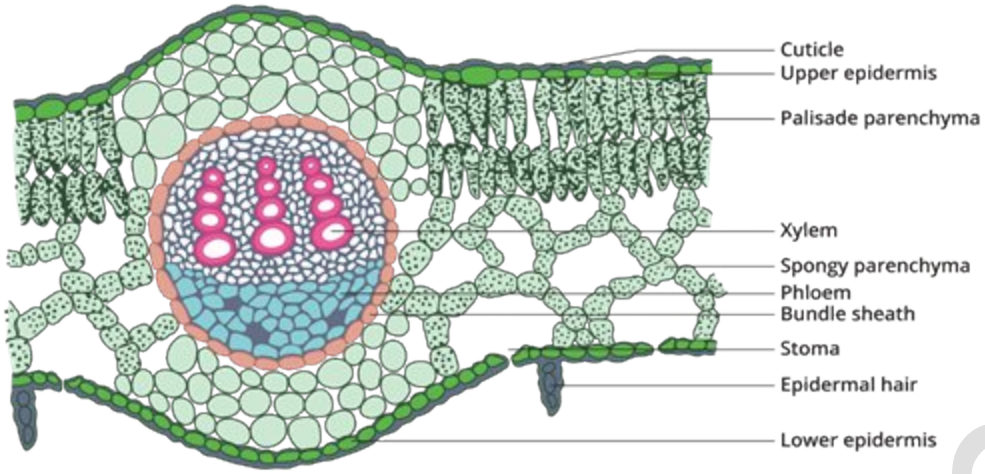
2. Dorsiventral structure – Palisade (upper) and spongy (lower) mesophyll differentiation.

Other Features:

- Stomata mostly on lower epidermis (hypostomatic).

- Epidermis with cuticle (thicker on upper surface).

- Bundle sheath surrounds vascular bundles.



Frog dissection

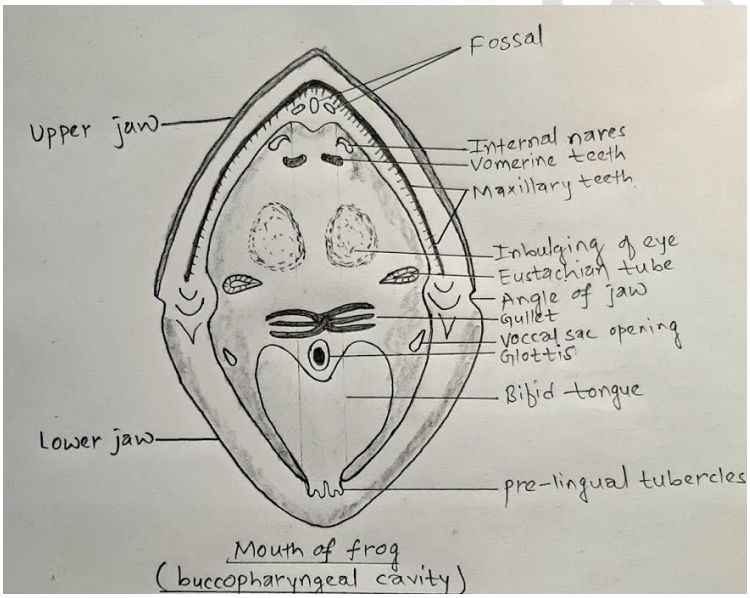
Buccal cavity of frog

Tongue Attachment & Function

- Attached at the front (not the back like in mammals)

- Sticky and bifid (forked)

2. Maxillary teeth



Frog:

1. Hindlimb Specialization

- Elongated, muscular hindlimbs adapted for powerful jumping

- Webbed feet

2. Head-Body Fusion

- Short, rigid trunk

- Broad, flattened skull with large mouth gape for prey capture

Kingdom Animalia

1. Jellyfish

- Umbrella-shaped

gelatinous body with radial symmetry.

- Tentacles armed

No central nervous system

2. Planaria

- Flat, leaf-shaped body with bilateral symmetry.

- body is made up of three germ layers

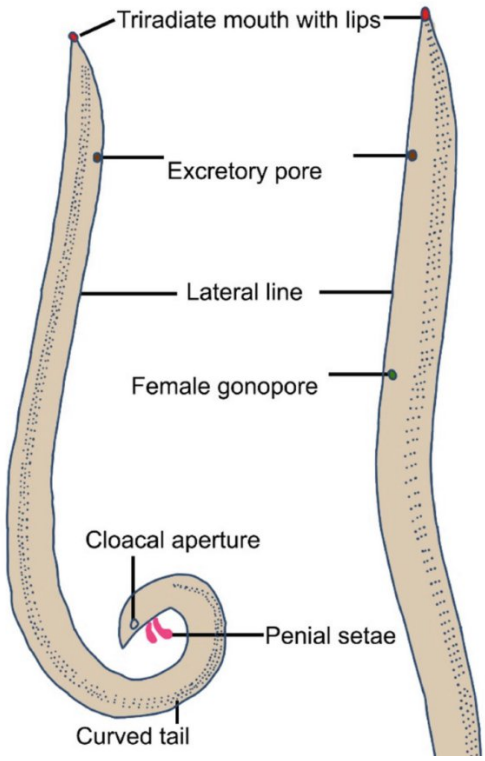
No respiratory system

3. Ascaris (Phylum Nematoda)

- Long, cylindrical, unsegmented body

Body with tapered ends.

- body is made up of three germ layers



4. Earthworm (Phylum Annelida)

- Metamerically segmented body (rings visible externally).

- respire through skin

5. Snail (Phylum Mollusca)

- Spiral coiled shell (in most species) for protection.

- Muscular foot for locomotion and a radula (toothed tongue for feeding).

6. Dengue Mosquito (Aedes aegypti)

- Black-and-white striped legs and body.

- wings for flight

Large in size

7. Starfish (Phylum Echinodermata)

- (typically 5 arms).

- Tube feet with suction cups (part of the water vascular system for movement).

8. Tapeworm

Has **suckers** (like tiny suction cups)

Ribbon like body

No mouth or gut

9. Leech

Leeches have a **soft, muscular body** divided into many rings

Strong sucker at the **back end** helps it stick to surfaces

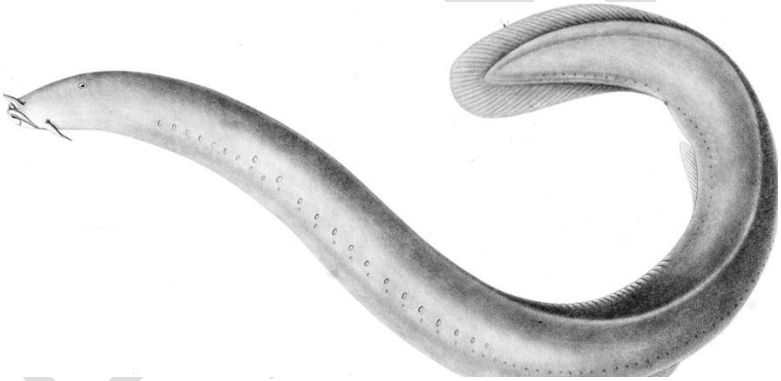
They can **stretch and shrink**

A. Jawless Fishes (Agnatha)

1. Absence of jaws – Mouth is circular/suction-like (e.g., lampreys use it to attach to prey).

2. Elongated, eel-like body – Lack paired fins and scales; skeleton entirely cartilaginous.

3. They donot have Swim bladder

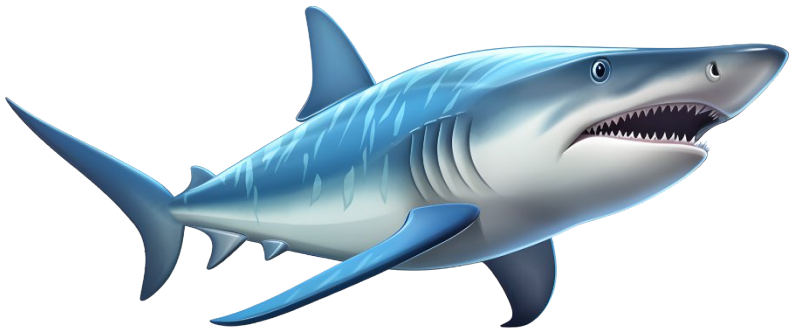


B. Cartilaginous Fishes (Shark or Rays)

1. Cartilage skeleton – No true bones (e.g., sharks, rays).

2. Exposed gill slits – Lack operculum (gill cover); 5–7 visible gill openings.

3. Tough skin



C. Bony Fishes (Osteichthyes)

1. Bony skeleton – Rigid bones support the body (e.g., trout, tuna).

2. Operculum-covered gills – Flap protecting gills; aids in efficient respiration.

3. terminal mouth

4. Swim bladder

1. Salamander (Amphibian)

- Elongated body with a long tail (retained in adults, unlike frogs).

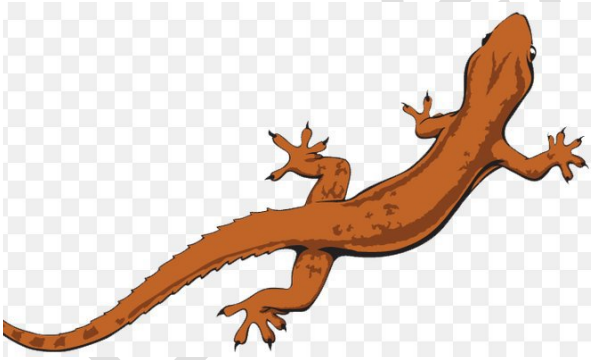
- Moist, smooth skin (no scales) used for cutaneous respiration.

2. Frog (Amphibian)

- Hindlimbs specialized for jumping (long, muscular with fused tibia-fibula).
- Smooth, moist skin (no scales) with prominent mucous glands.

3. Lizard (Reptile)

- Dry, scaly skin (prevents water loss; sheds periodically).
- Clawed toes (adapted for climbing, running, or digging).



4. Crocodile (Reptile)

- V-shaped snout (narrower than alligator's; visible fourth tooth when mouth is closed).
- Armored body with bony plates

Thick scales.

5. Alligator (Reptile)

- U-shaped snout (broader than crocodile's; hidden fourth tooth when mouth is closed).

- Dark, armored skin

Rough and tough skin

6. Cat (Mammal)

Sharp teeth

- Retractable claws (aids in hunting/climbing).

- Slit-pupiled eyes (enhanced night vision).

7. Goat (Mammal)

- Hollow, curved horns (permanent; not shed like antlers).
- Split upper lip (prehensile) and rough tongue (for grasping vegetation).

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1. Mosses (Bryophytes)

- Leafy gametophyte stage (dominant phase; lacks true roots, stems, or leaves).
- Rhizoids (hair-like structures for anchorage, not true roots).

2. Pteris (Fern)

- Compound leaves (fronds) with pinnate leaflets.

- Sori (clusters of sporangia) on the underside of fronds for spore production.

3. Adiantum (Maidenhair Fern)

- Delicate, fan-shaped fronds with black, shiny stipes (stalks).

- Sori under curled leaf margins (false indusium).

4. Male Cone of Pinus (Gymnosperm)

- Small in size

clustered near branch tips (produces pollen).

Non woody

- Microsporophylls (scales bearing pollen sacs).

5. Female Cone of Pinus (Gymnosperm)

- Large in size

, woody, and conical (holds seeds).

- Ovuliferous scales (each bears two ovules).

6. Brassica (Mustard Plant – Angiosperm)

- Yellow, four-petaled flowers (cruciform corolla).

- Siliqua fruit (elongated seed pod splitting along two seams).

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1. Onion Bulb

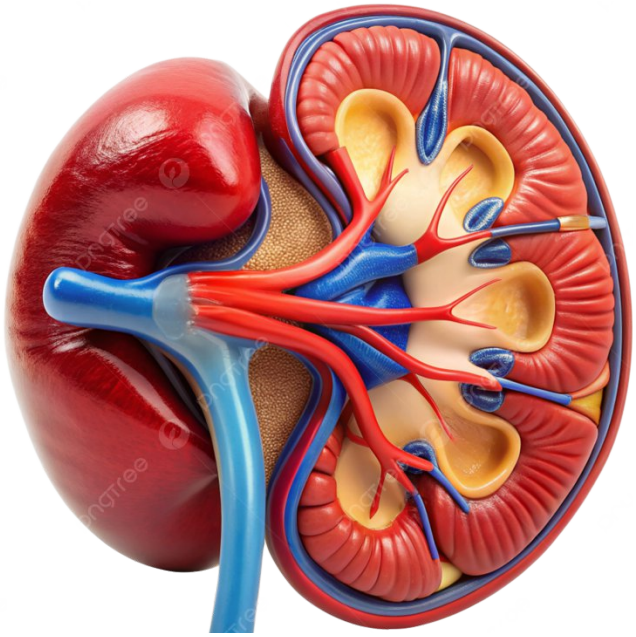
- Fleshy, concentric leaf bases (modified leaves store food as scales).

- Basal plate (short, disc-like stem at the bottom where roots emerge).

2. Mammal Kidney

- Bean-shaped with a hilum (indentation where vessels enter/exit).

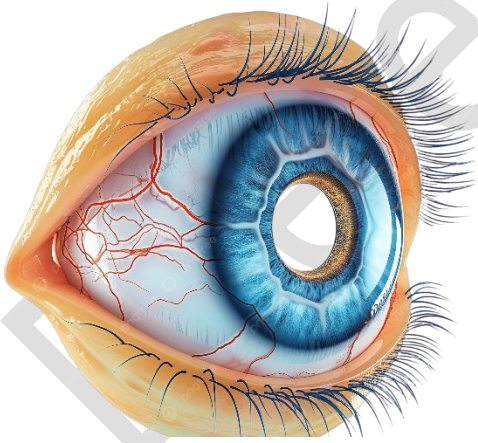
- Cortex and medulla regions (outer granular cortex, inner striated medulla with pyramids).



3. Mammal Eye

- Spherical shape with cornea (transparent front layer for light entry).

- Iris and pupil (muscular diaphragm controlling light intake).

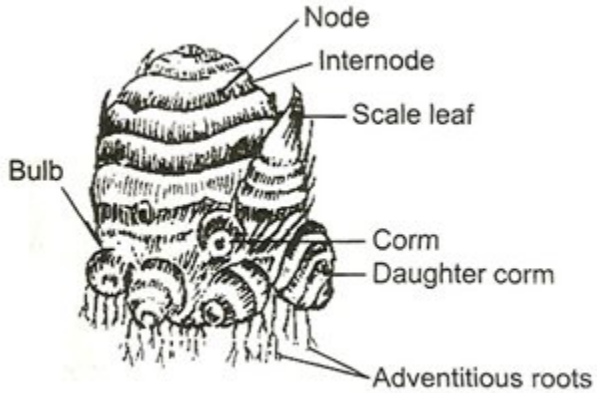


4. Corm of Colocasia

- Swollen, solid stem base

(Stores starch, no scales like bulbs).

- Nodes and internodes (visible rings with buds for new growth).



Corms in *Colocasia*

5. Ginger (Rhizome)

- Knobby, branched structure (horizontal underground stem).

- Nodes with scale leaves and buds (grows laterally, not a true root).

6. Stem Tuber (Potato)

- Swollen tip of underground stem (stores starch in parenchyma cells).

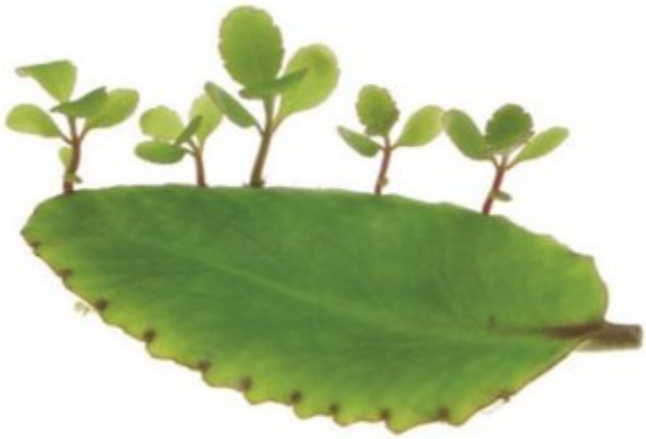
- Eyes (buds) in spirals (each can grow into a new plant).

7. Bryophyllum Leaf

- Notched margins with adventitious buds

Reproduction through leaf (new plants form at leaf edges).

- Thick, fleshy structure



8. Parrot (Bird)

- Curved, hooked beak (for cracking seeds/fruits).

- (two toes forward, two backward for climbing/grasping).

Wings to fly