Summary

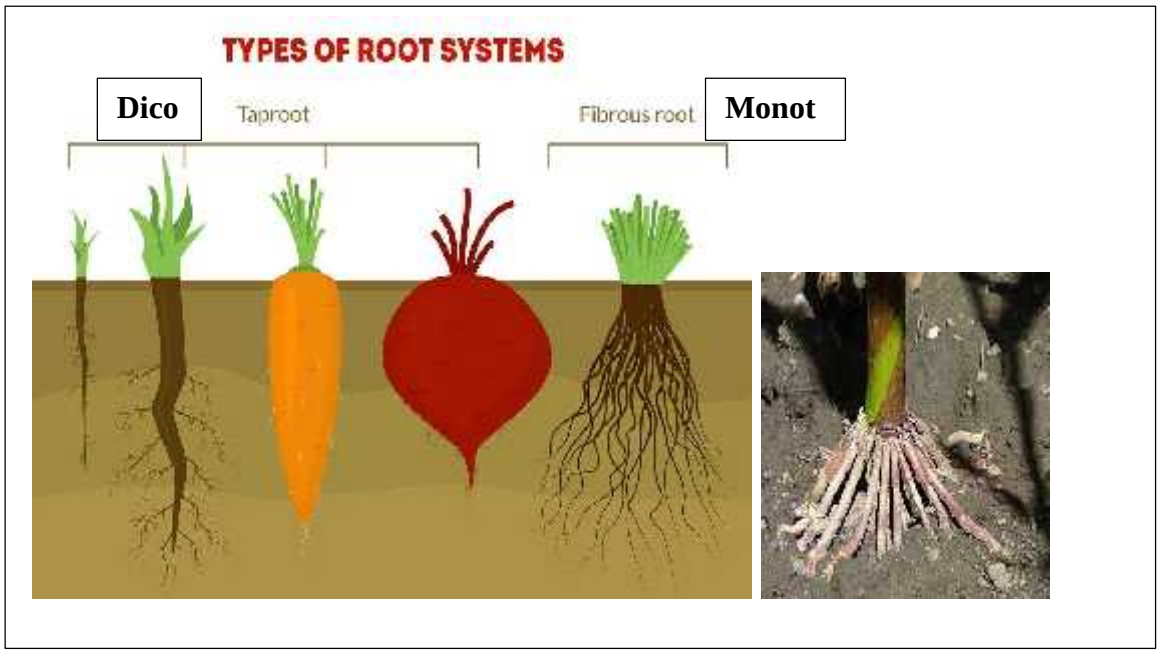
<u>Work pratical:</u>
1. Secretory tissue (hair – glands – tannin cells)
2. Root anatomy 3. stem anatomy 4. Leaf anatomy 5. Flower study.
6. Fruit Study 7. Seed Study.

Chapter 1: Introduction

Higher plants, also known as vascular plants, is a large group of plants that have vascular tissues (with veins) to distribute resources through the plant. This feature allows vascular plants to evolve to a larger size than non-vascular plants (also known as lower plants).

Angiosperms and gymnosperms are the two major groups of vascular seed plants. Angiosperms, which are flowering plants, are the largest and most diverse group within the kingdom Plantae. With around 300,000 species, they represent approximately 80 percent of all the known green plants now living.

Chapter 1: Anatomy of Higher Plants

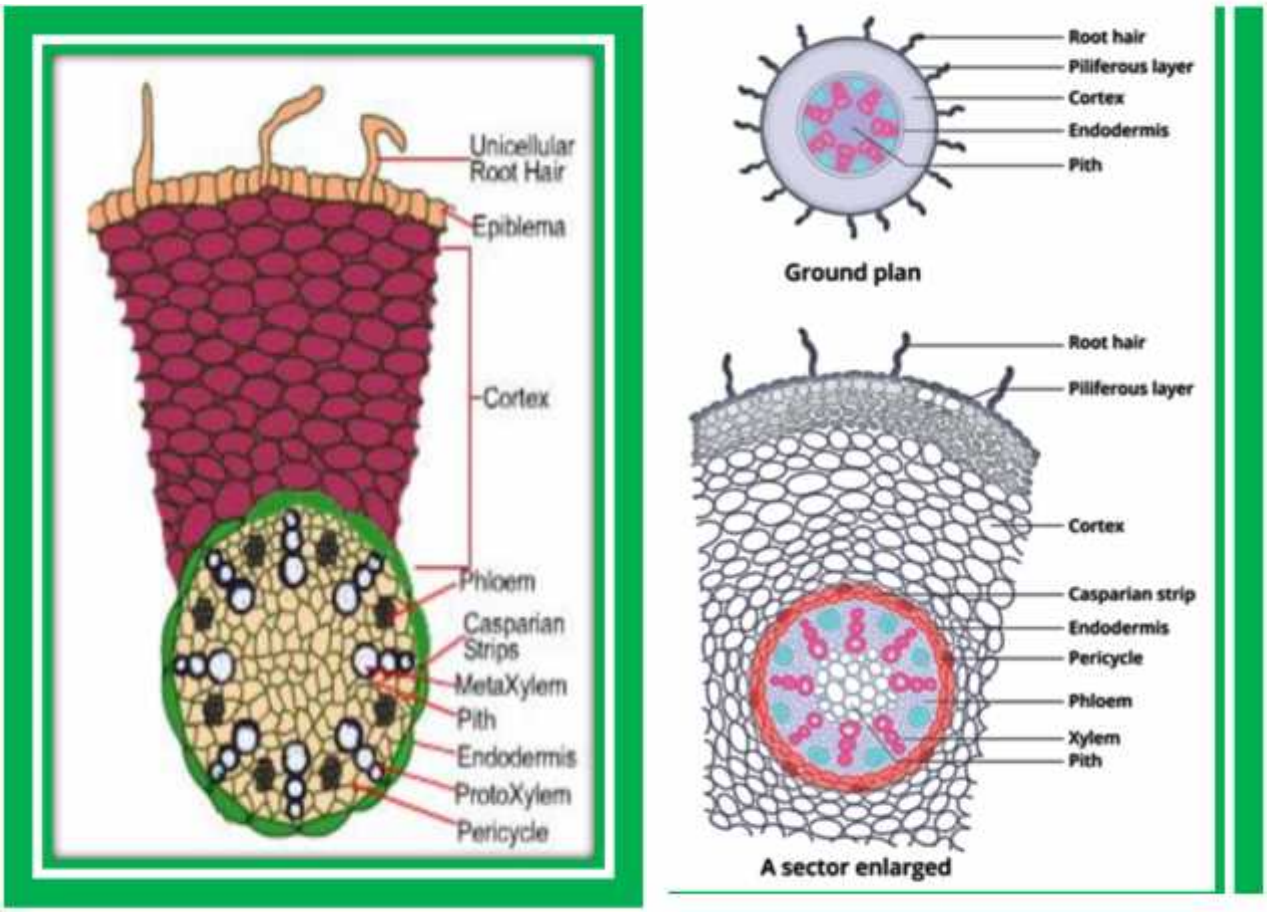


2.1 Anatomical structure of the root:

The upper or outermost layer is the epidermis and is composed of parenchymatous cells. Cuticle and stomata are absent. Unicellular root hairs are formed by the elongation of some of its cells in the maturation zone of the root. These hairs perform absorption of water from the soil.

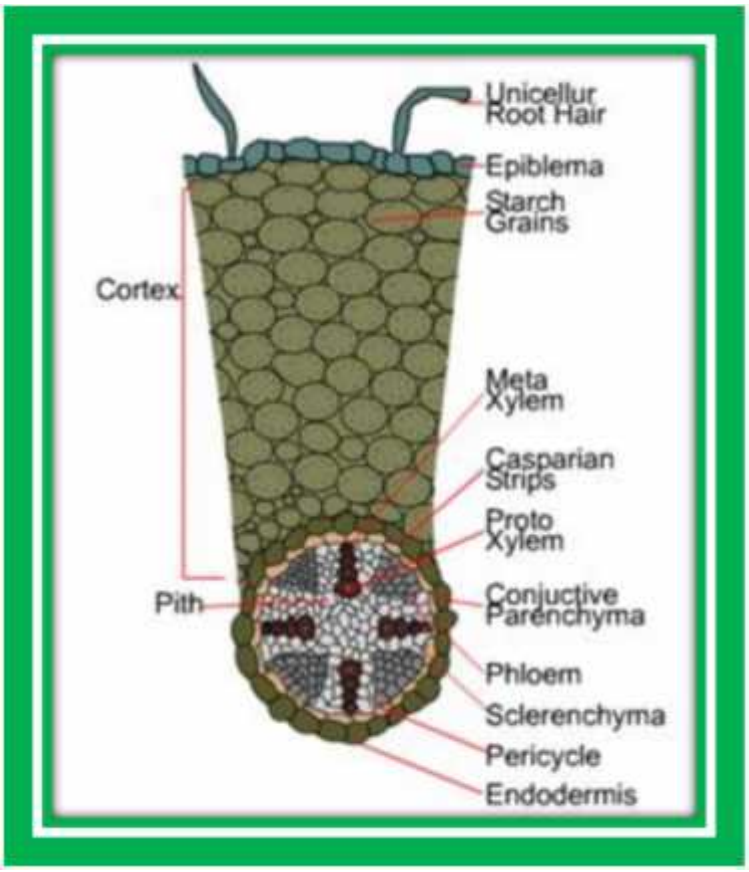
2.1.l. Anatomical structure of a monocotyledon root:

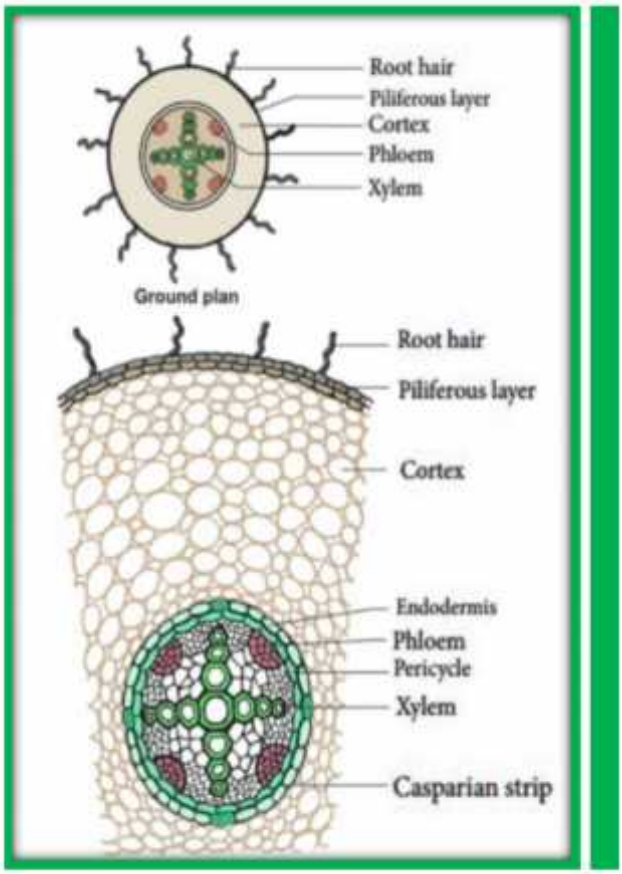
Monocot plants possess an adventitious root system. As in the dicots, the epidermis forms the outermost layer, followed by cortex, pericycle, endodermis, vascular bundles (xylem and phloem) and pith (random order). Pith is conspicuous and large. The number of xylem in a monocot is six or more.



2.1.2. Anatomical structure of a dicotyledons root:

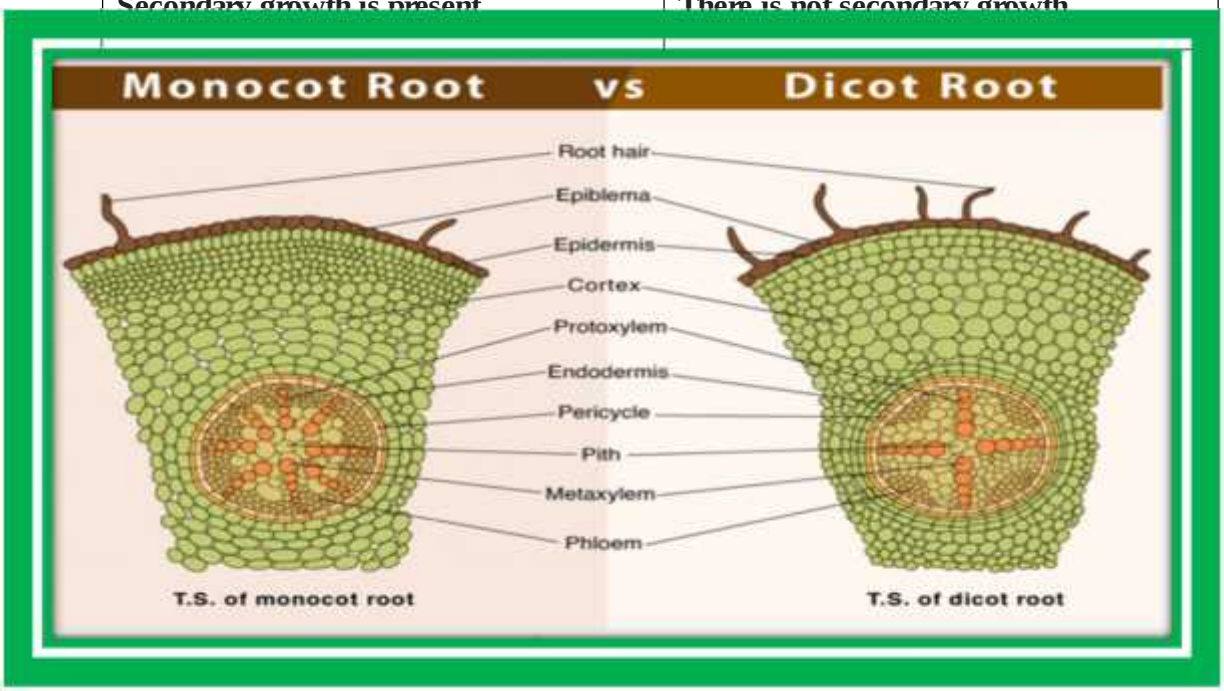
Epiblema is the outermost layer, and epiblema cells appear in the form of unicellular root hairs. Multiple layers of thin-walled parenchyma cells make up the cortex. The endodermis is the cortex's deepest layer, made up of barrel-shaped cells with no intercellular space.





2.1.3. Anatomical comparison between monocotyledonous and dicotyledonous roots

Dicot roots	Monocot roots
Xylem is usually tetrarch.	Xylem is polyarch.
Pith is usually absent.	Pith is usually large at the centre.
Metaxylem vessels are generally polygonal in cross section.	Metaxylem vessels are generally circular in cross section.
Secondary growth is present	There is not secondary growth

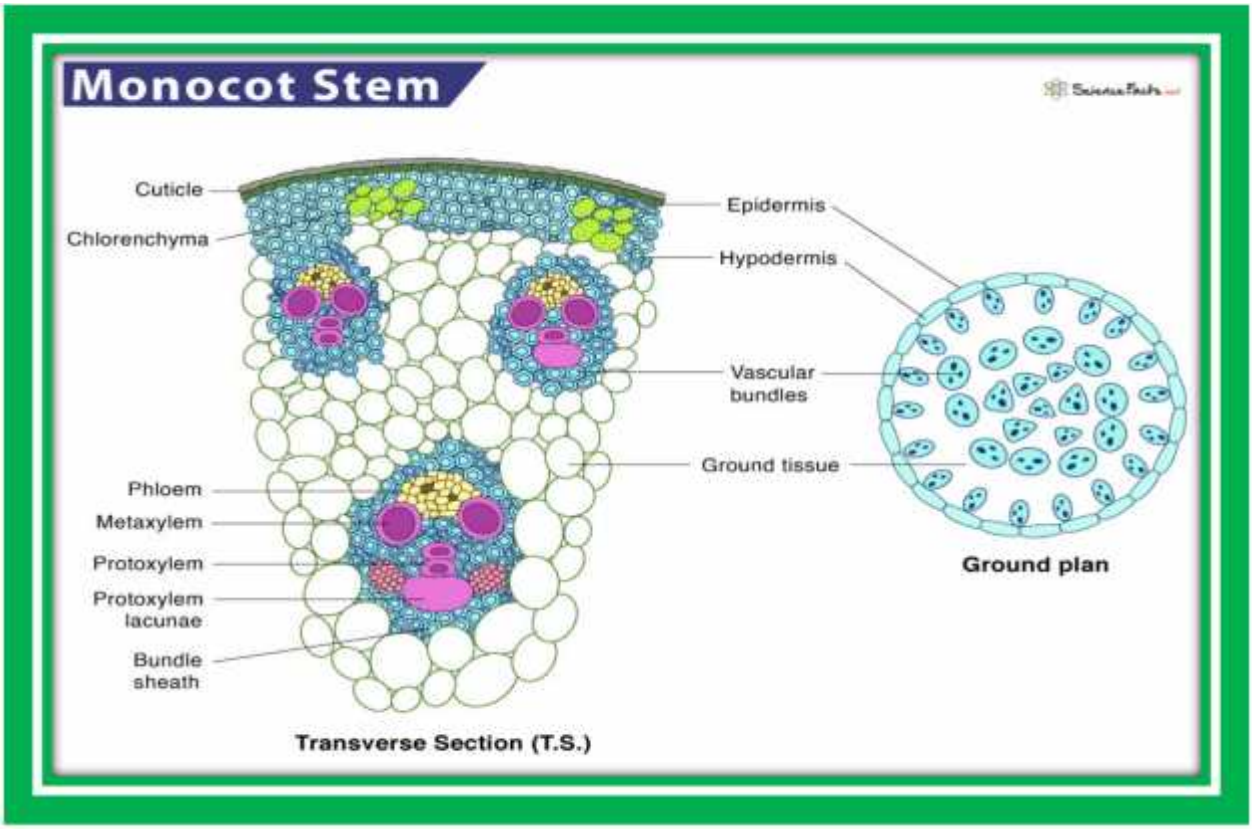


2.2. Anatomical structure of the stem:

The stem is composed of three tissue systems that include the epidermis, vascular, and ground tissues, all of which are made from the simple cell types. The xylem and phloem carry water and nutrients up and down the length of the stem and are arranged in distinct strands called vascular bundles.

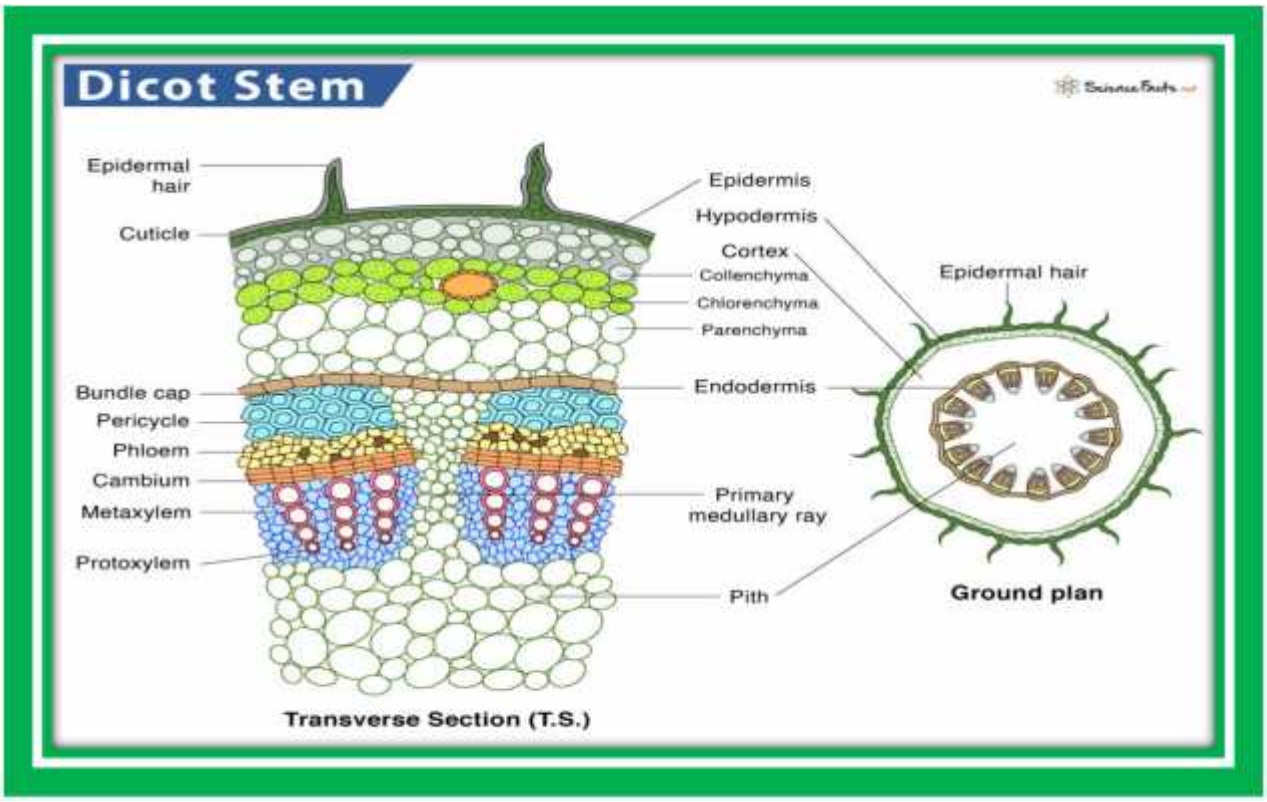
2.2.l. Anatomical structure of a monocotyledon stem:

Monocotyledonous stems have lateral branches; the circular stem may exhibit depressed characteristics. The cuticle is thick, the epidermis is single-layered, and epidermal hairs are missing. Multicellular trichomes can be found in the single-layered cuticularized epidermis. Monocotyledonous stems have lateral branches; the circular stem may exhibit depressed characteristics. The cuticle is thick, the epidermis is single-layered, and epidermal hairs are missing. Multicellular trichomes can be found in the single-layered cuticularized epidermis.



2.2.2. Anatomical Structure of a Dicotyledonous Stem:

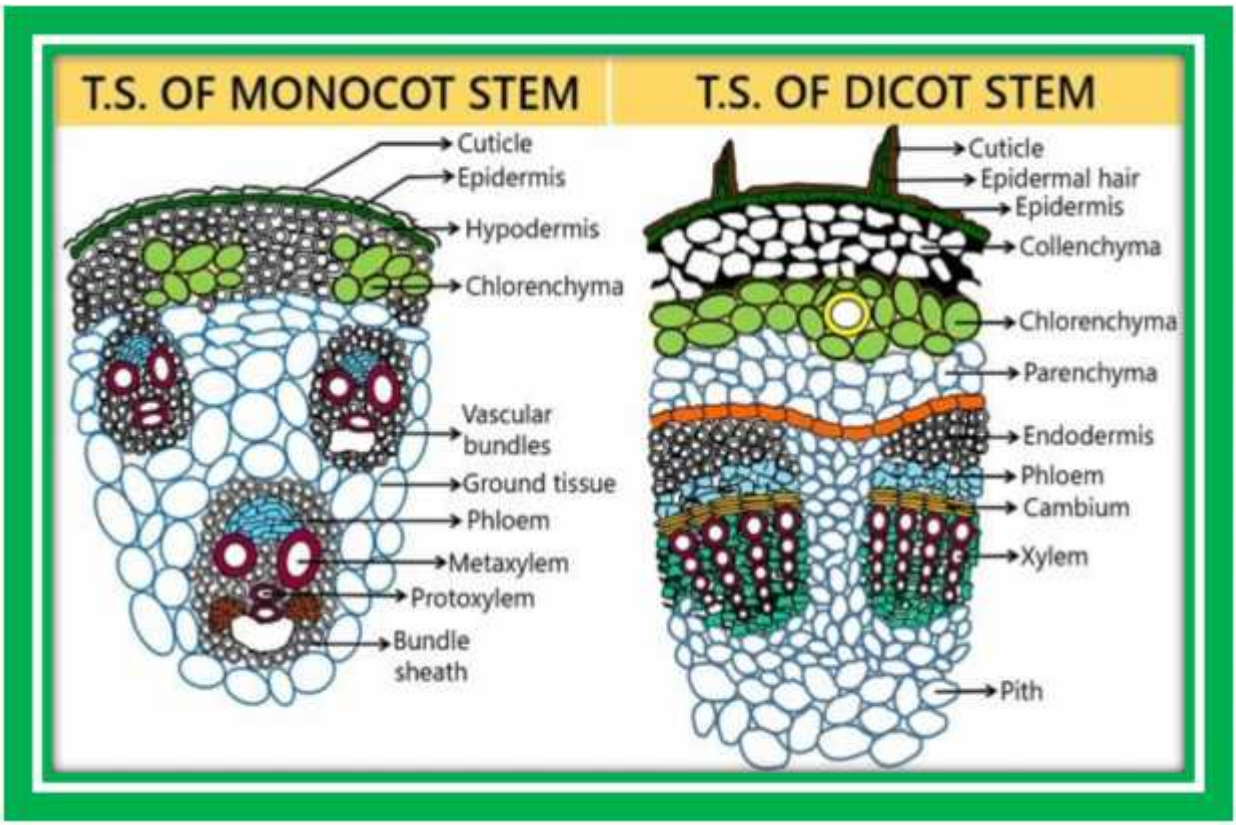
Stem contains two cotyledons or embryonic leaf called as dicotyledonous stem or dicot stems. It is a protective outermost single layer of parenchymatous cells without intercellular spaces. The outer walls of the epidermal cells have a layer called cuticle and multicellular hairs (trichomes).



2.2.3. Anatomical comparison between monocotyledon and dicotyledons stems

Anatomical differences between dicot stem and monocot stem

S.No.	Characters	Dicot Stem	Monocot Stem
1.	Hypodermis	Collenchymatous	Sclerenchymatous
2.	Ground tissue	Differentiated into cortex, endodermis and pericycle and pith	Not differentiated, but it is a continuous mass of parenchyma.
3.	Starch Sheath	Present	Absent
4.	Medullary rays	Present	Absent
5.	Vascular bundles	(a) Collateral and open	(a) Collateral and closed
		(b) Arranged in a ring	(b) Scattered in ground tissue
		(c) Secondary growth occurs	(c) Secondary growth usually does not occur.

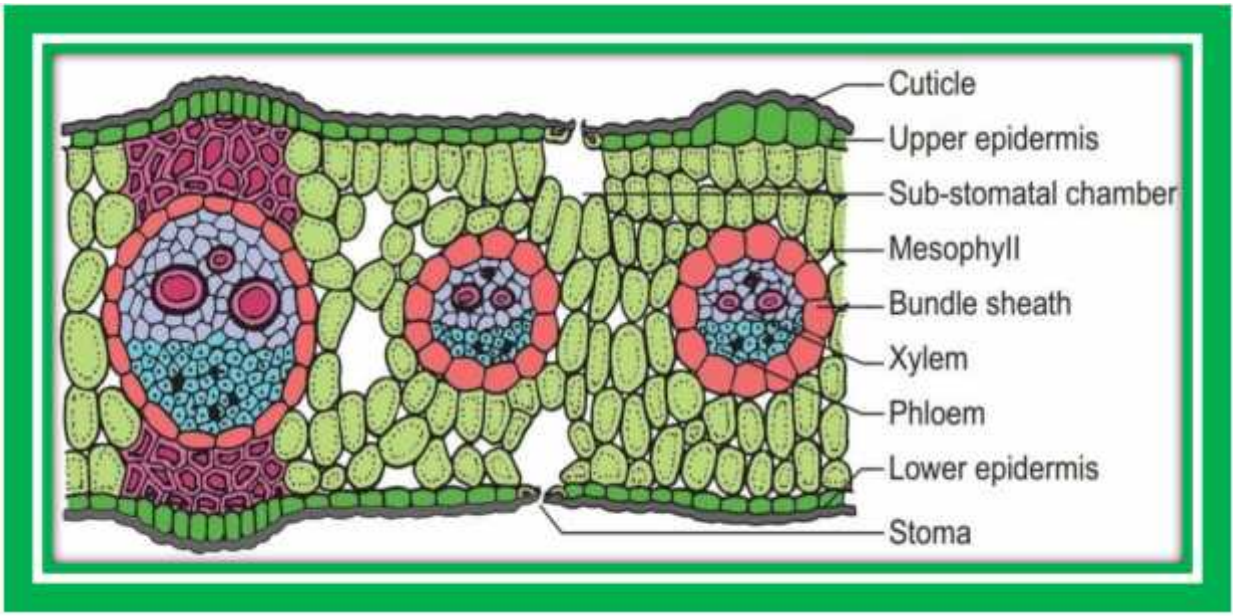


2.3. Anatomical structure of the leaf:

Leaves can have various shapes and sizes. The blade, petiole, and stipules are the three primary parts of the leaves of flowering plants (angiosperms). The epidermis, the mesophyll, and the vascular tissue are the three primary tissues of leaves. Layers of cells make up each form of tissue.

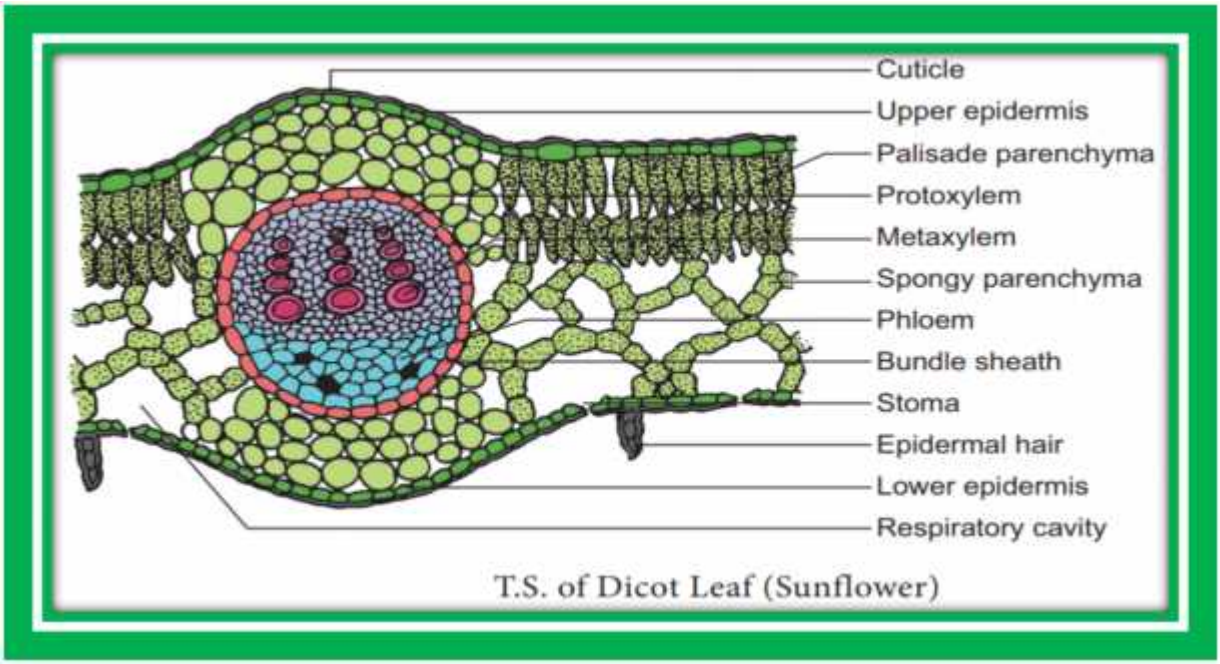
2.3.l. Anatomical structure of a monocotyledon leaf:

Monocotyledonous leaves are characterized by parallel venation. The anatomy of a monocot leaf includes: Both adaxial epidermis and abaxial epidermis bear stomata. There is no differentiated palisade and spongy parenchyma of the mesophyll.



2.3.2. Anatomical structure of a dicotyledonous leaf:

Broadly, a dorsiventral dicot leaf shows three structures, namely – epidermis, mesophyll and vascular system. The epidermis is present on both the upper and lower surfaces of a leaf with thin cuticles which protect the plants against mechanical and physical injury.



2.3.3. Anatomical comparison between monocotyledonous and dicotyledonous leaves

Differences between Monocot and Dicot Leaves are as follows:

Features	Monocot Leaf	Dicot Leaf
Venation	Parallel	Reticulate
Vein Arrangement	Scattered	Network
Leaf Shape	Long and narrow	Broad and flat
Orientation	Iso-bilateral	Dorsoventral
Leaf Margin	Smooth and entire	Serrated or lobed
Attachment to Stem	The sheath-like base wraps around the stem	Petiole
Stomata	Dumbbell-shaped and present on upper and lower surfaces	Bean-shaped and present on the lower surface only
Vascular Bundles	Small as well as Large-sized	Large-sized
Mesophyll Cells	No differentiation	Palisade mesophyll (upper), spongy mesophyll (lower)
Leaf Surface	Both upper and lower surfaces have the same color	The upper surface is dark green, and the lower surface is light green.
Intercellular Spaces between mesophyll cells	Small	Large
Hypodermis of Midrib	Sclerenchyma	Collenchyma

Chapter 3: Reproduction in higher plants:

In higher plants, each of the four cells from the male meiosis enters two mitotic divisions, to produce one pollen grain. The pollen grain tube germinates and carries out polarized growth to deliver two sperm cells within its cytoplasm. The sperm cells are highly compacted, with very little cytoplasm.

3.1. Reproduction in Angiosperms:

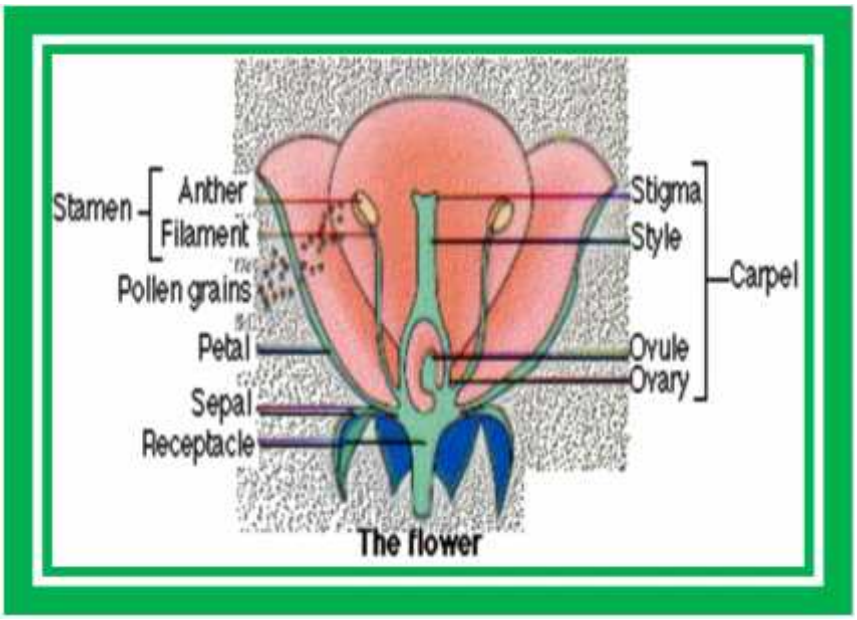
Flowering plants, also called angiosperms, use a sexual mode of production. Reproduction in plants mainly revolves around the flower, which has both the male and the female gametes. All parts of a flower aid in the process of reproduction, although some of them are sterile.

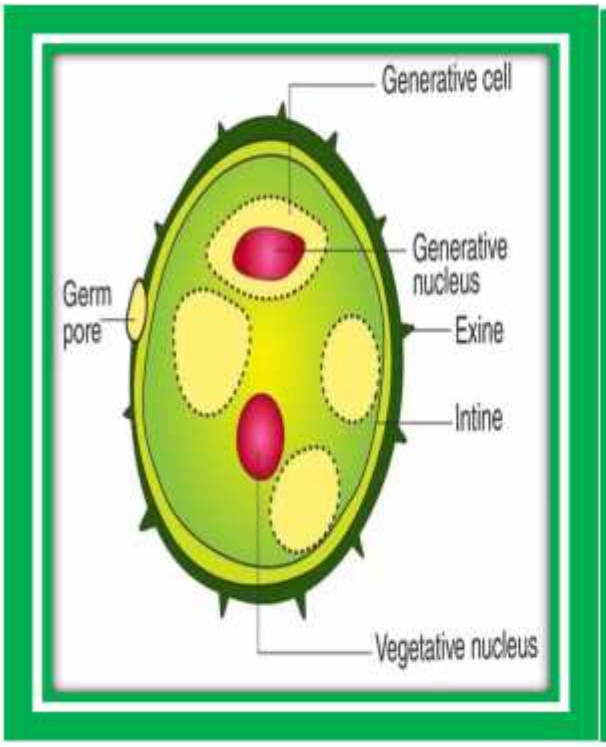
3.1. l. Gametogenesis:

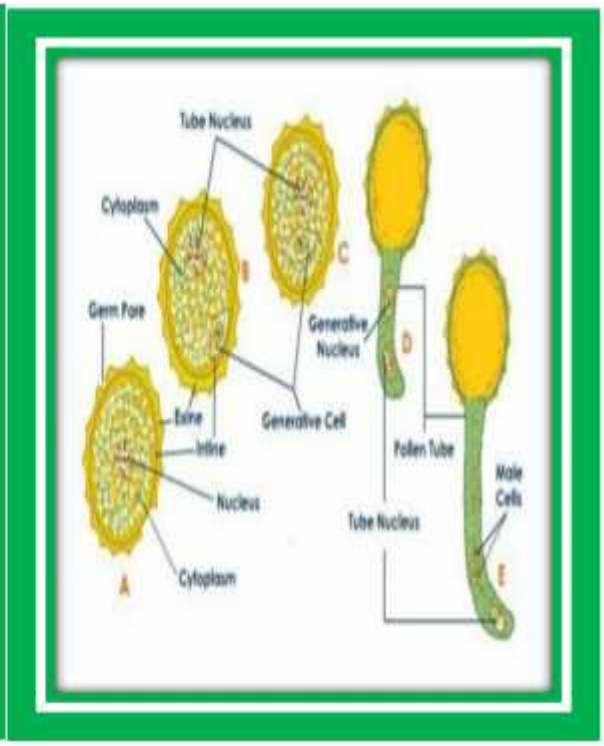
Gametogenesis is a biological process by which haploid male and female gametes are formed. This occurs in both plants and animals. In higher plants, there are two stages that are involved- sporogenesis and gametogenesis. Sporogenesis is the formation of spores whereas gametogenesis is the formation of gametes.

3.1. l. l. Pollen grain:

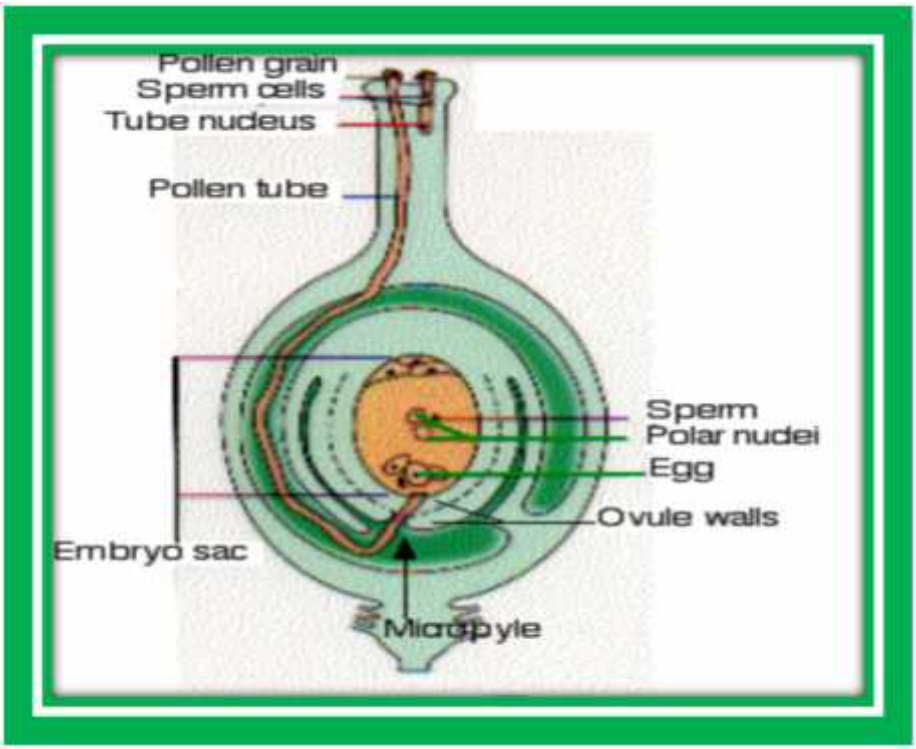
Most pollen grains consist of three distinct parts. The central cytoplasmic part is the source of nuclei responsible for fertilization. The other parts constituting the wall of the grain are an inner layer, the intine, and an outer layer, the exine. The intine consists, at least in part, of cellulose or hemicellulose.

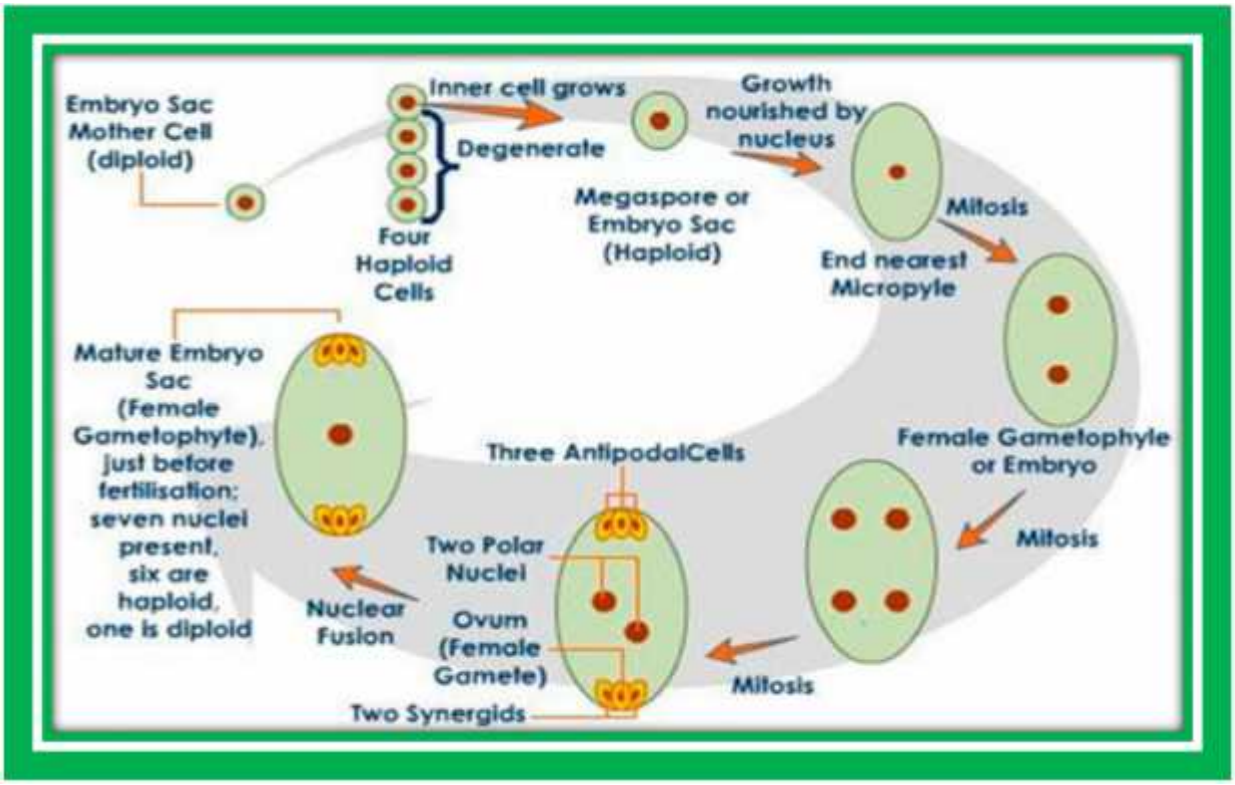


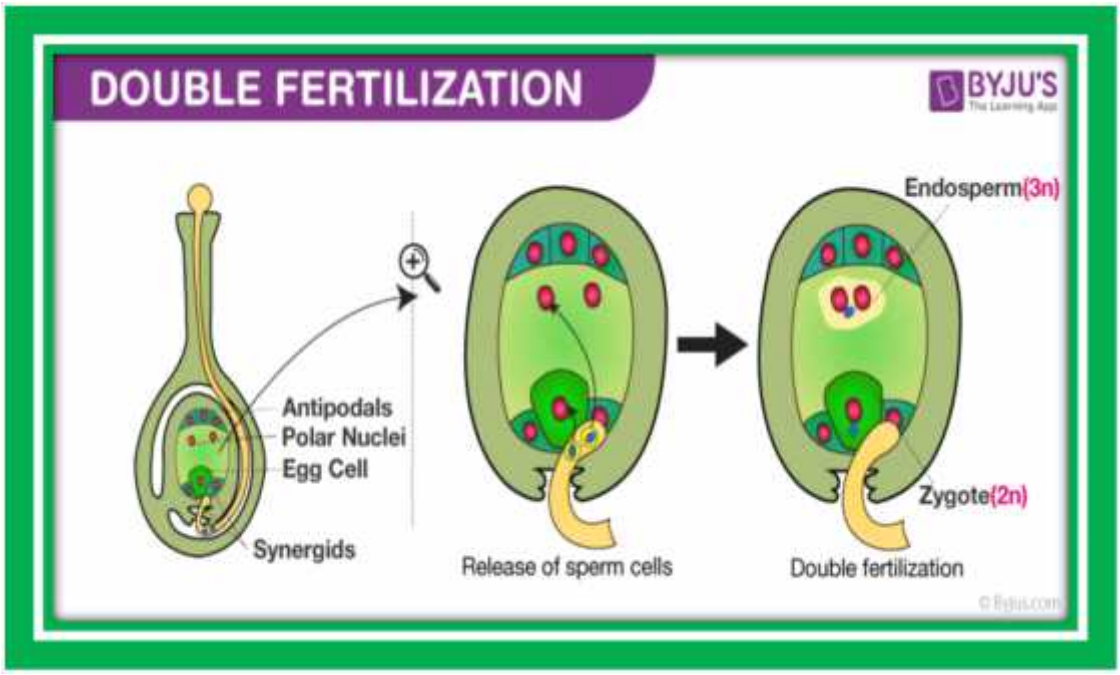


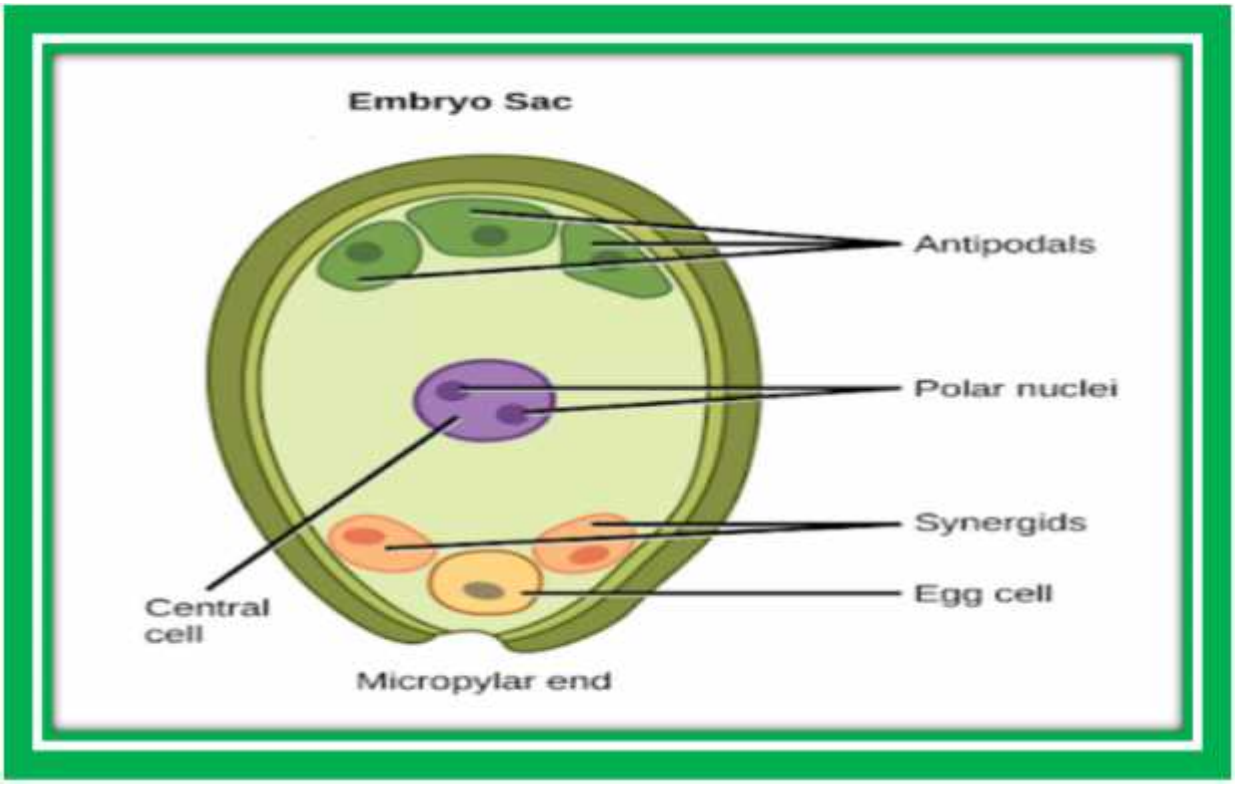


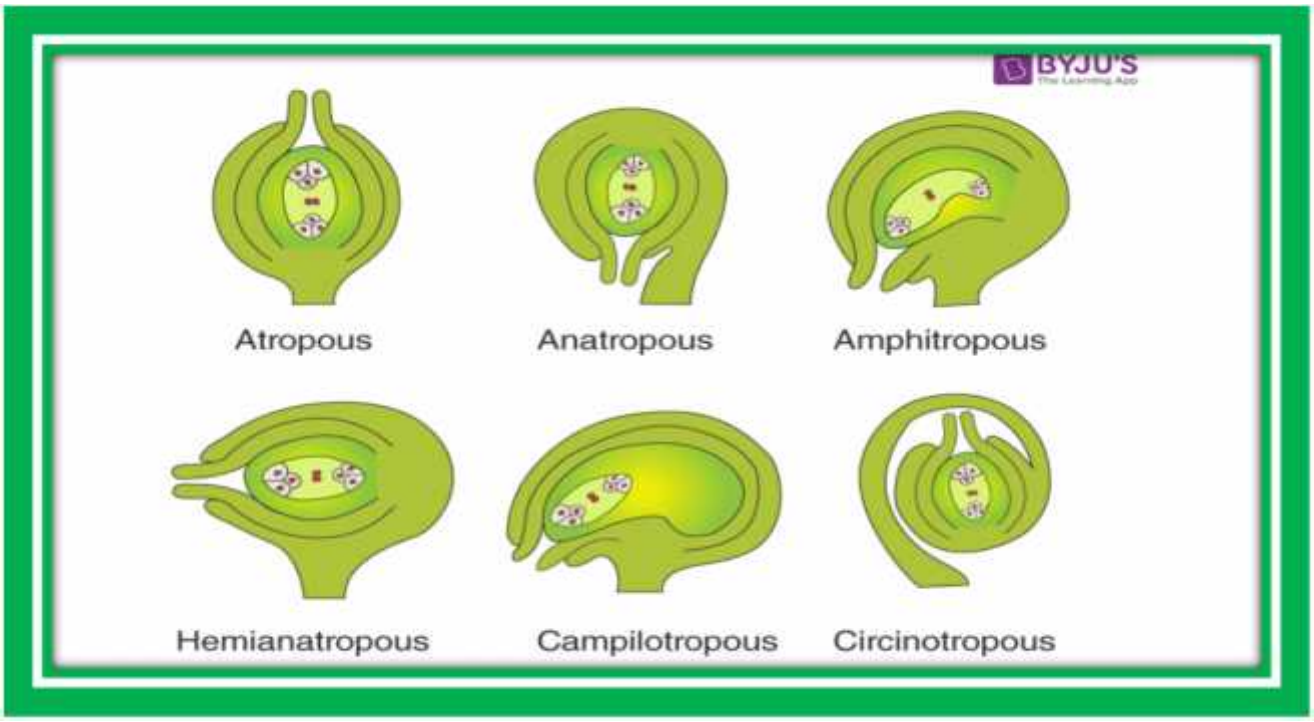
3.1.1.2. Egg and embryo sac:


Pollen grain
Sperm cells
Tube nucleus
Pollen tube
Sperm
Polar nuclei
Egg
Ovule walls
Embryo sac
Micropyle


Embryo Sac Mother Cell (diploid)
Inner cell grows
Degenerate
Four Haploid Cells
Growth nourished by nucleus
Megaspore or Embryo Sac (Haploid)
Mitosis
End nearest Micropyle
Female Gametophyle or Embryo
Mitosis
Three AntipodalCells
Two Polar Nuclei
Ovum (Female Gamete)
Two Synergids
Nuclear Fusion
Mature Embryo Sac (Female Gametophyte), just before fertilisation; seven nuclei present, six are haploid, one is diploid

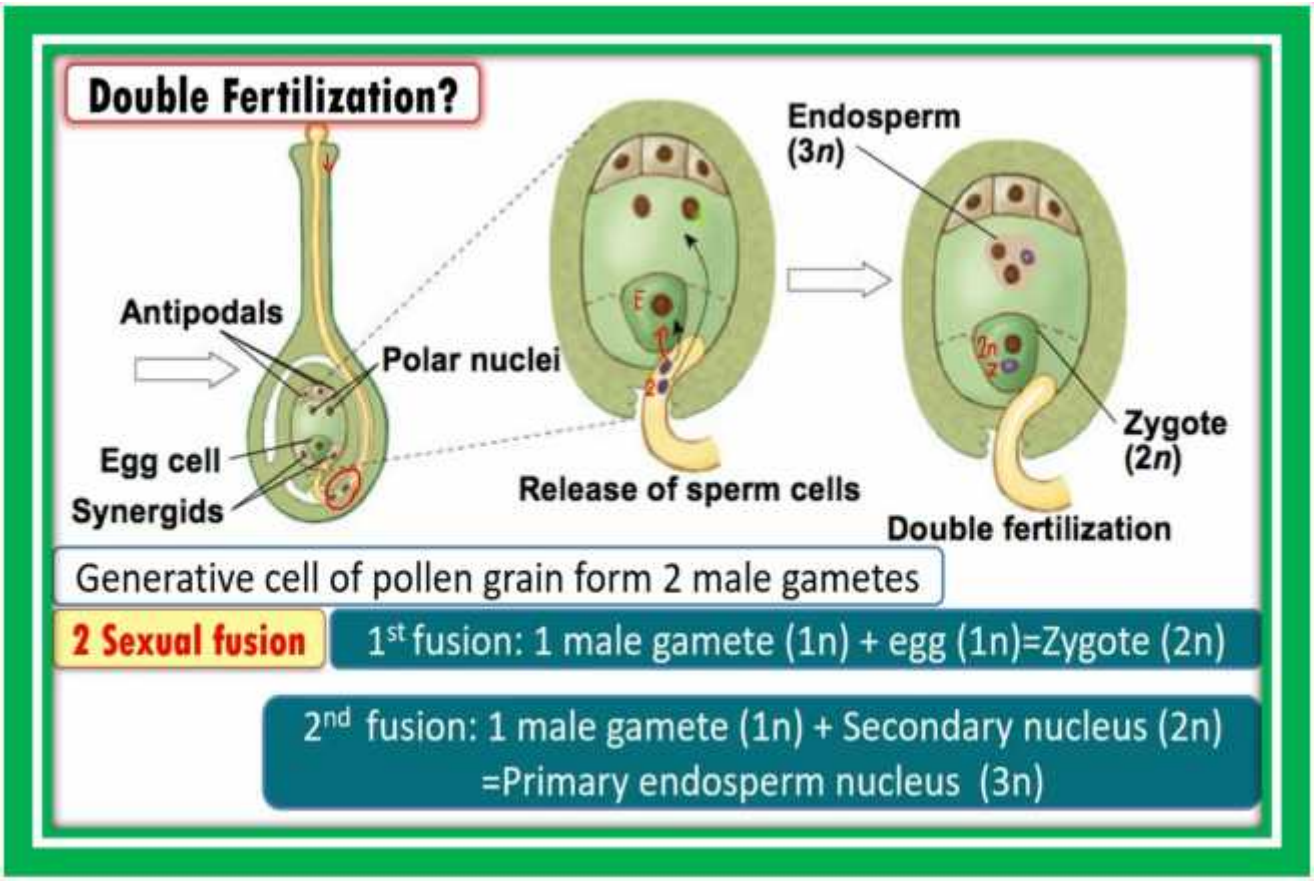

DOUBLE FERTILIZATION
BYJU'S
Antipodals
Polar Nuclei
Egg Cell
Synergids
Release of sperm cells
Endosperm(3n)
Zygote(2n)
Double fertilization


Embryo Sac
Antipodals
Polar nuclei
Synergids
Egg cell
Central cell
Micropylar end

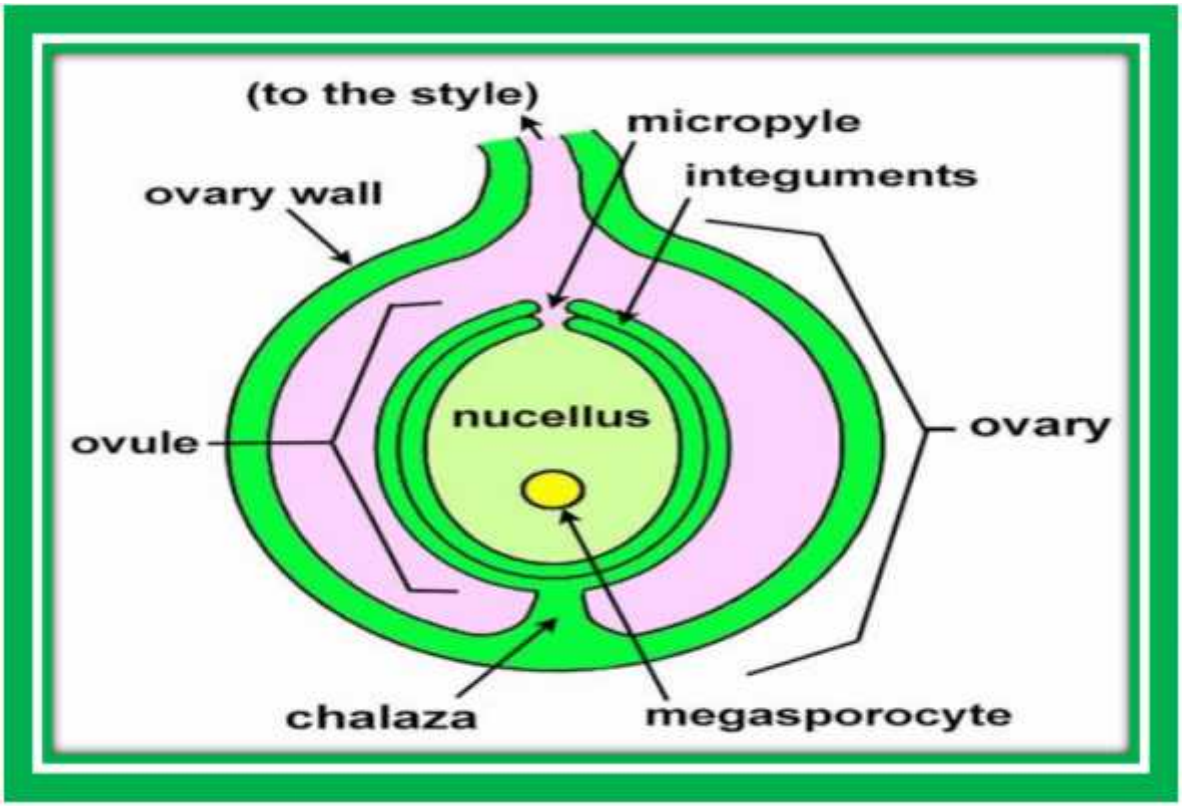


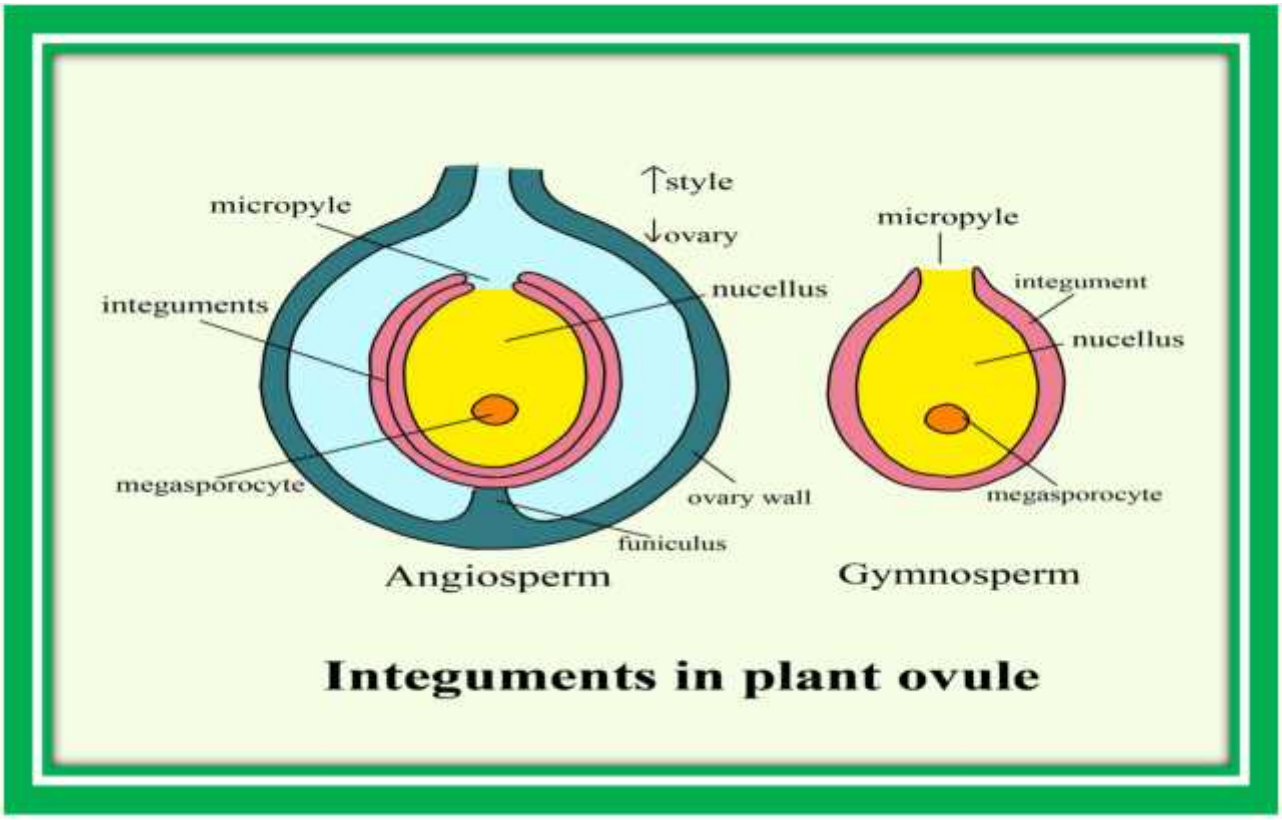
3.1.2. Double fertilization:

Double fertilization, in flowering plant reproduction, the fusion of the egg and sperm and the simultaneous fusion of a second sperm and two polar nuclei that ultimately results in the formation of the endosperm (the food-storage tissue) of the seed.



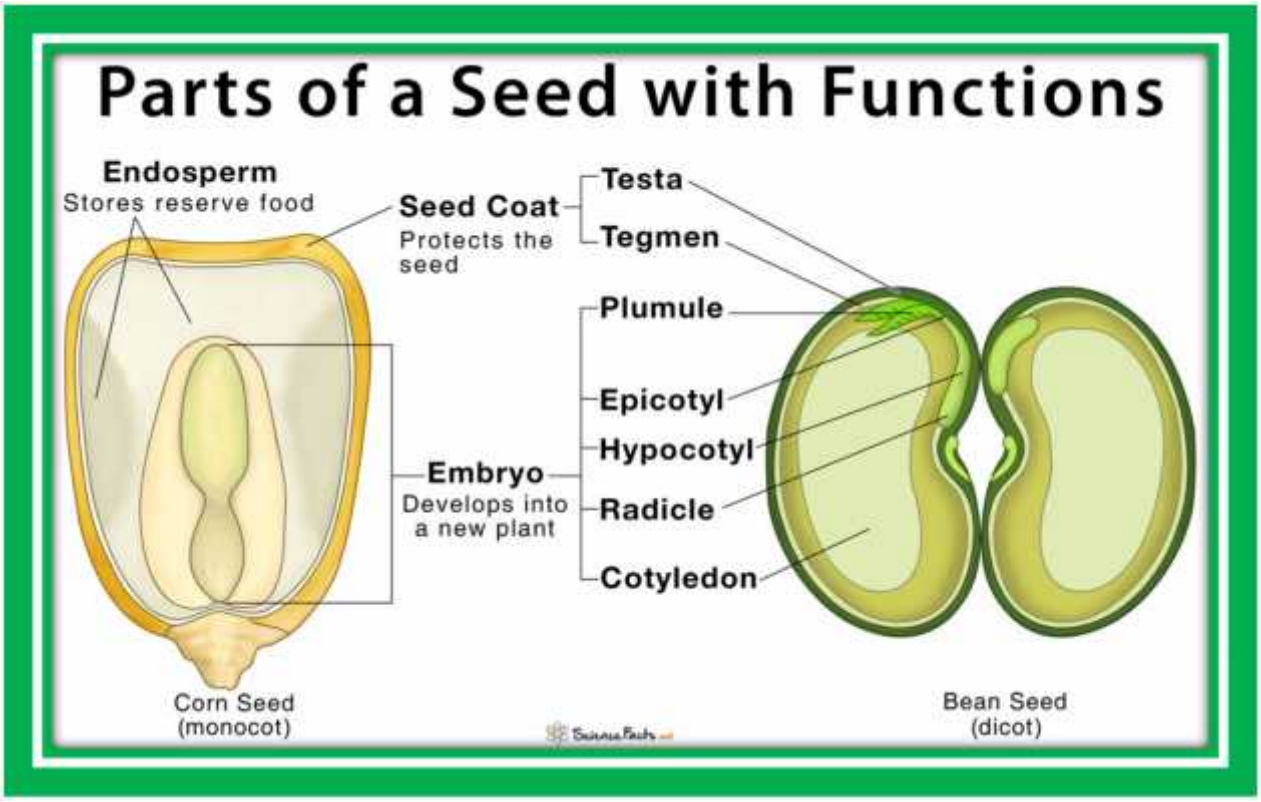
3.1.3. Different types of seeds:



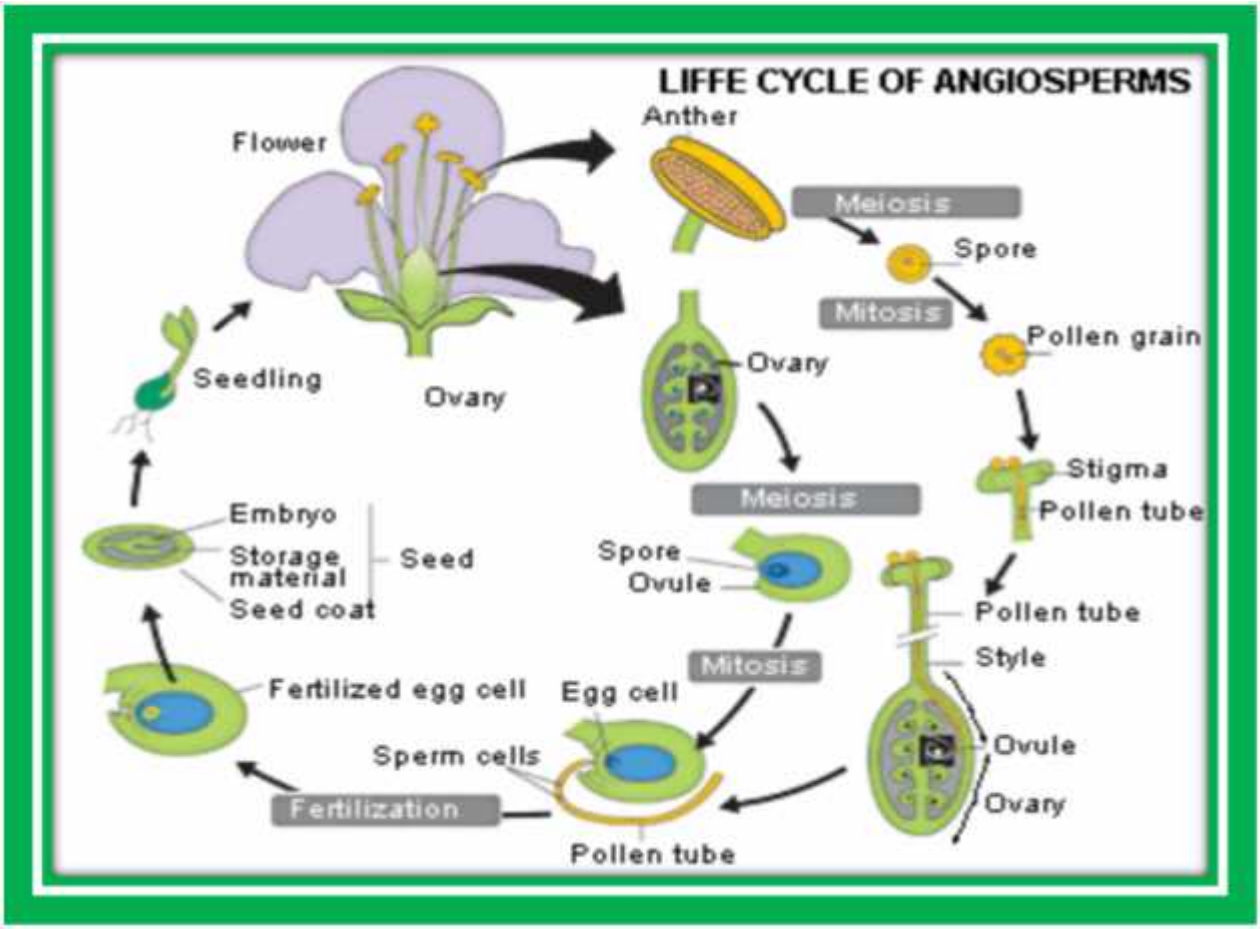


Monocotyledonous seeds: These are the seeds with only one cotyledon.

Dicotyledonous seeds: These are the seeds that have two cotyledons.



3.1.4. Concept of development cycle:



3.2. Reproduction in Gymnosperms

3.2.1. Gametogenesis:

Gametogenesis in gymnosperms is a slow process that usually ends until pollination. Female gametogenesis consists of a coenocytical megagametophyte development, followed by cellularization and differentiation of two or more archegonia.

.2.l.1 Fertilization and cycle of life: