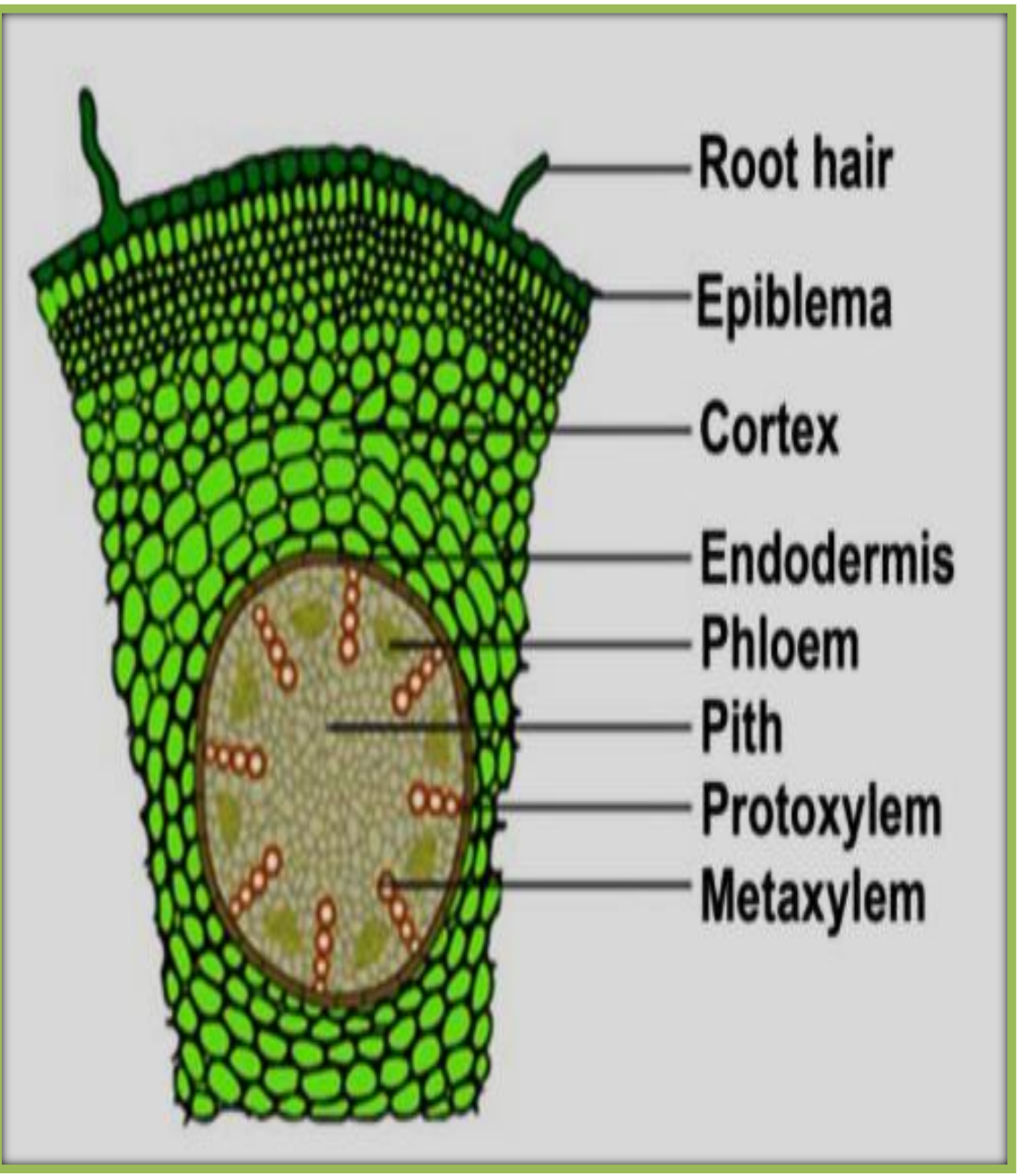
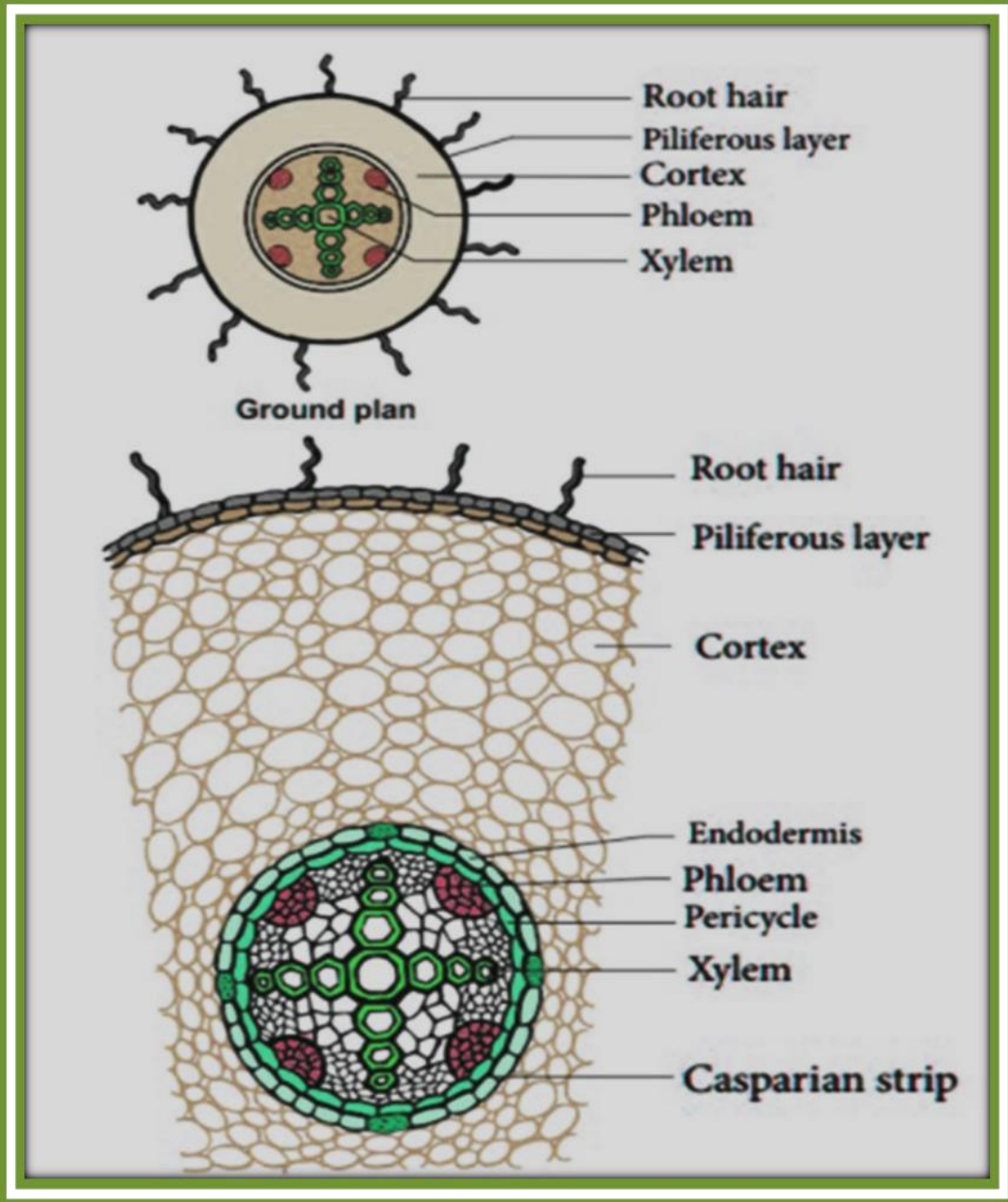
Anatomy of Higher Plants:

Anatomy of root of monocotyledons:

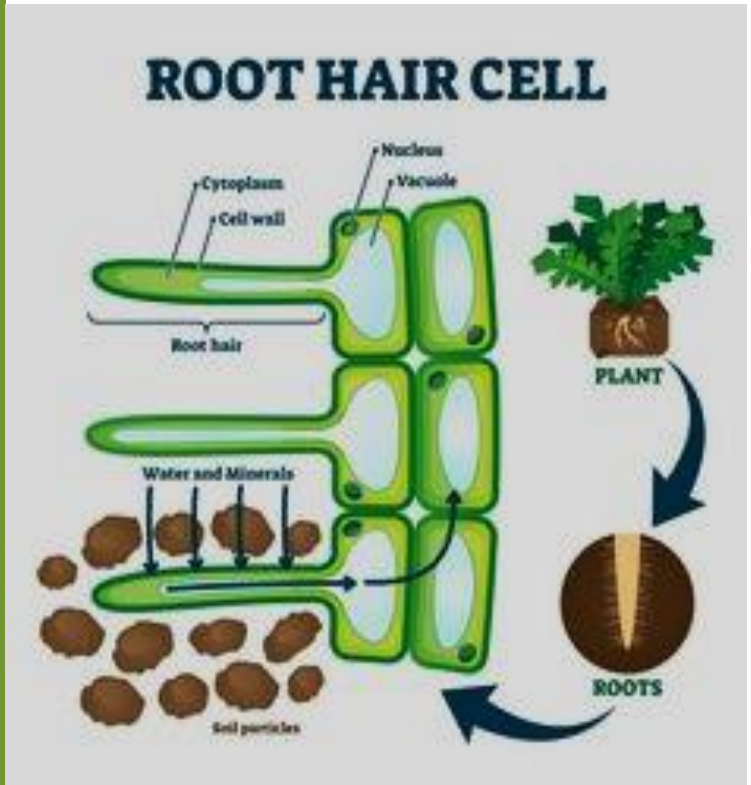


1. Epiblema (Rhizodermis or Piliferous layer):
2. Cortex
3. Endodermis
4. Pericycle
5. Vascular bundles
6. Pith

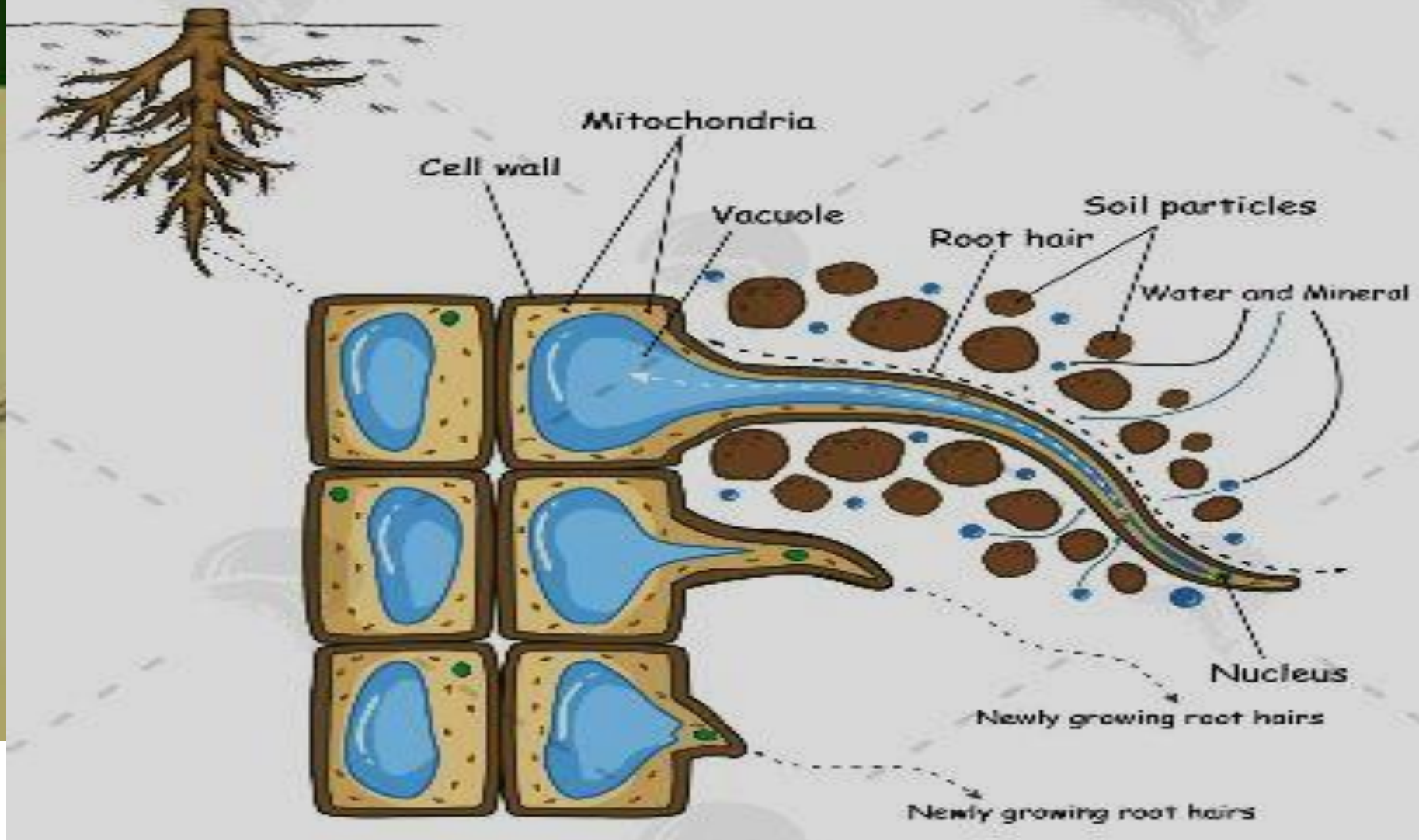
Anatomy of root of dicotyledons:



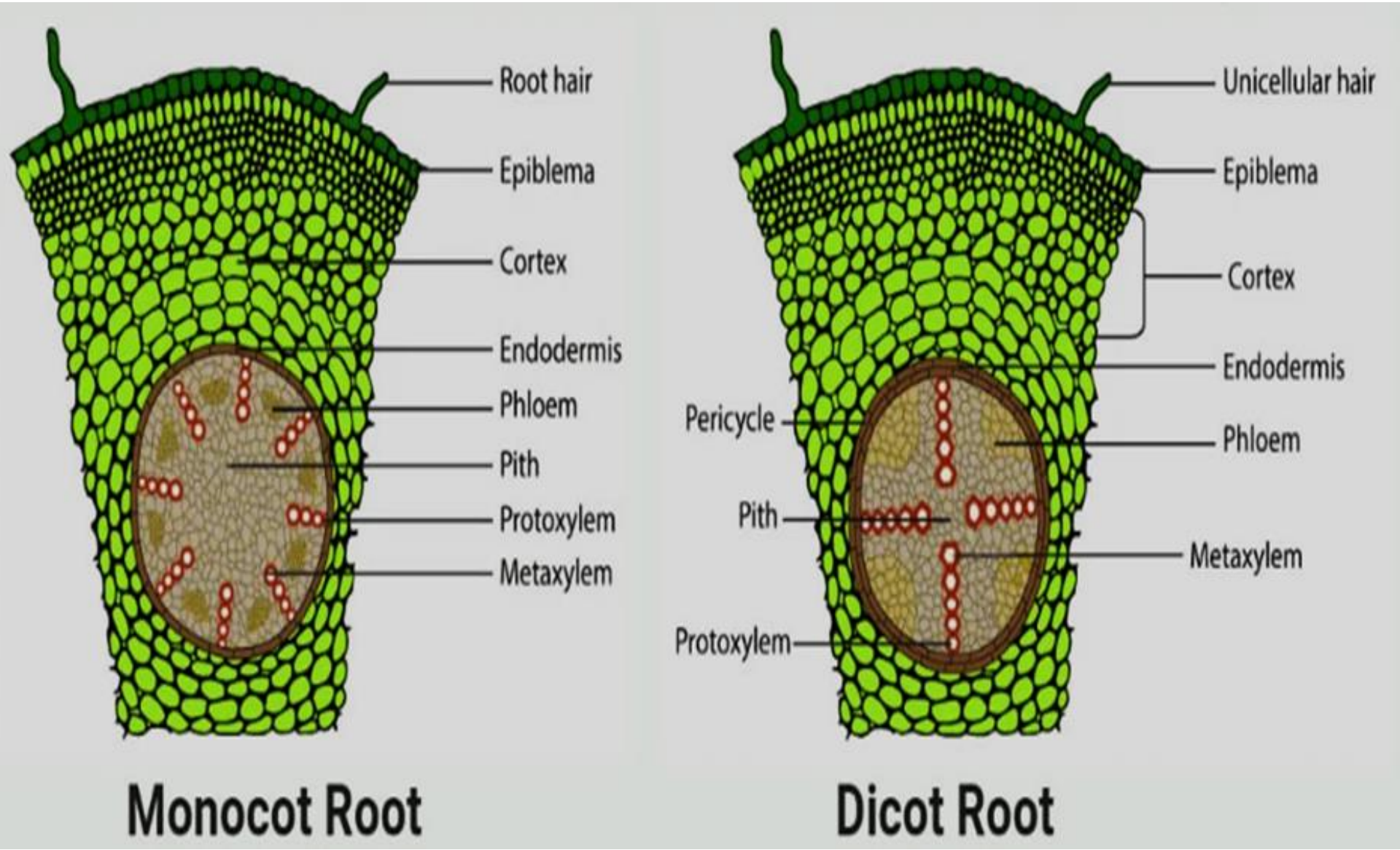
1. Epiblema (Rhizodermis or Piliferous layer)
2. Cortex
3. Endodermis
4. Pericycle
5. Vascular Bundles
6. Pith



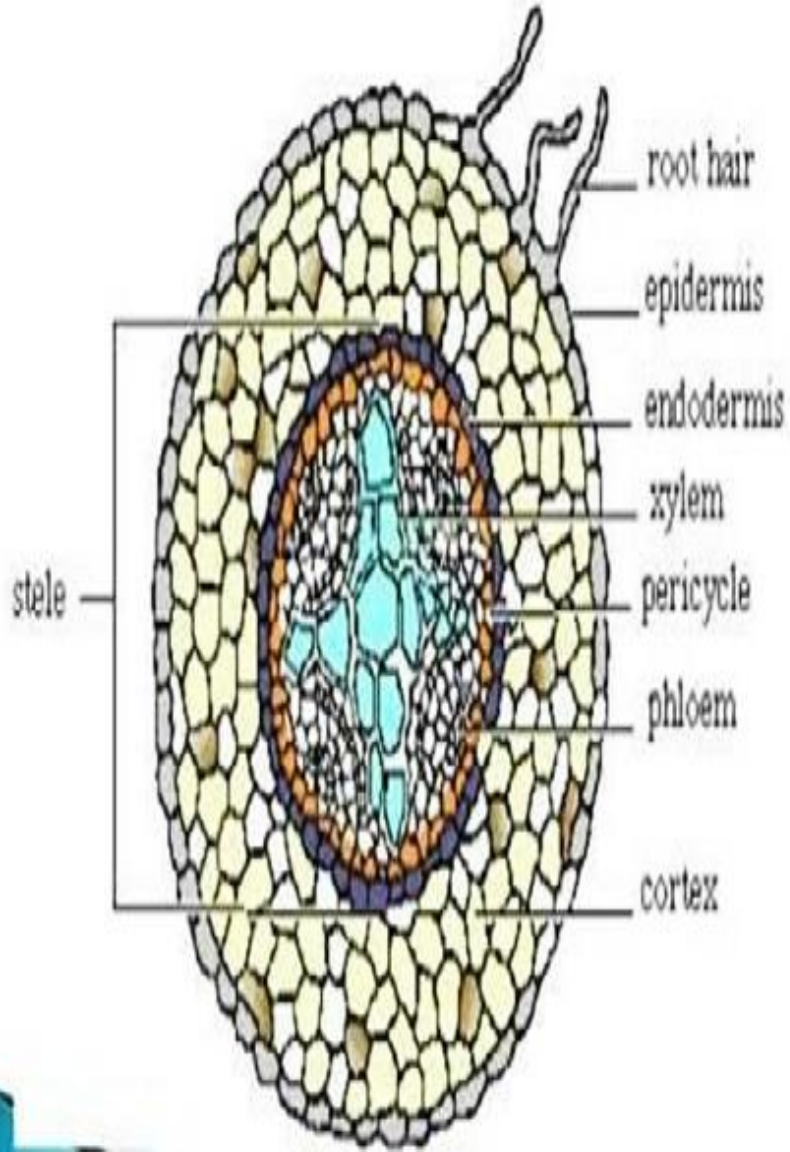
Root hair

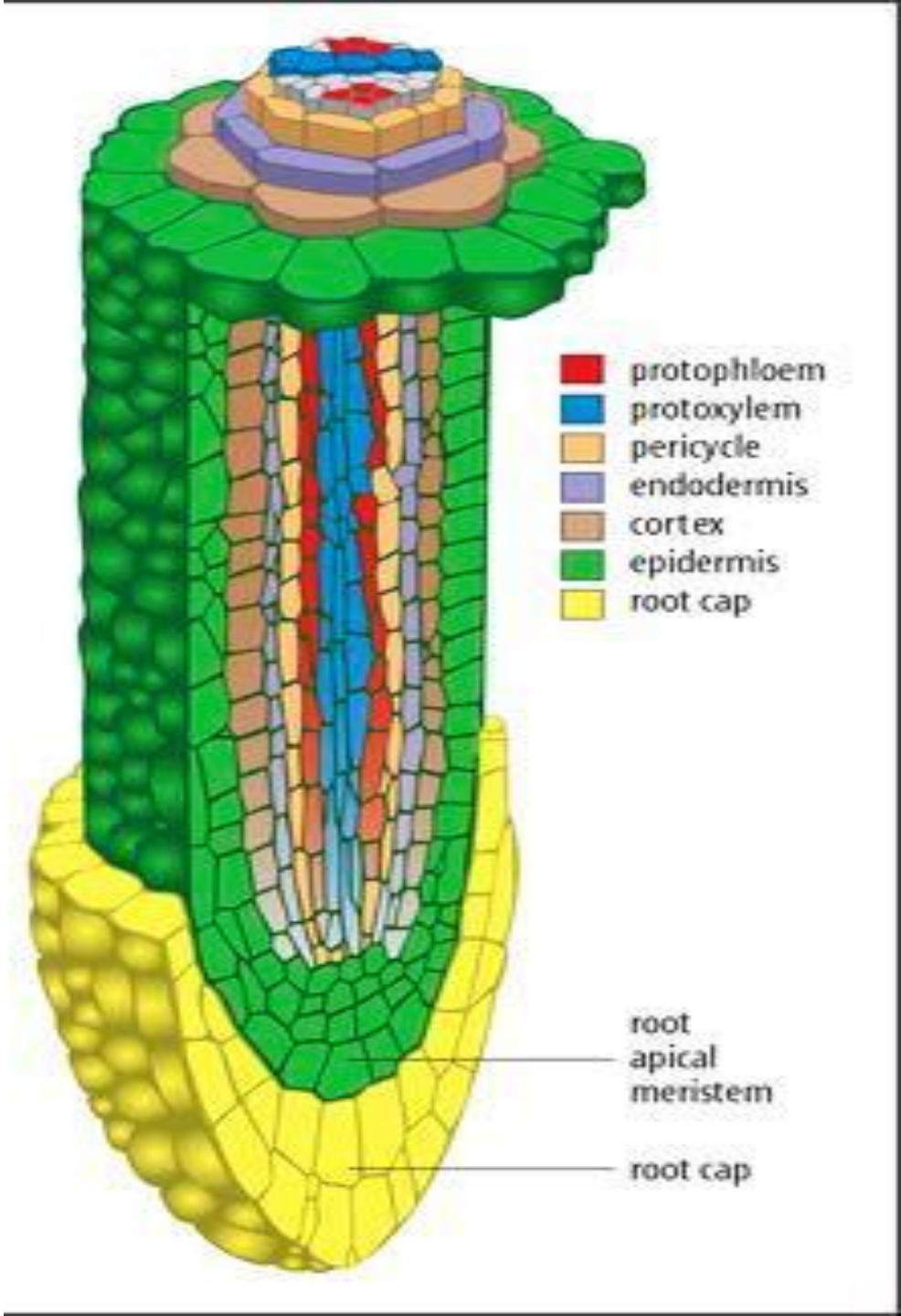

Mitochondria
Cell wall
Vacuole
Soil particles
Root hair
Water and Mineral
Nucleus
Newly growing root hairs
Newly growing root hairs

Monocot and Dicot Roots



Dicot Root


root hair
epidermis
endodermis
xylem
pericycle
phloem
cortex
stele

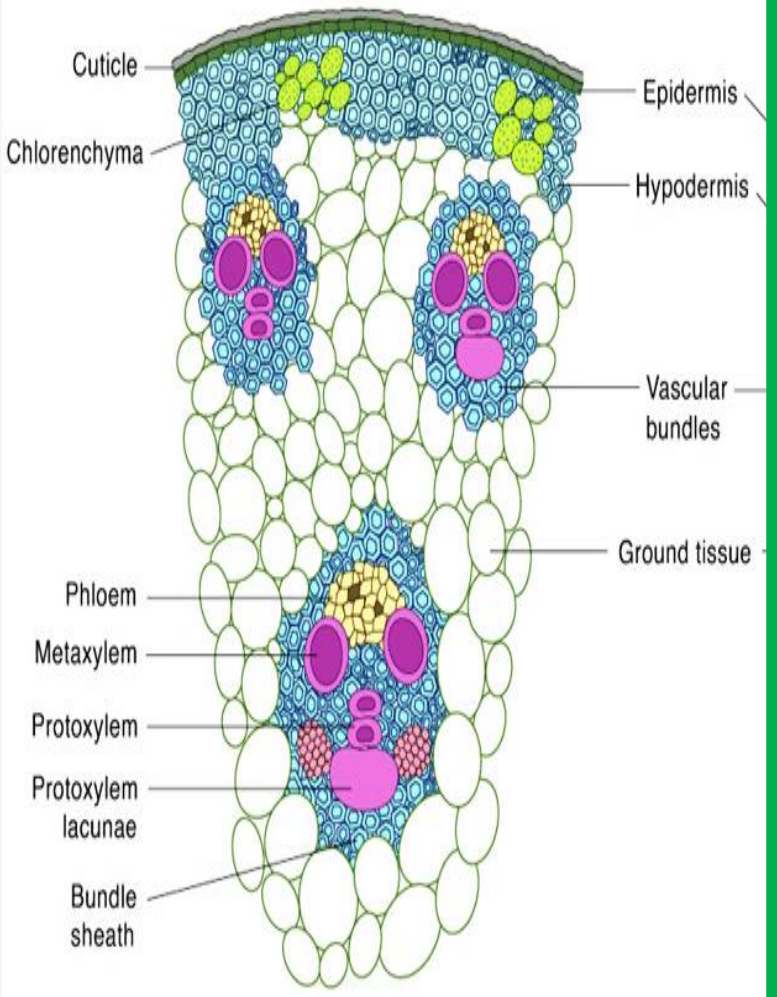

protophloem
protoxylem
pericycle
endodermis
cortex
epidermis
root cap
root apical meristem
root cap

Anatomy of Root

Dicot Root	Monocot Root
1. Cortex is comparatively narrow.	1. Cortex is very wide.
2. Endodermis is less thickened casparian stripes are more prominent.	2. Endodermal cells are highly thickened Casparian strips are visible only in young roots.
3. The xylem and phloem bundles varies from 2 to 5.	3. Xylem and phloem are more than 6 (polyarch).
4. Pith is absent or very small.	4. Well developed pith is present.
5. Secondary growth takes place with the help of vascular cambium and cork cambium	5. Secondary growth is absent.

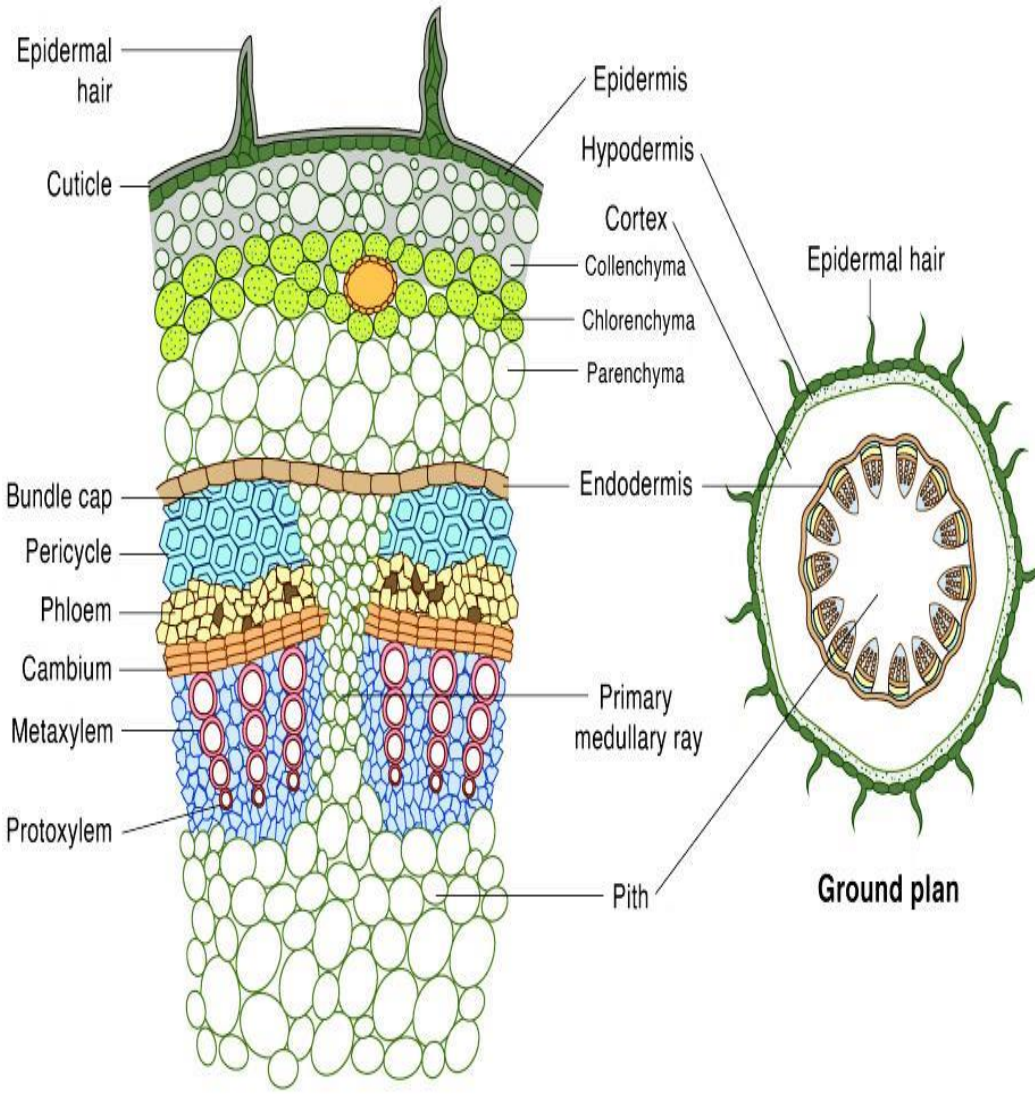
Stem

Monocot Stem



Transverse Section (T.S.)

Dicot Stem

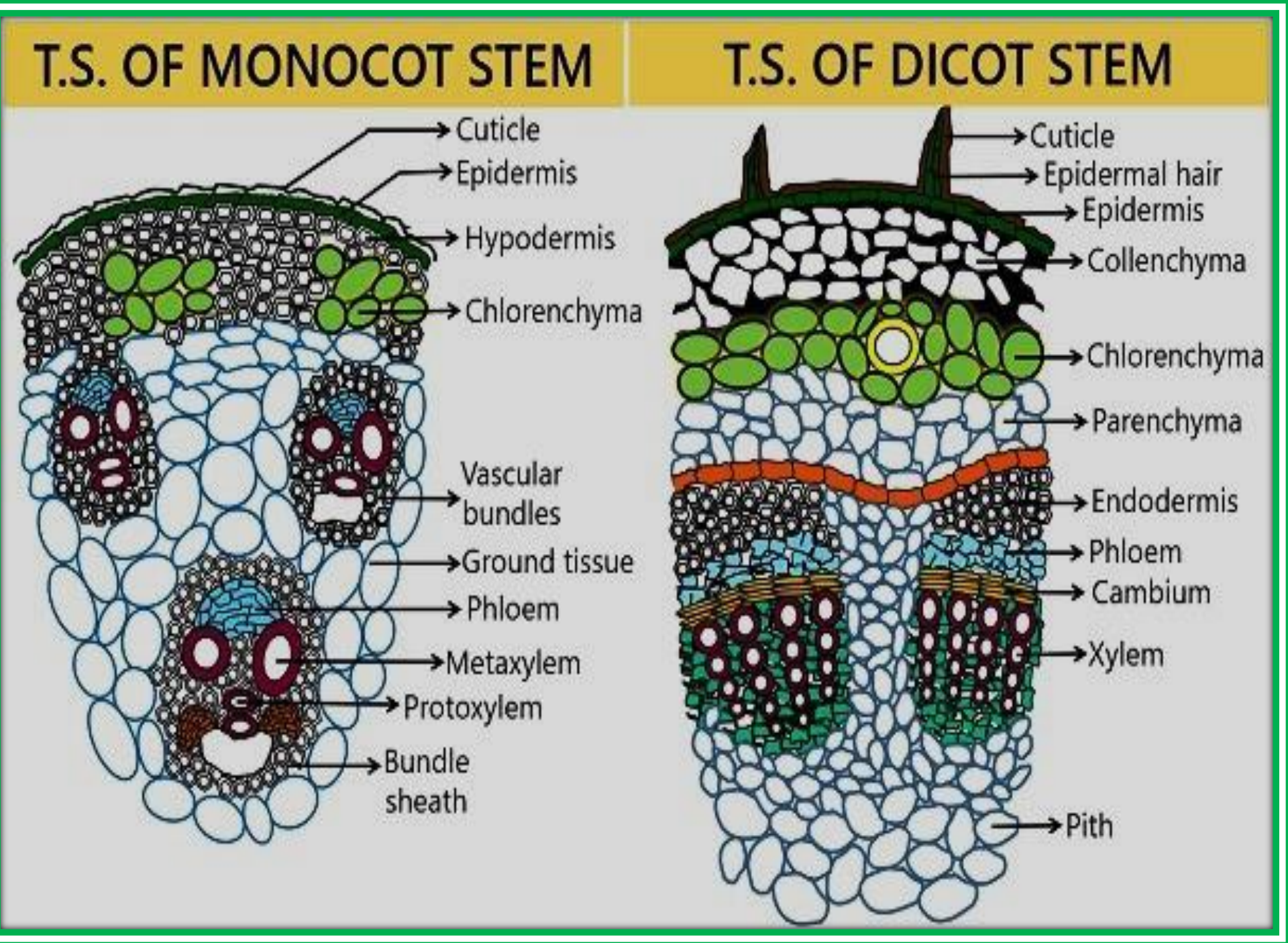


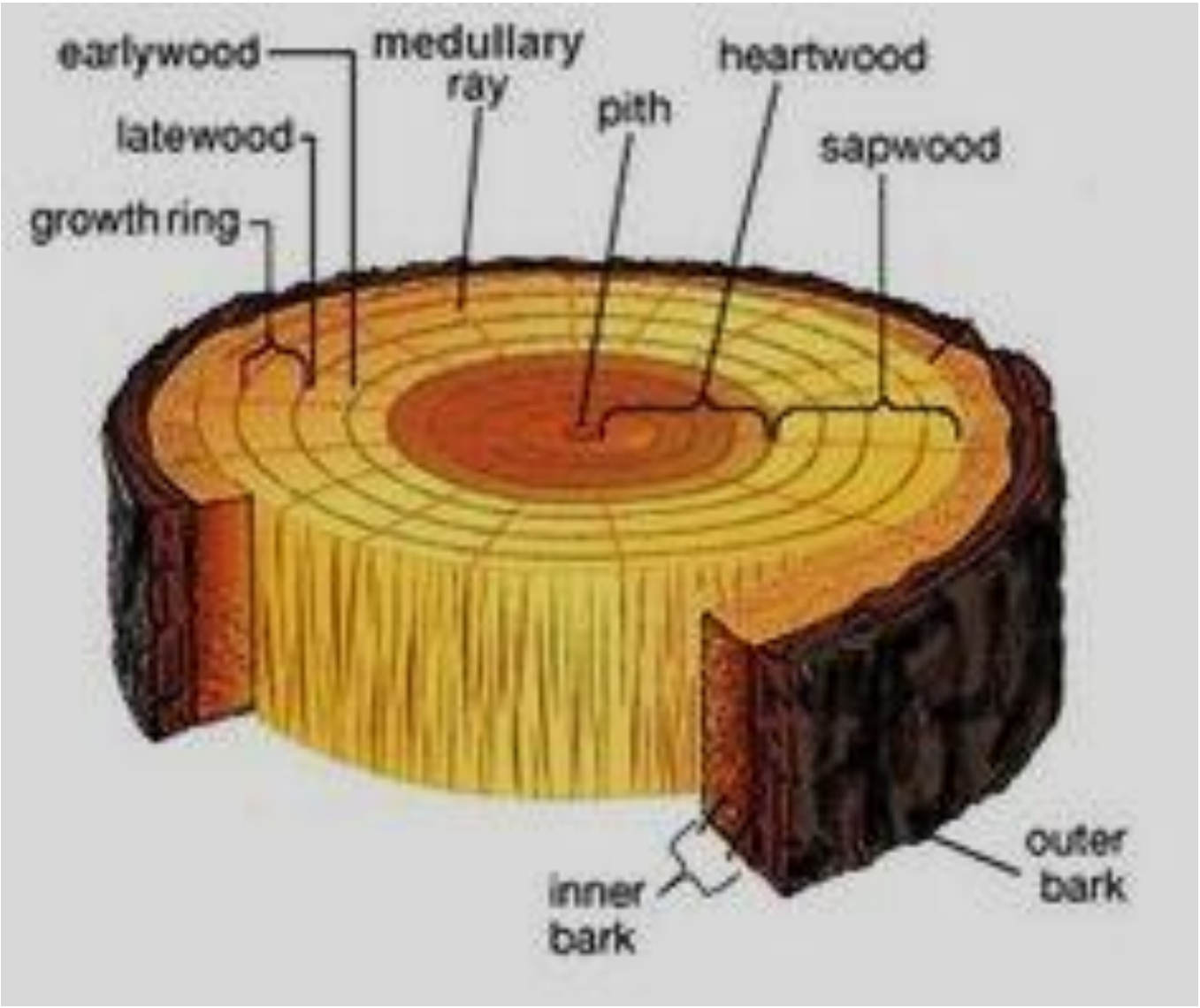
Transverse Section (T.S.)

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.


T.S. OF MONOCOT STEM
Cuticle
Epidermis
Hypodermis
Chlorenchyma
Vascular bundles
Ground tissue
Phloem
Metaxylem
Protoxylem
Bundle sheath
T.S. OF DICOT STEM
Cuticle
Epidermal hair
Epidermis
Collenchyma
Chlorenchyma
Parenchyma
Endodermis
Phloem
Cambium
Xylem
Pith


earlywood
latewood
growth ring
medullary ray
pith
heartwood
sapwood
inner bark
outer bark

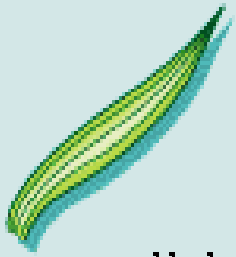
Leaves


apex
margin
apex
margin
ash
poplar
aspen
pecan
maple
birch
oak
lilac
chestnut
elm
rowan
palm
holly
willow
magnolia
linden

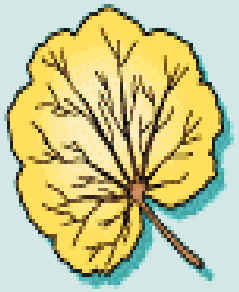
Types of leaves and their names

VENATION

pinnate



parallel

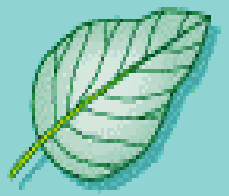


palmate

SHAPES

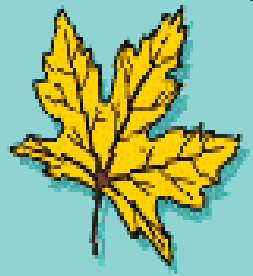
linear

obovate



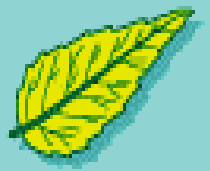
ovate

pinnately lobed



palmately lobed

reniform



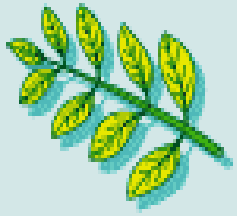
lanceolate

sagittate

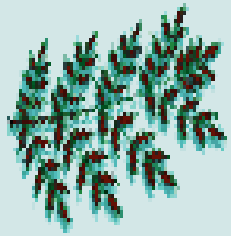
ARRANGEMENT

simple

palmately compound

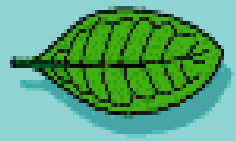


pinnately compound



bipinnately

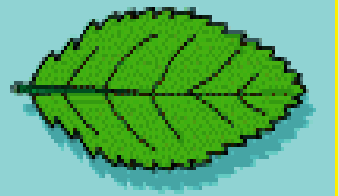
MARGINS



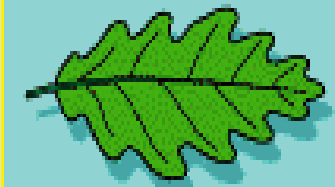
entire

crenate

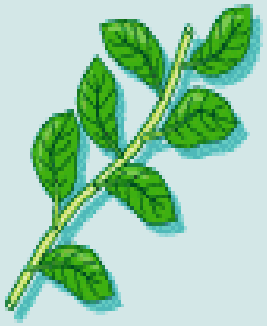
dentate



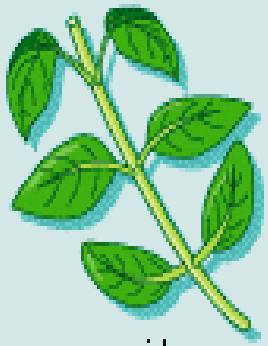
serrate



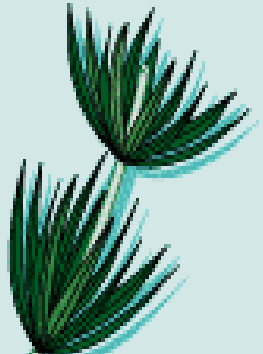
ARRANGEMENT ON THE STEM



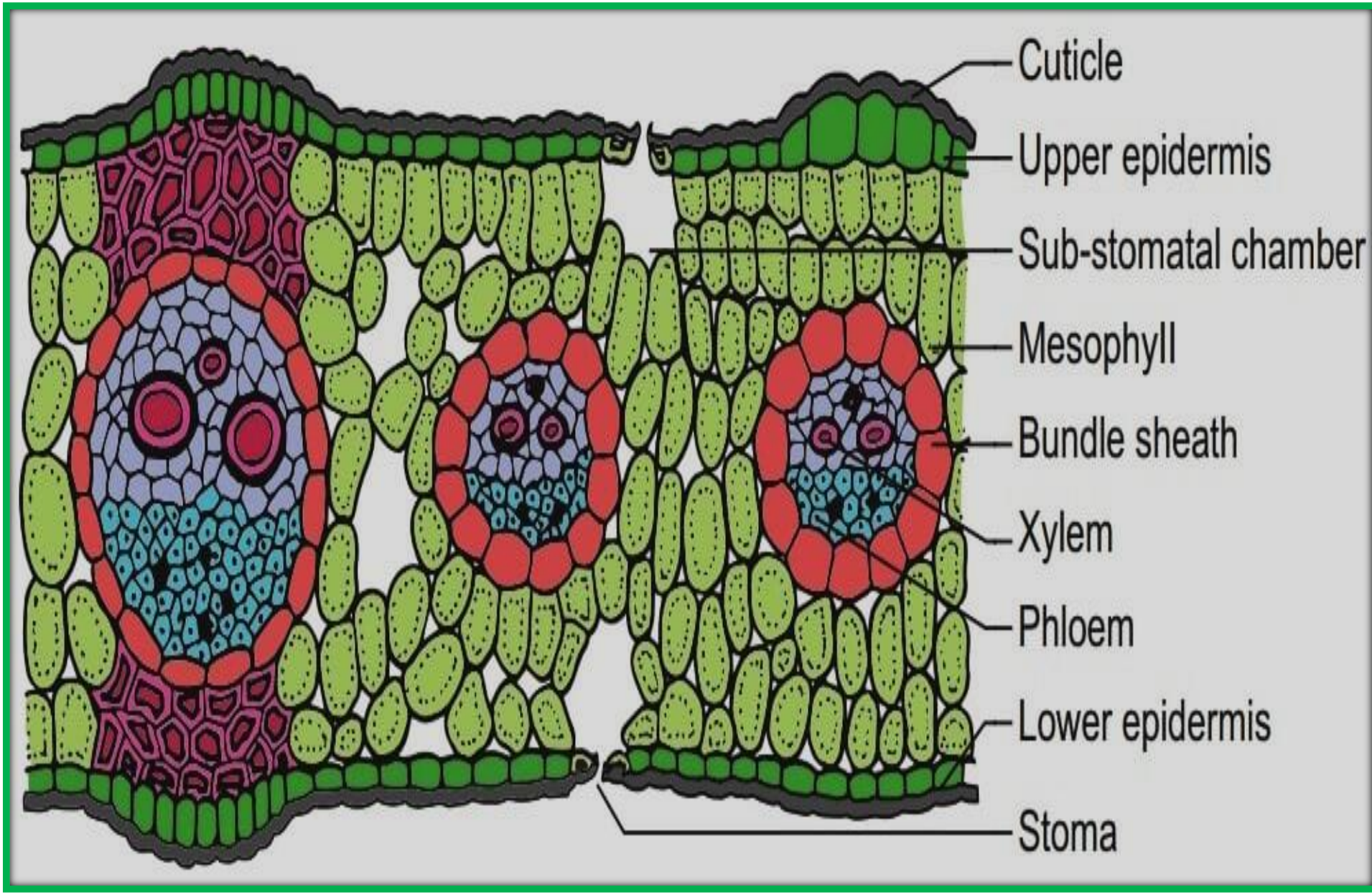
alternate



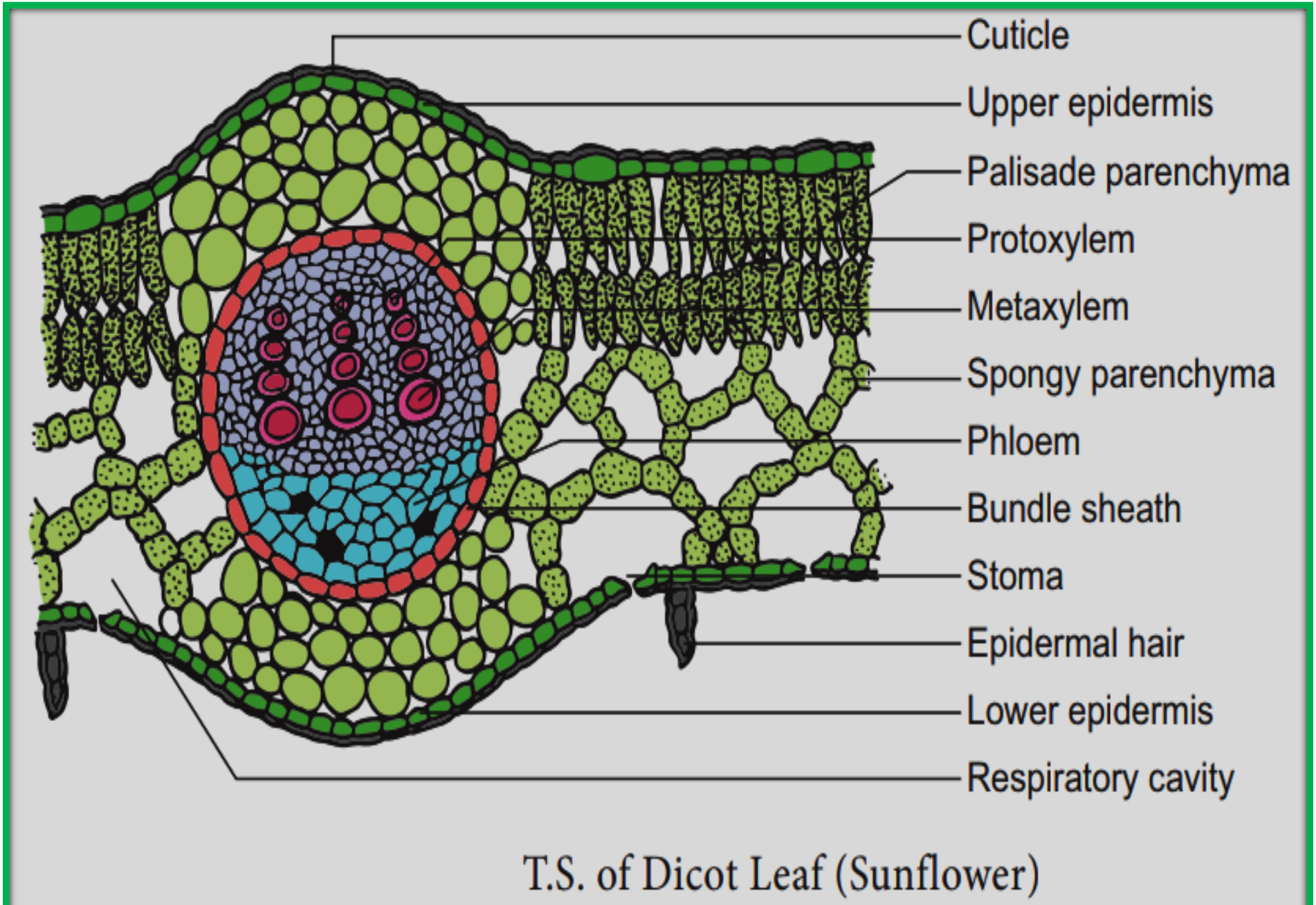
opposite



Anatomical structure of a monocotyledon leaf:



Anatomical structure of a dicotyledonous leaf:



T.S. of Dicot Leaf (Sunflower)

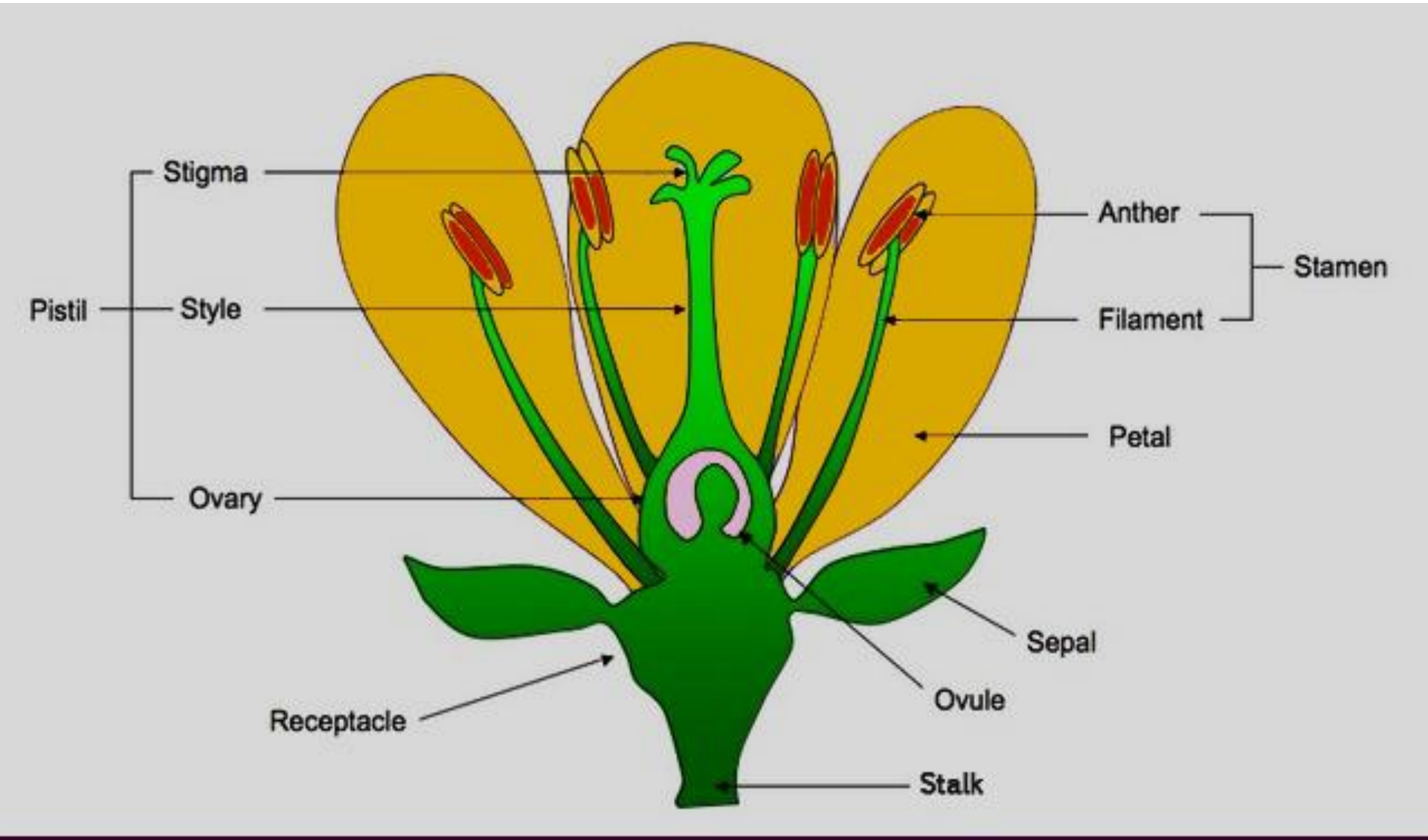
Anatomical comparison between monocotyledonous and dicotyledonous leaves

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

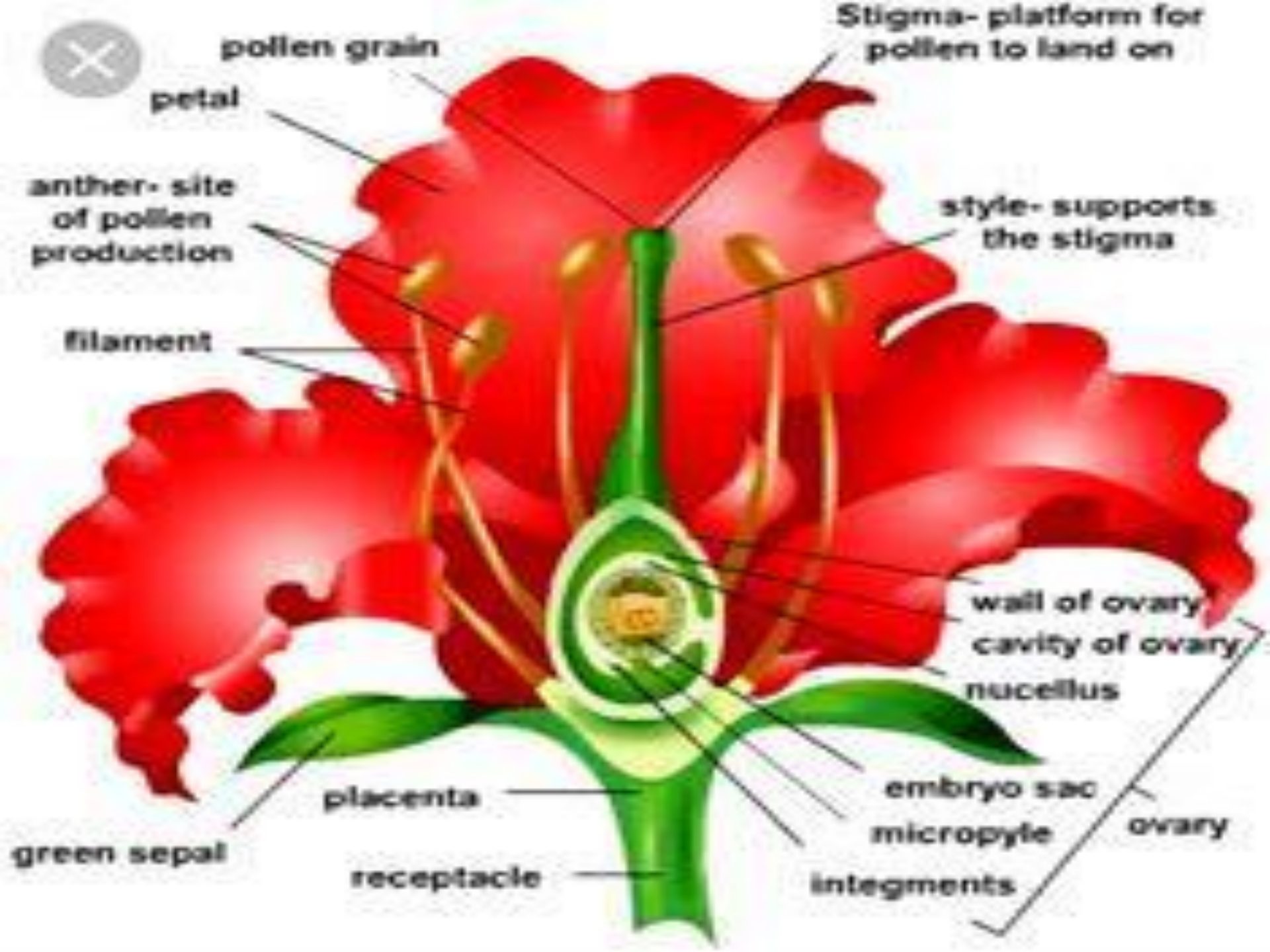
Chapter 3: Reproduction in higher plants:

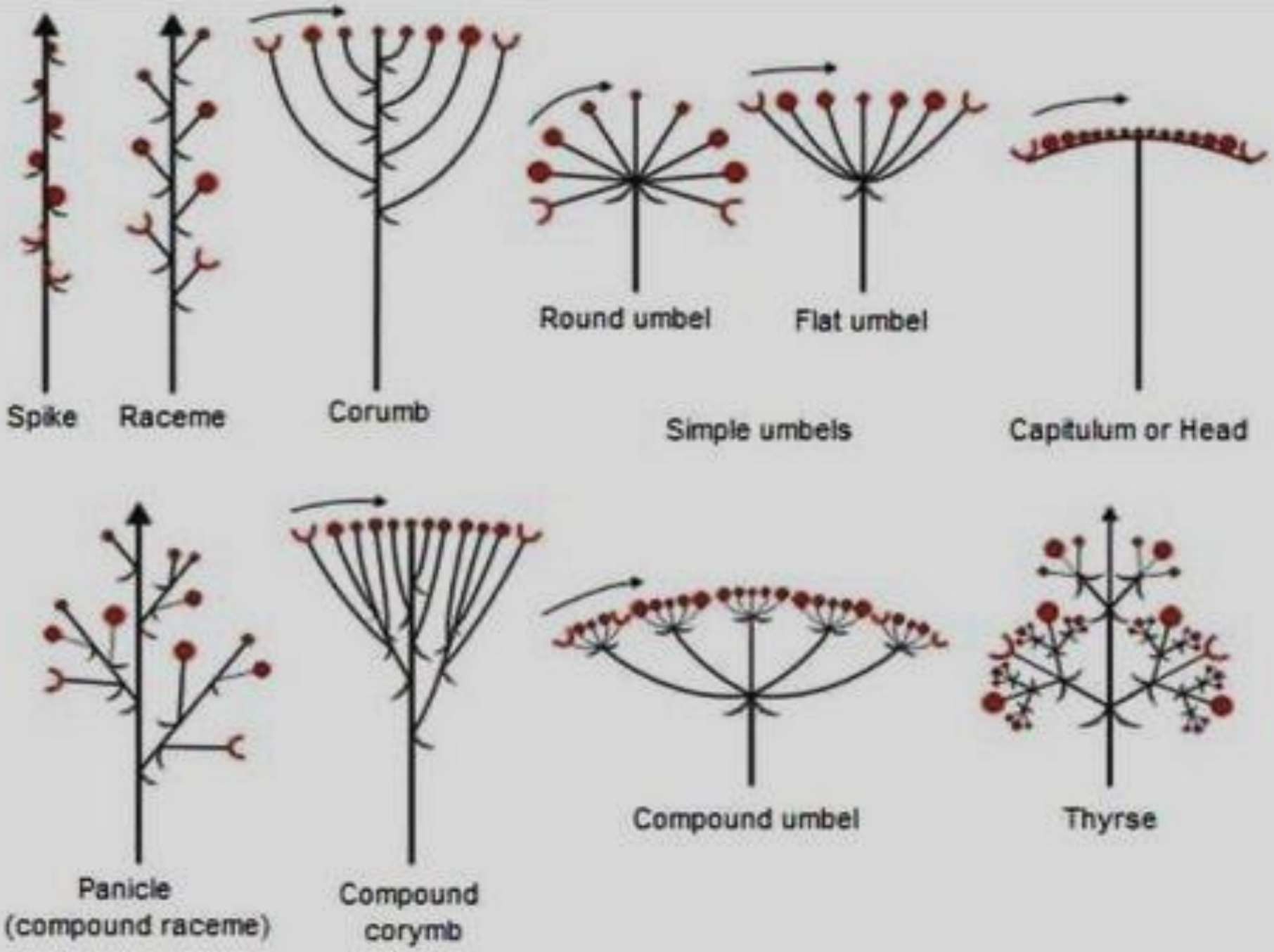
Reproduction in Angiosperms:

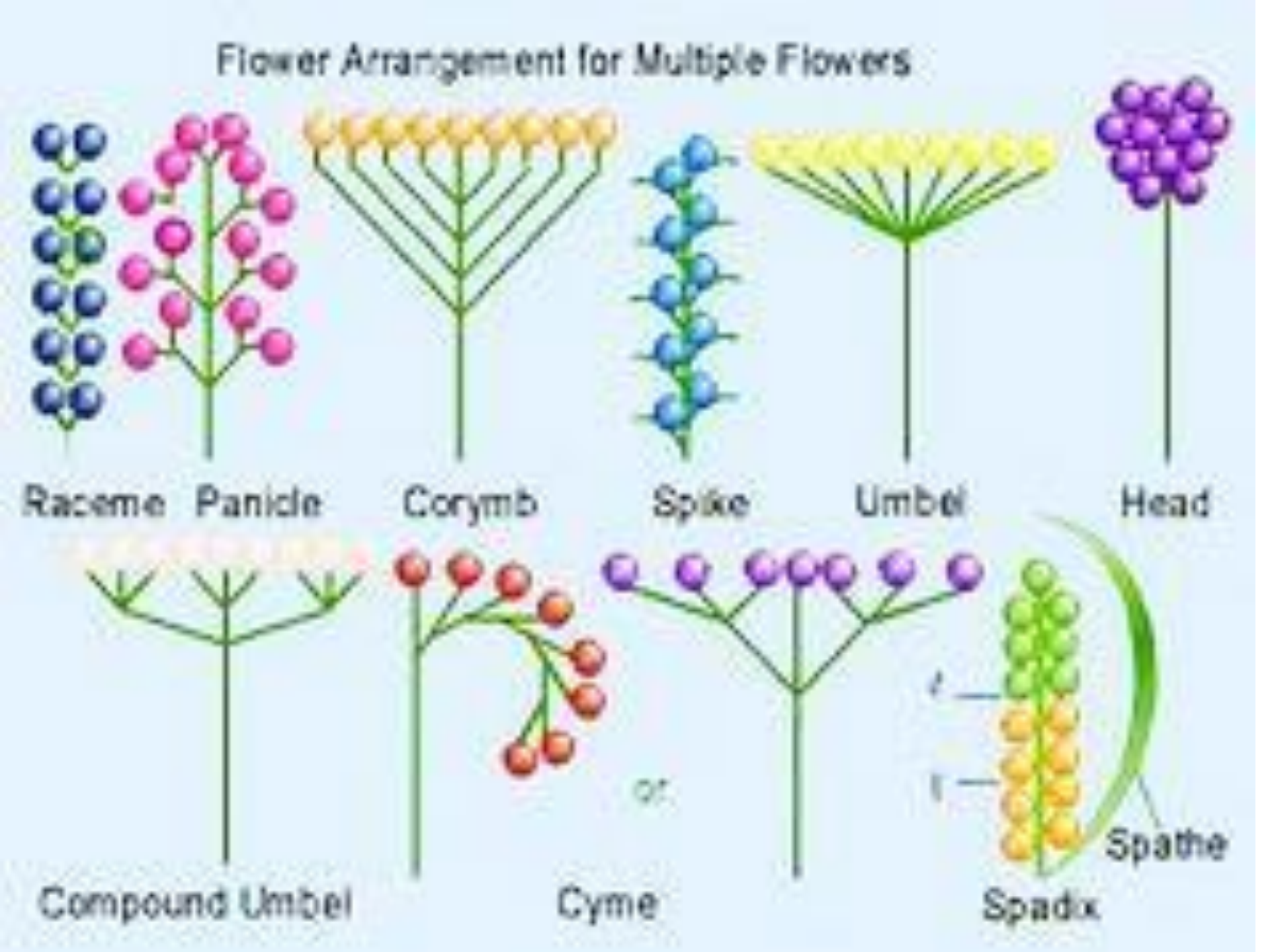
Gametogenesis:



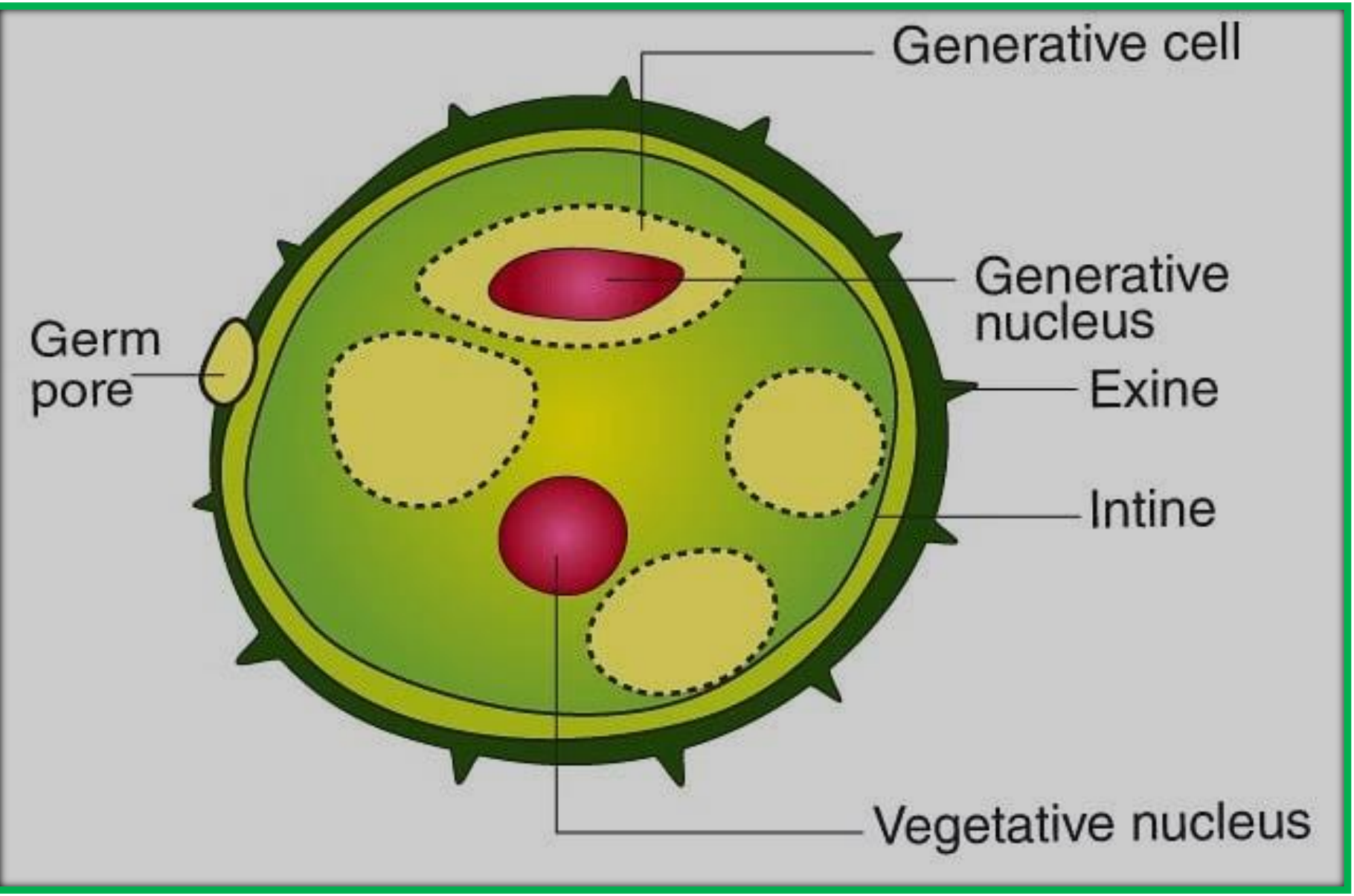
Parts of a flower


Stigma- platform for pollen to land on
pollen grain
petal
anther- site of pollen production
style- supports the stigma
filament
wall of ovary
cavity of ovary
nucellus
embryo sac
micropyle
integments
ovary
placenta
green sepal
receptacle

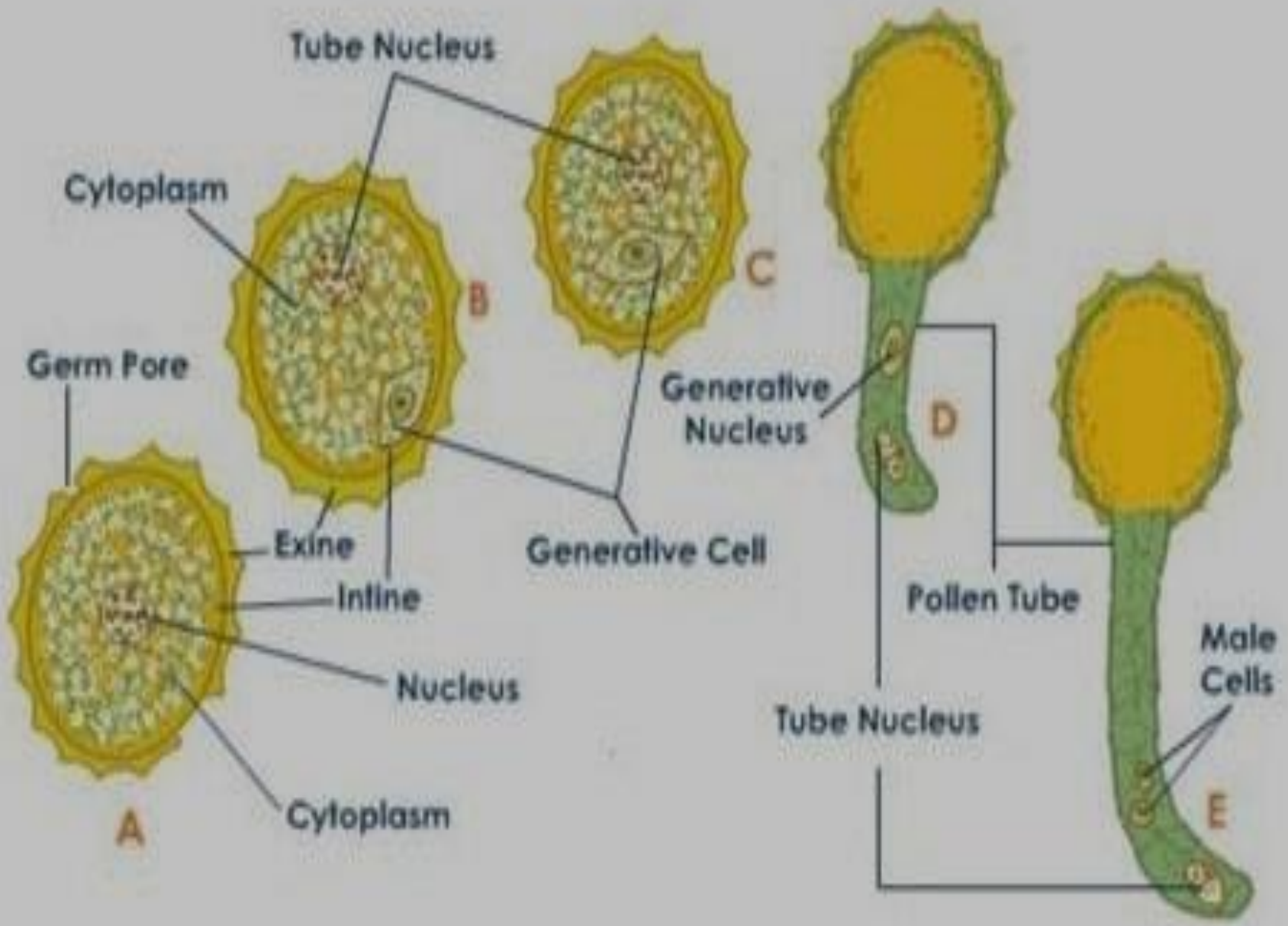

Spike
Raceme
Corumb
Round umbel
Flat umbel
Simple umbels
Capitulum or Head
Panicle
(compound raceme)
Compound
corymb
Compound umbel
Thyrse


Flower Arrangement for Multiple Flowers
Raceme
Panicle
Corymb
Spike
Umbel
Head
Compound Umbel
Cyme
or
Spathe
Spadix

Pollen grain:

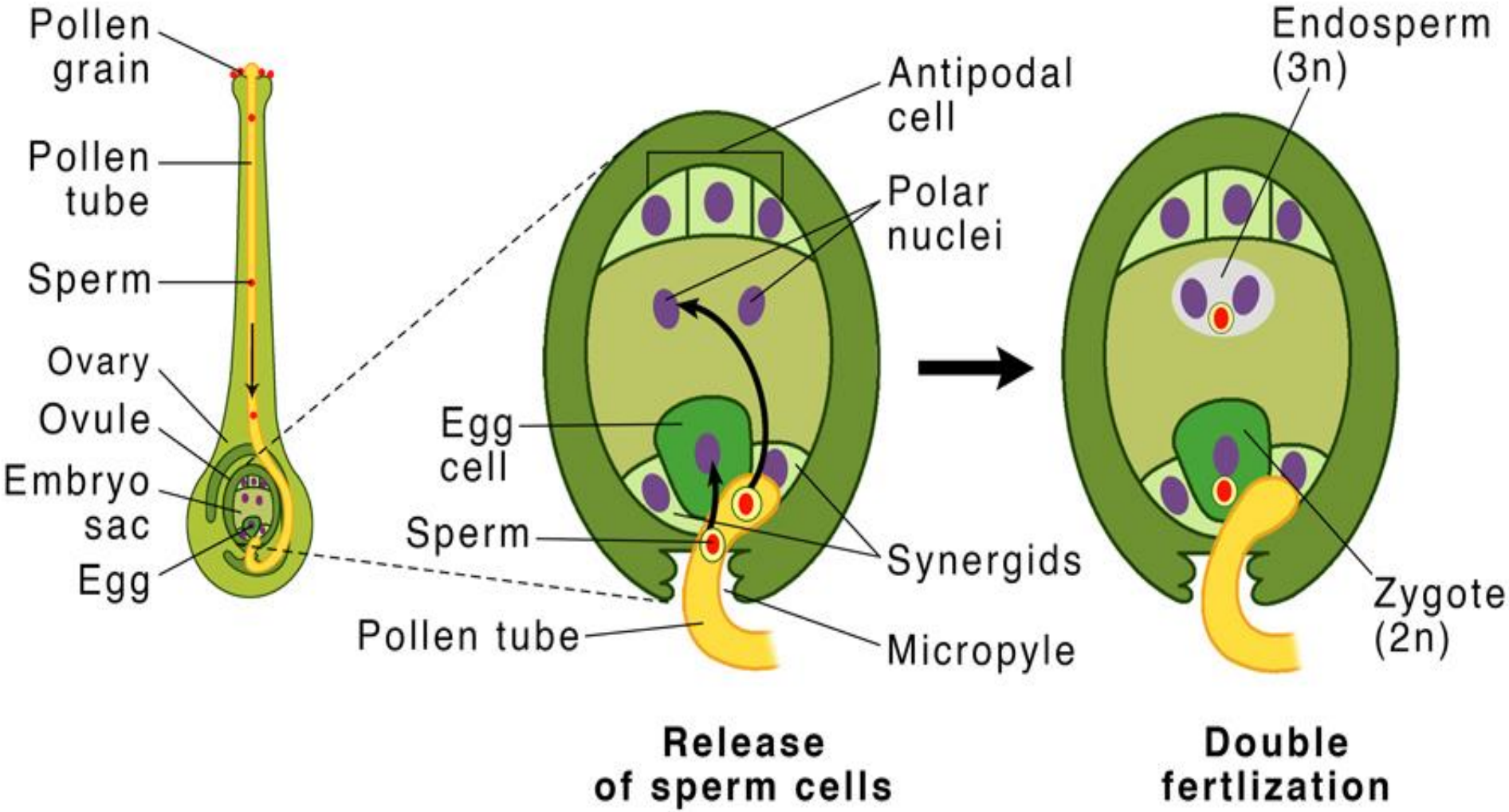


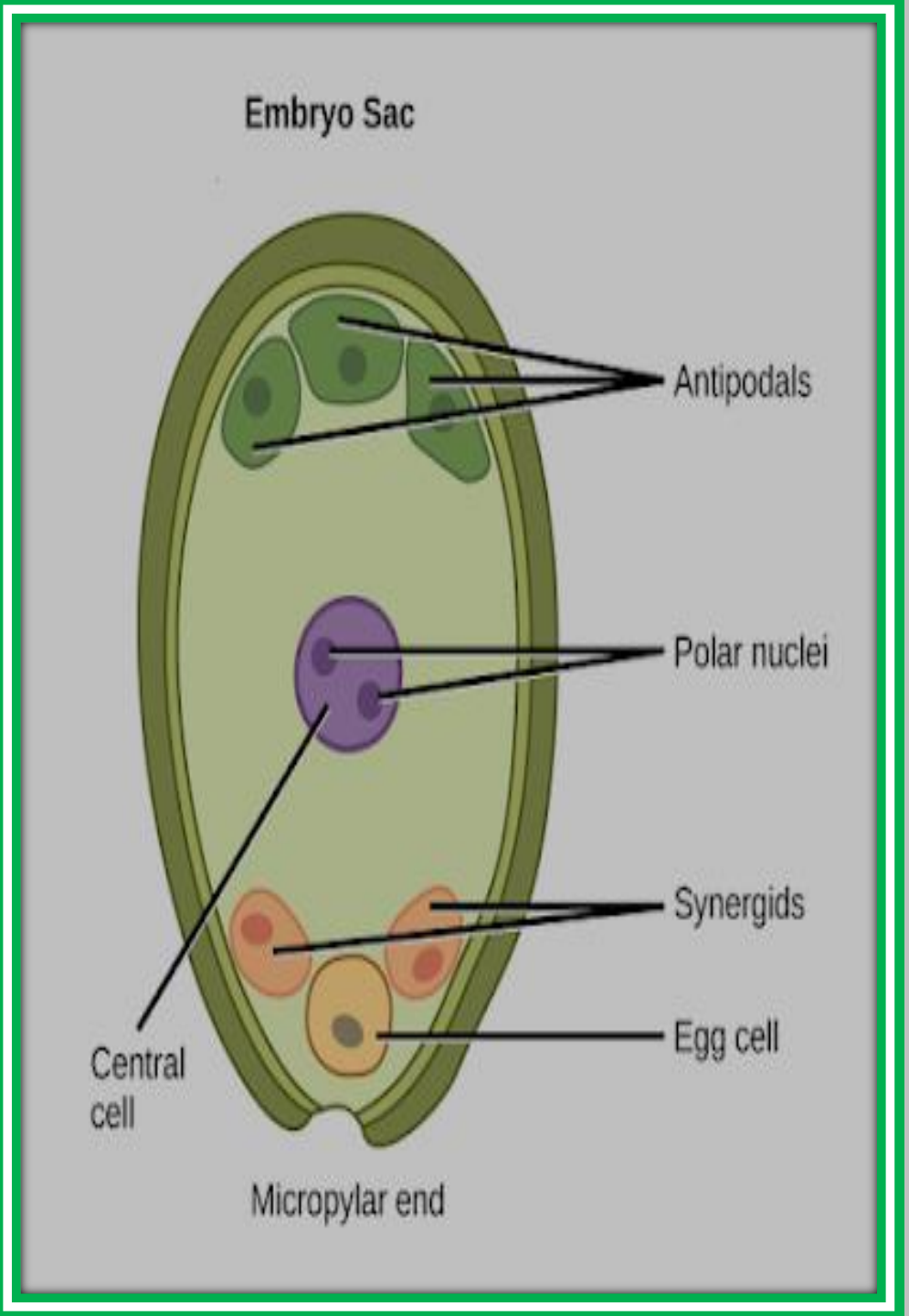
Egg and embryo sac:

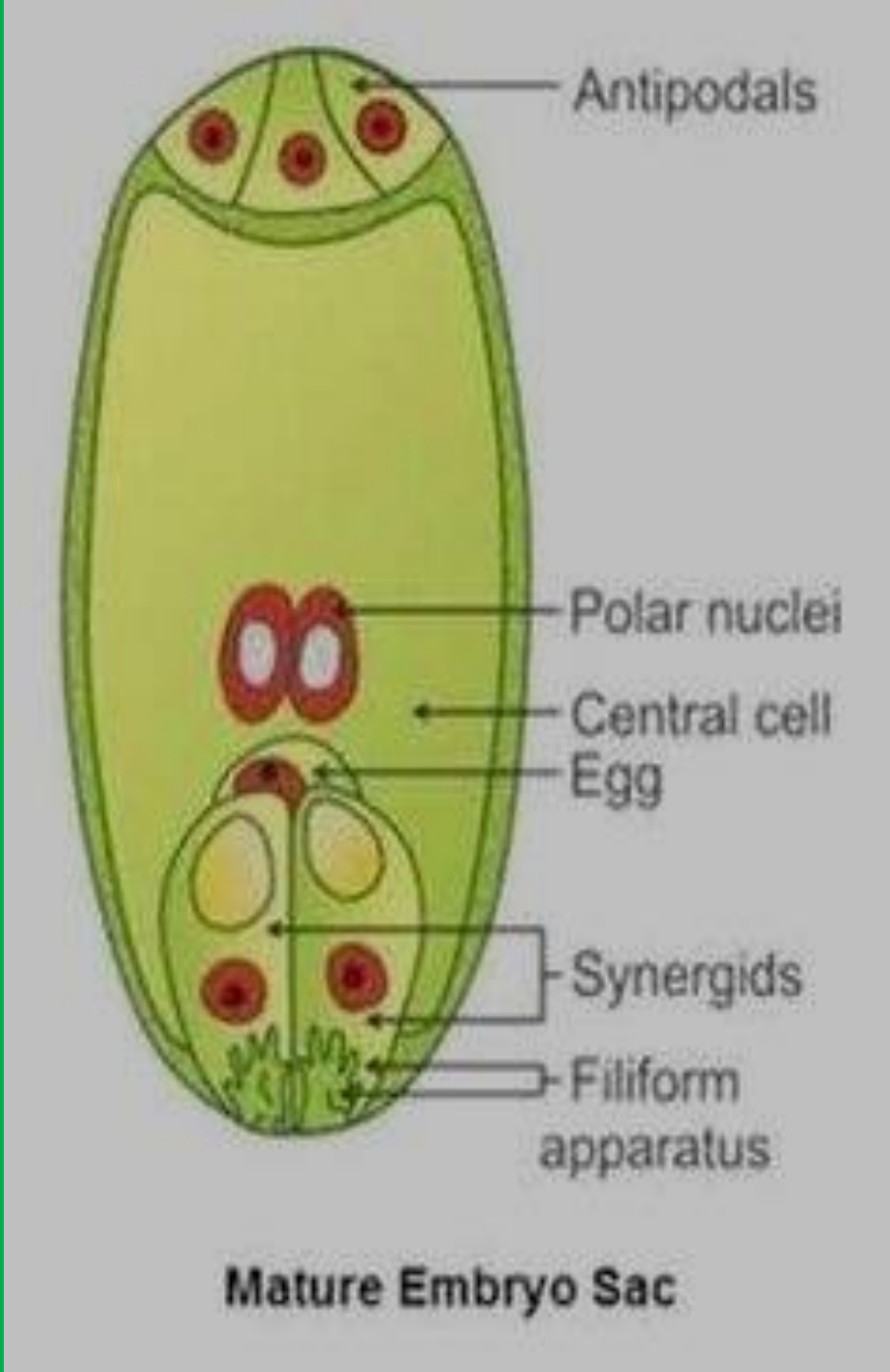


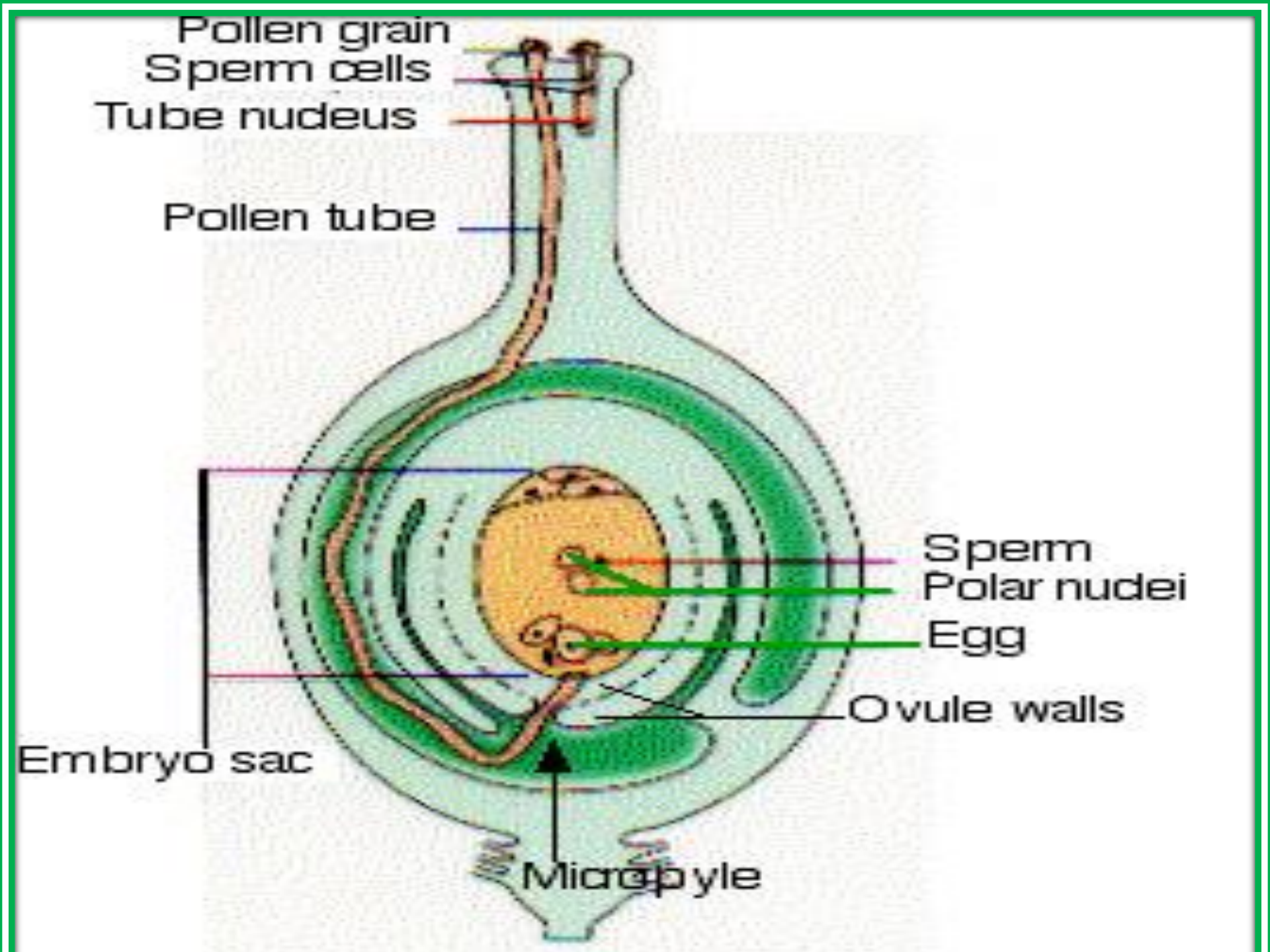
Double Fertilization

ScienceFacts.net

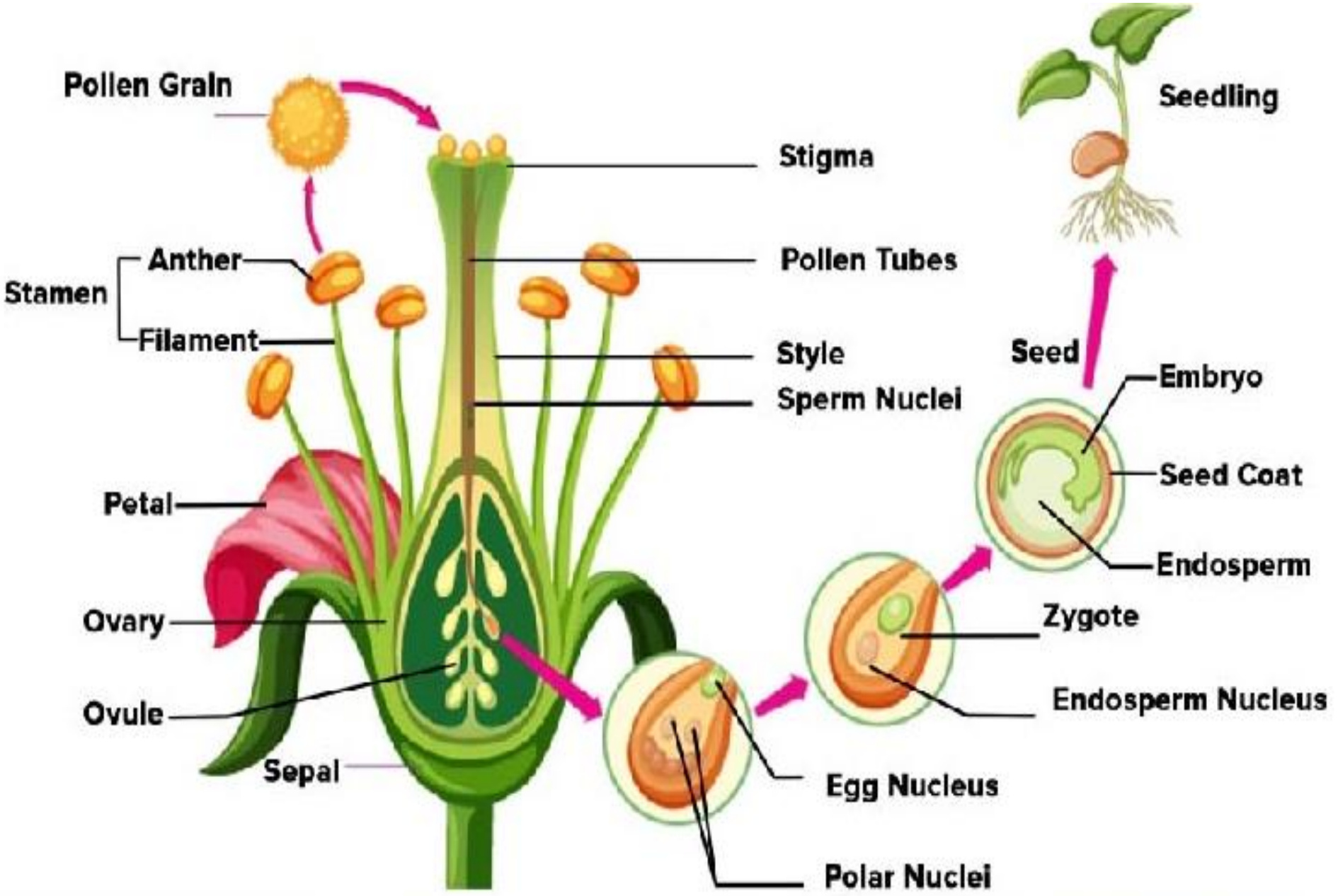


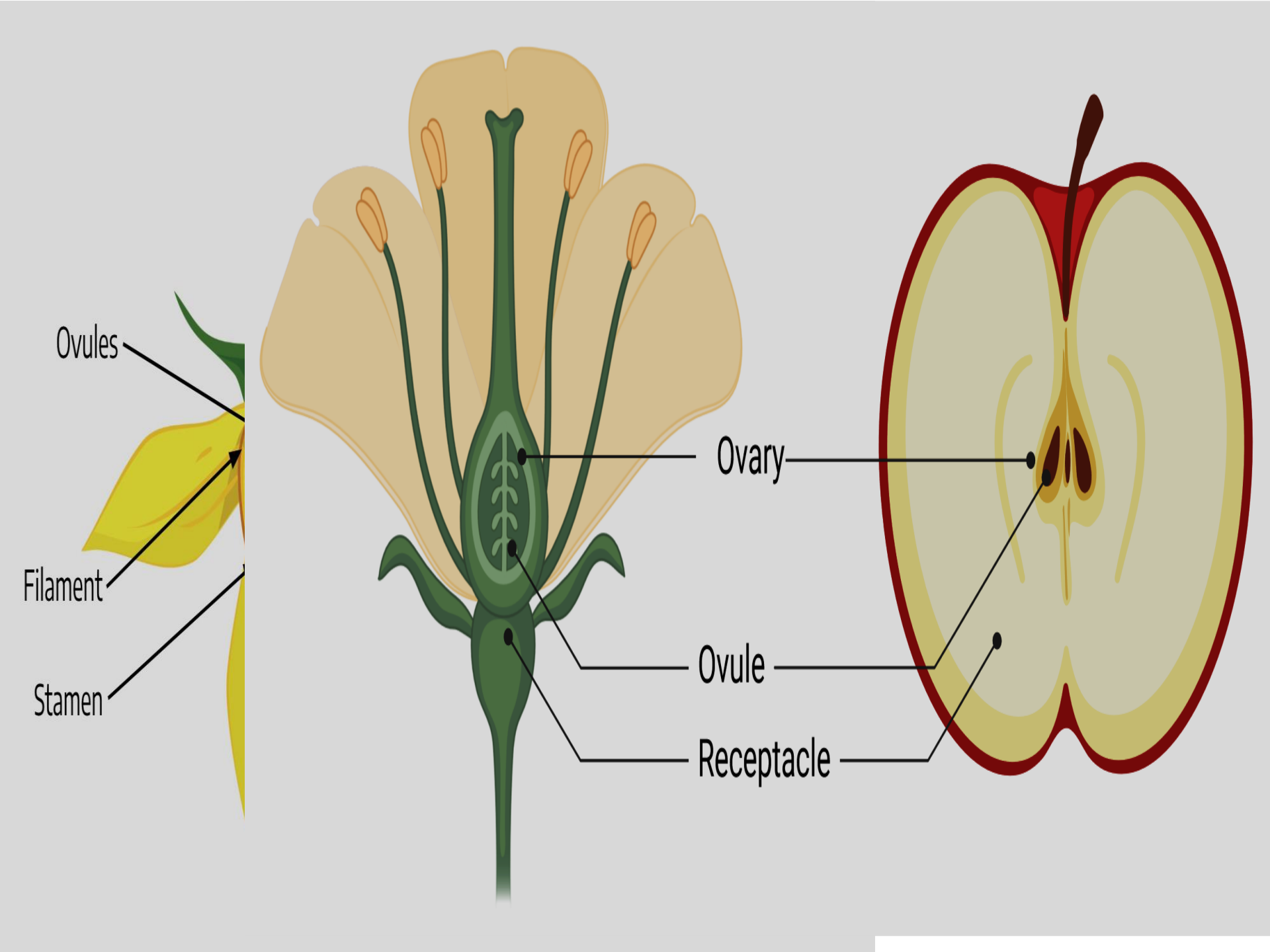

Embryo Sac
Antipodals
Polar nuclei
Synergids
Egg cell
Central cell
Micropylar end

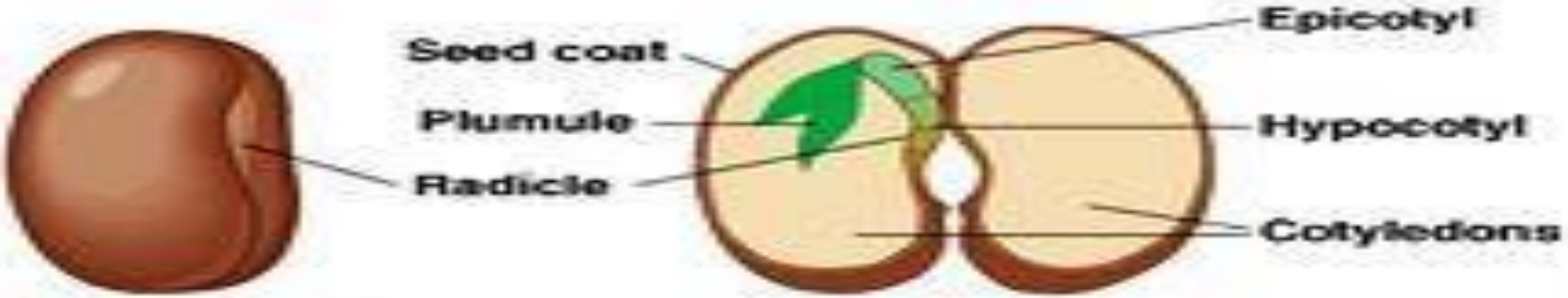

Antipodals
Polar nuclei
Central cell
Egg
Synergids
Filiform apparatus
Mature Embryo Sac


Pollen grain
Sperm cells
Tube nudeus
Pollen tube
Sperm
Polar nudei
Egg
Ovule walls
Embryo sac
Micropyle

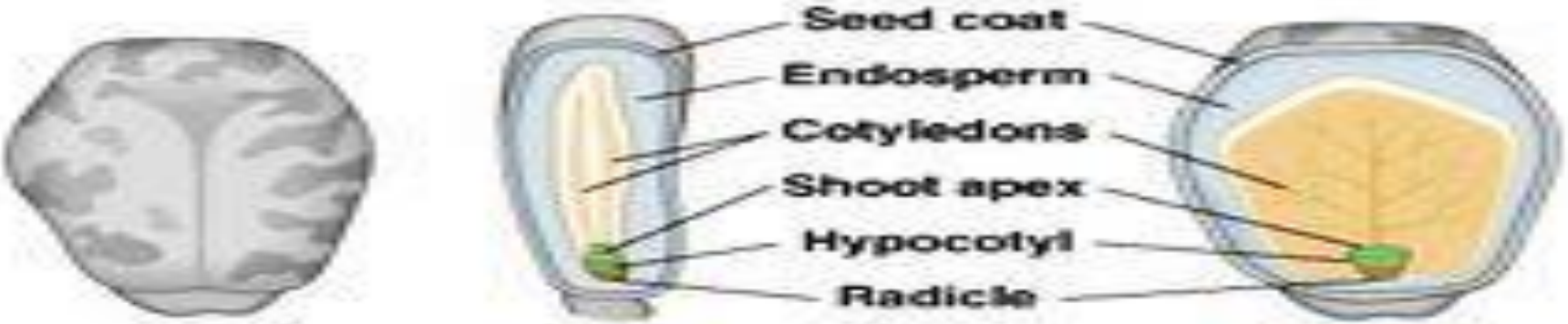
POST FERTILISATION



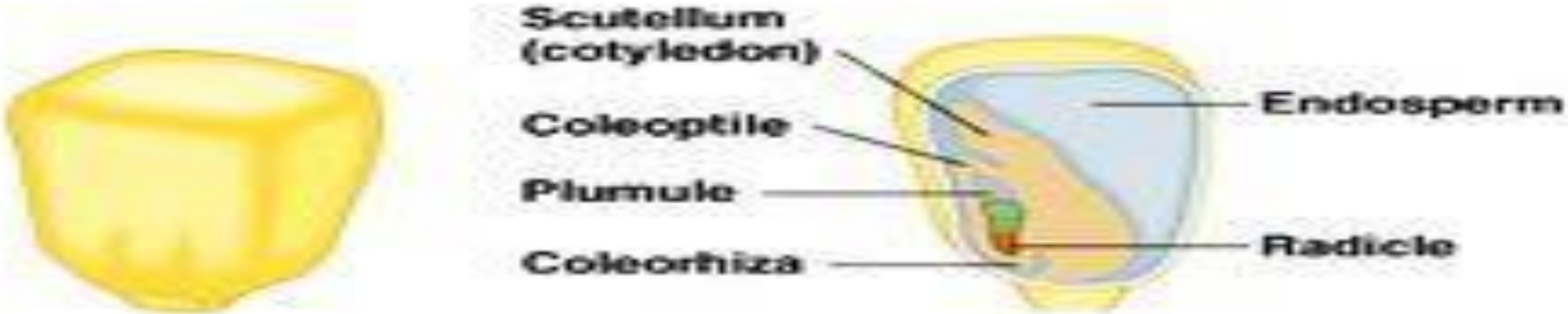

Ovules
Filament
Stamen
Ovary
Ovule
Receptacle



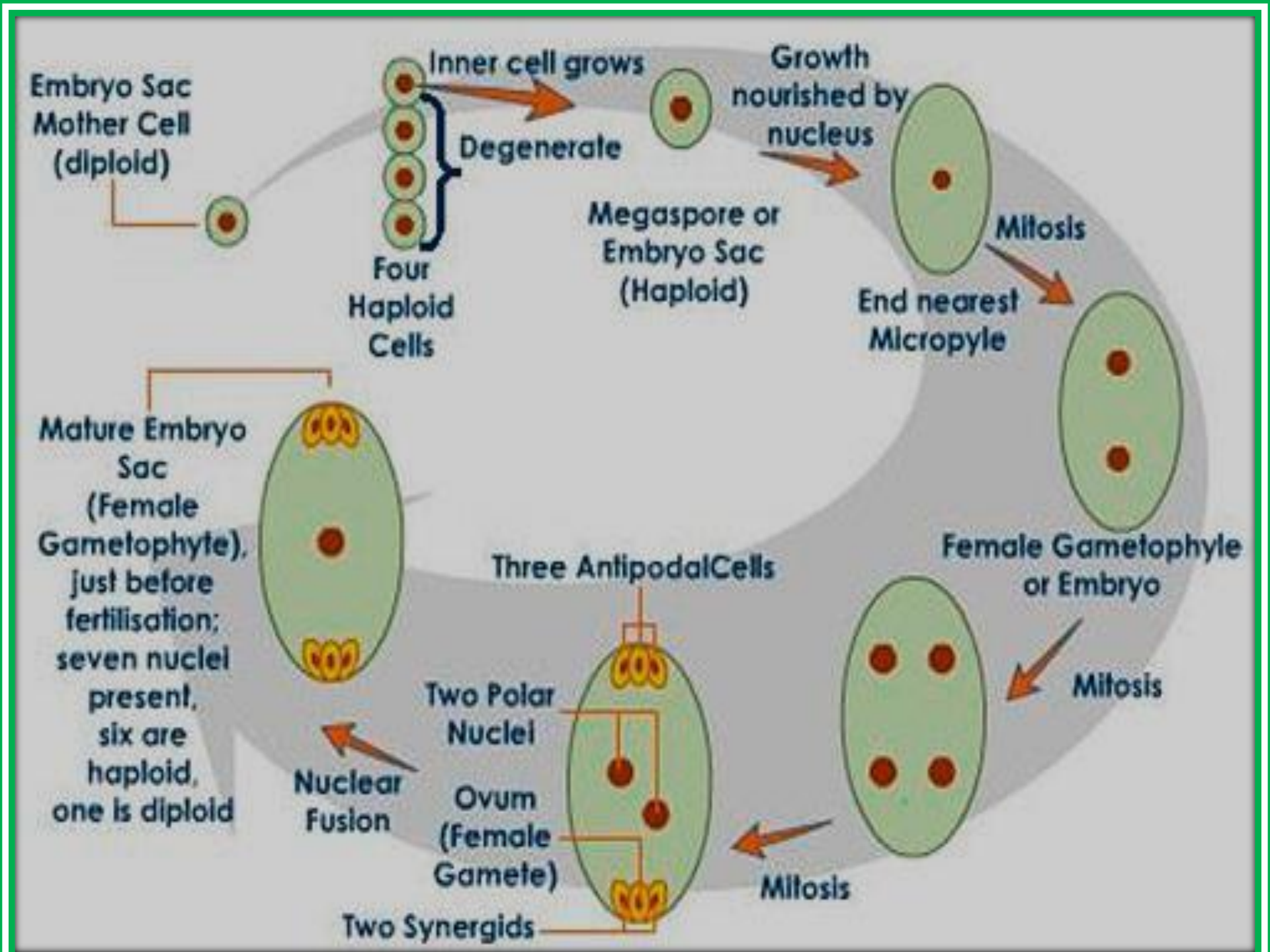
(a) Common bean



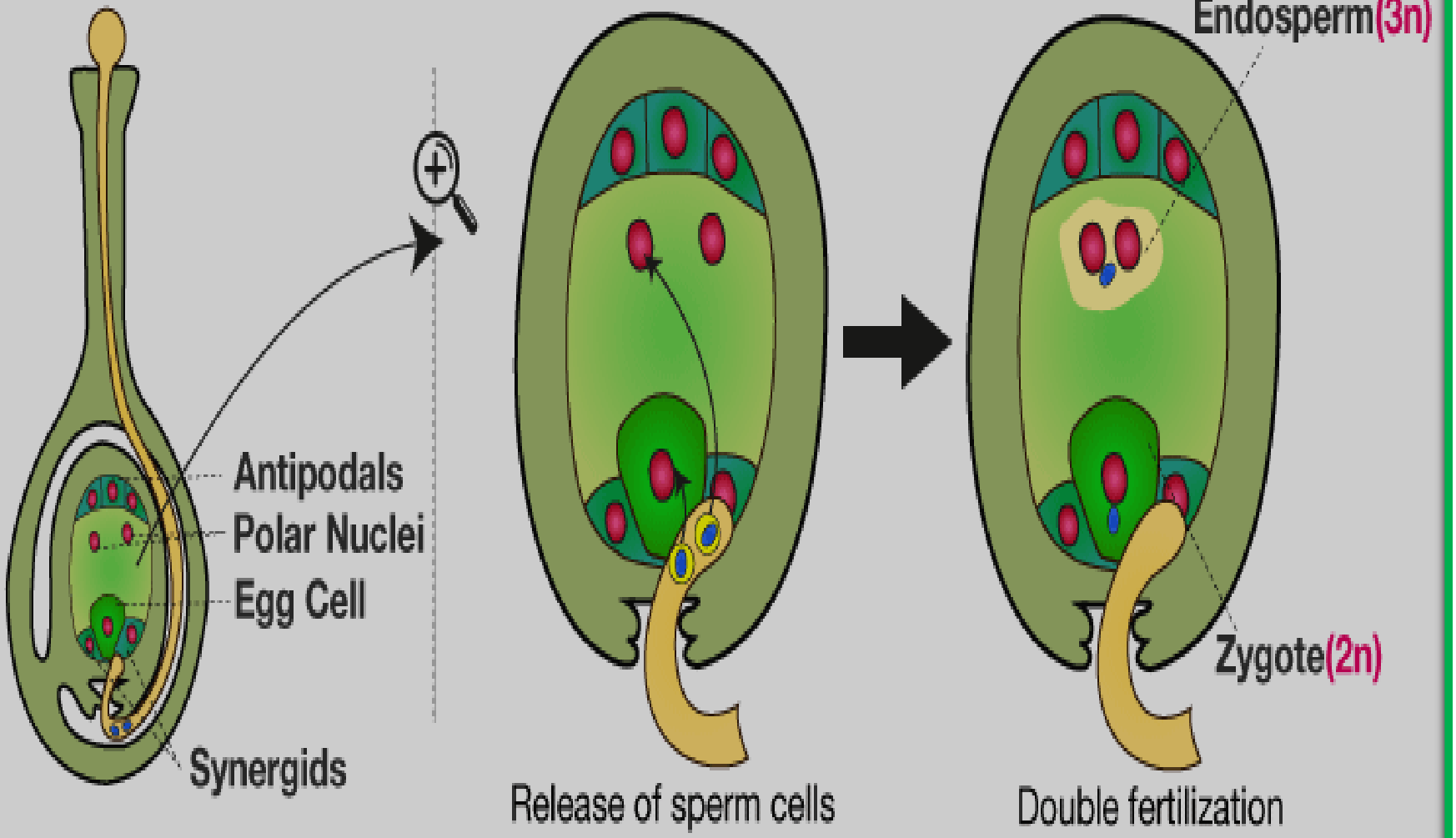
(b) Castor bean



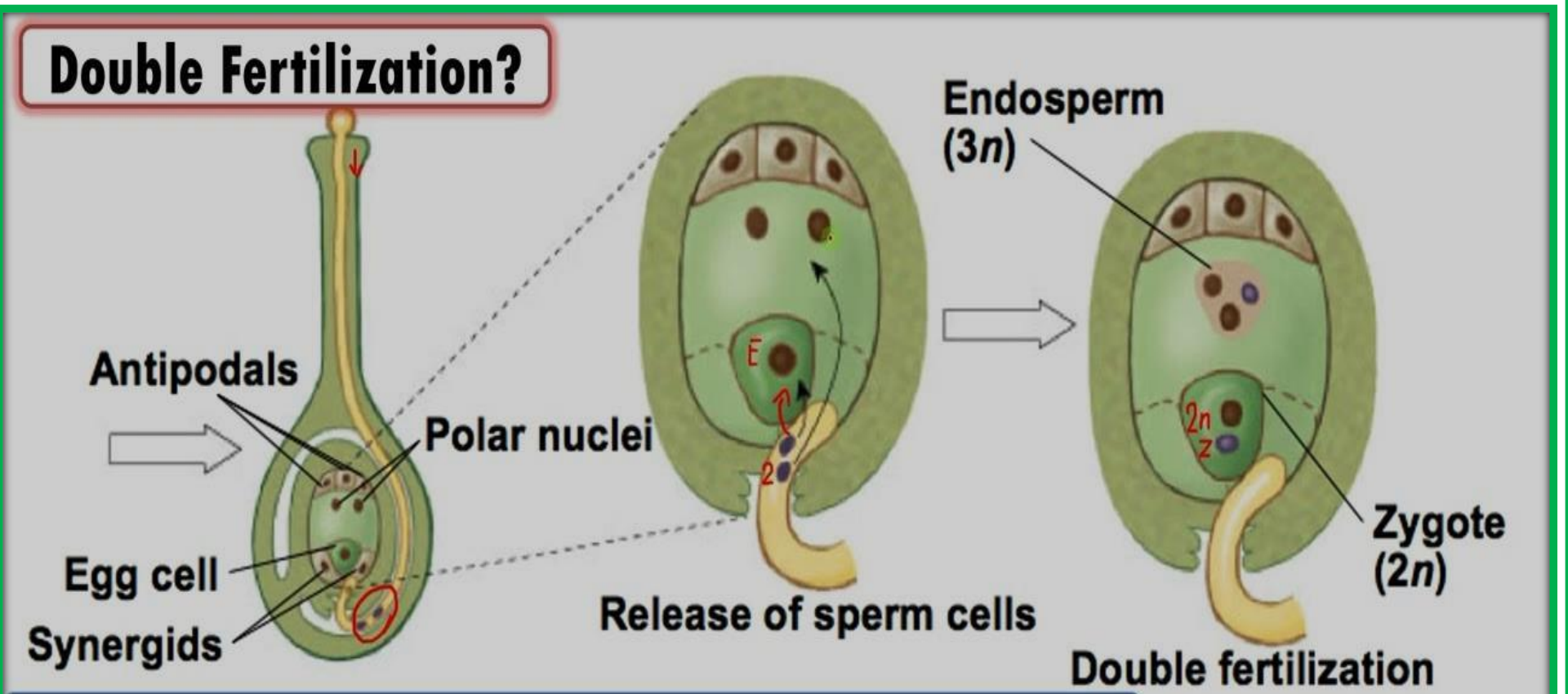
(c) Corn


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
Mitosis
Nuclear Fusion
Mature Embryo Sac (Female Gametophyte), just before fertilisation; seven nuclei present, six are haploid, one is diploid

DOUBLE FERTILIZATION



Double fertilization:



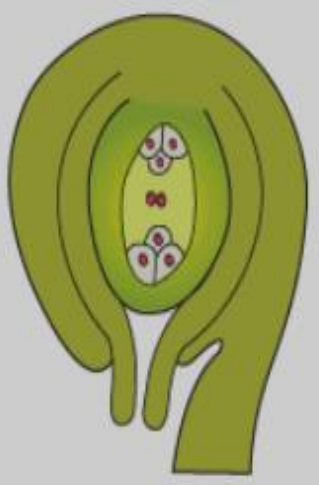
Generative cell of pollen grain form 2 male gametes

2 Sexual fusion

1st fusion: 1 male gamete (1n) + egg (1n)=Zygote (2n)

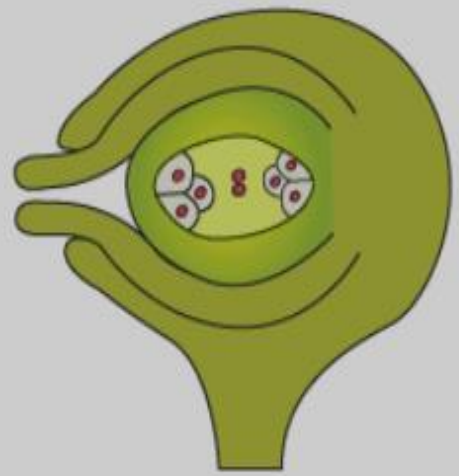
2nd fusion: 1 male gamete (1n) + Secondary nucleus (2n)
=Primary endosperm nucleus (3n)

Atropous

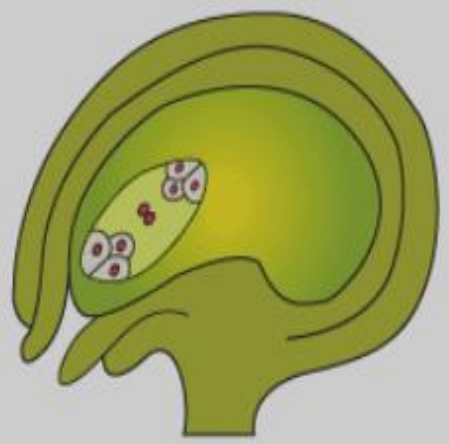


Anatropous

Amphitropous



Hemianatropous

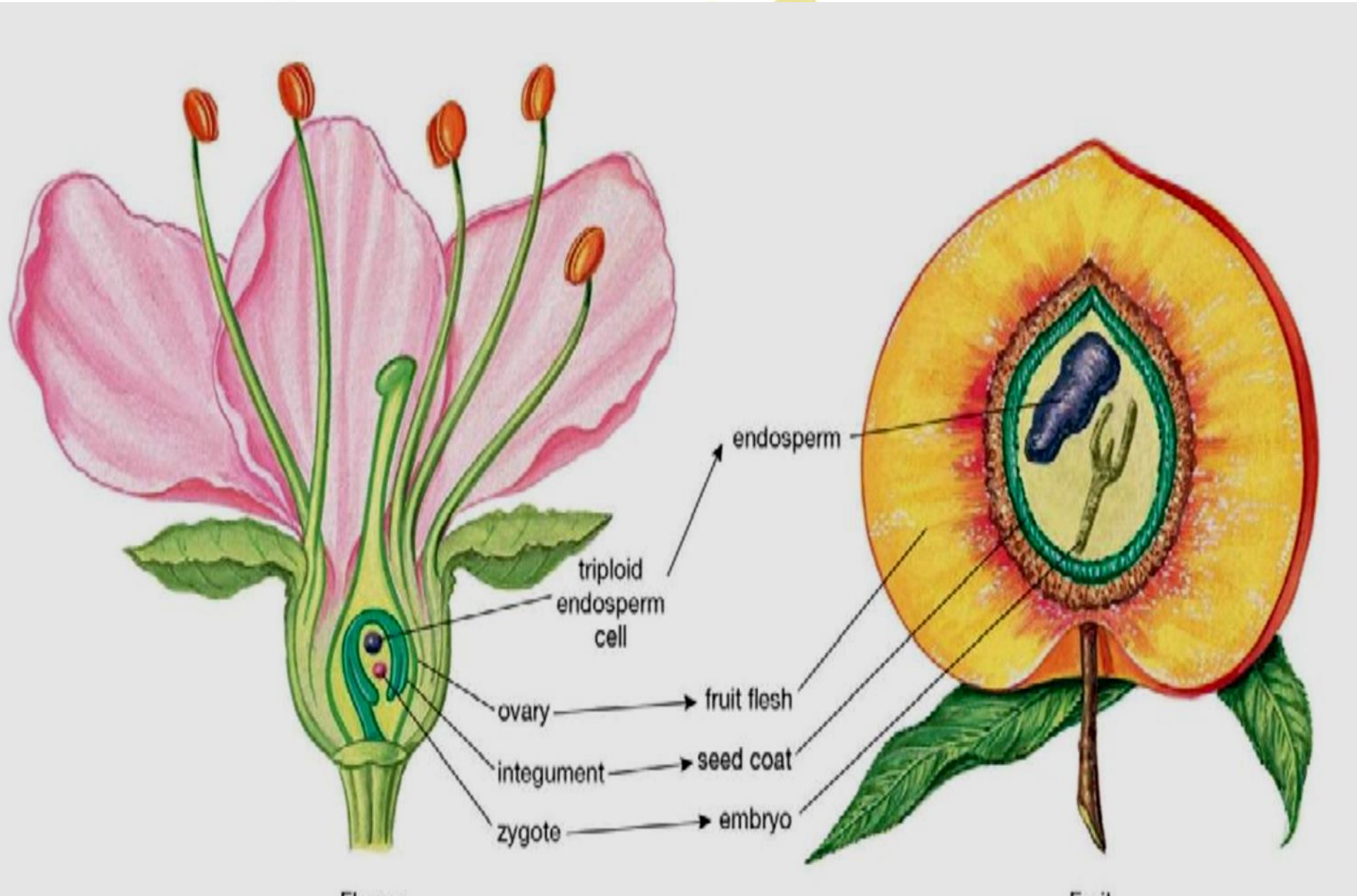


Campilotropous

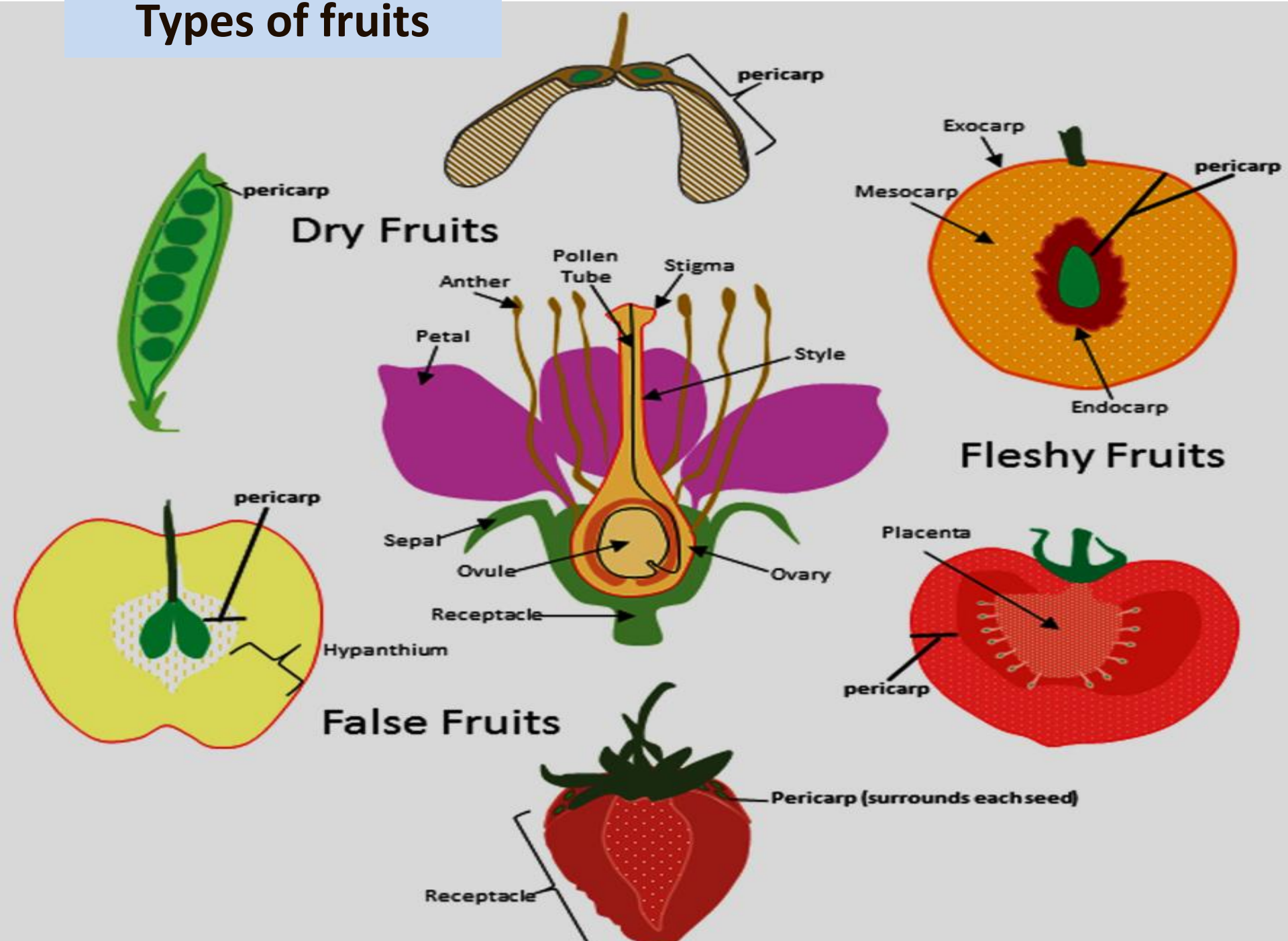
Circinotropous

fructification

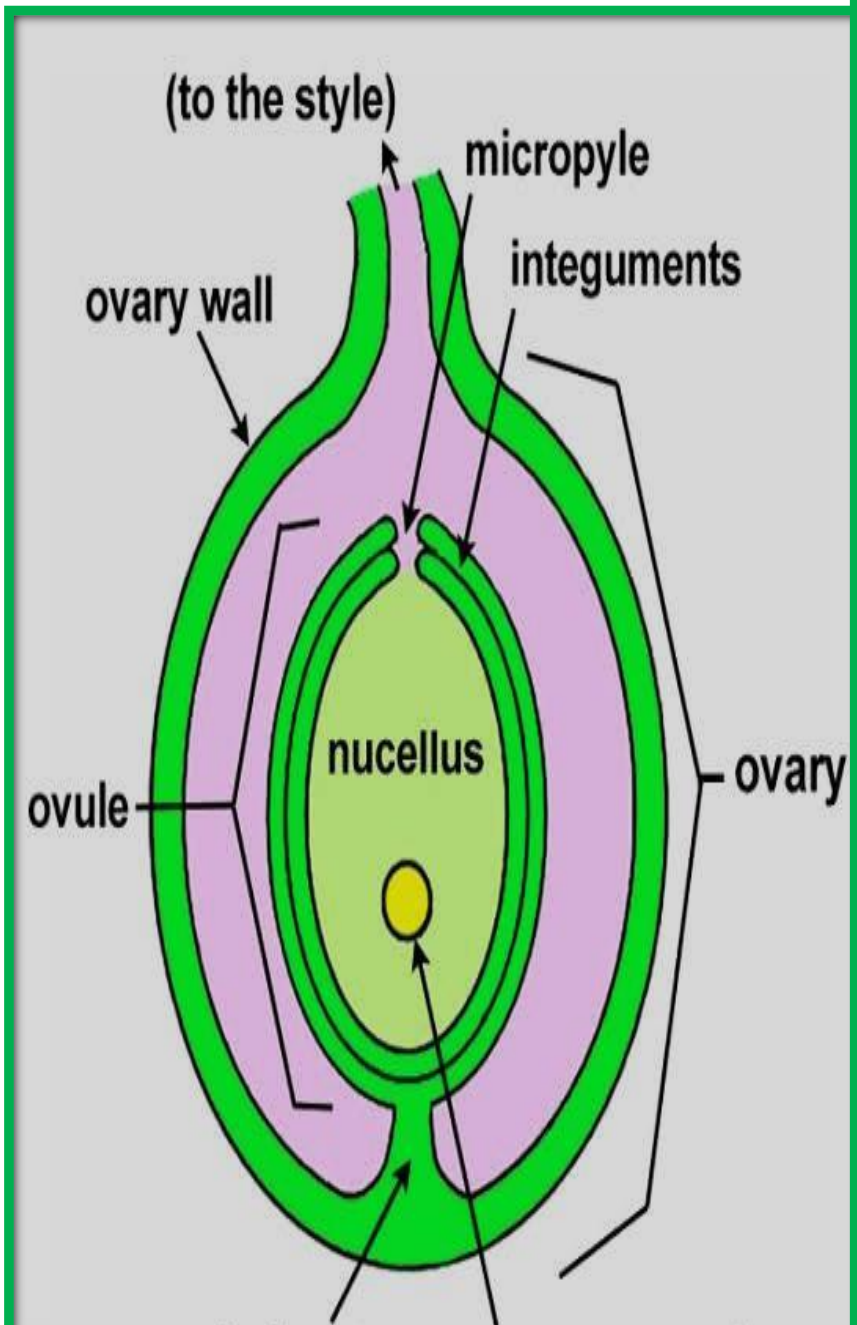
Development of flower

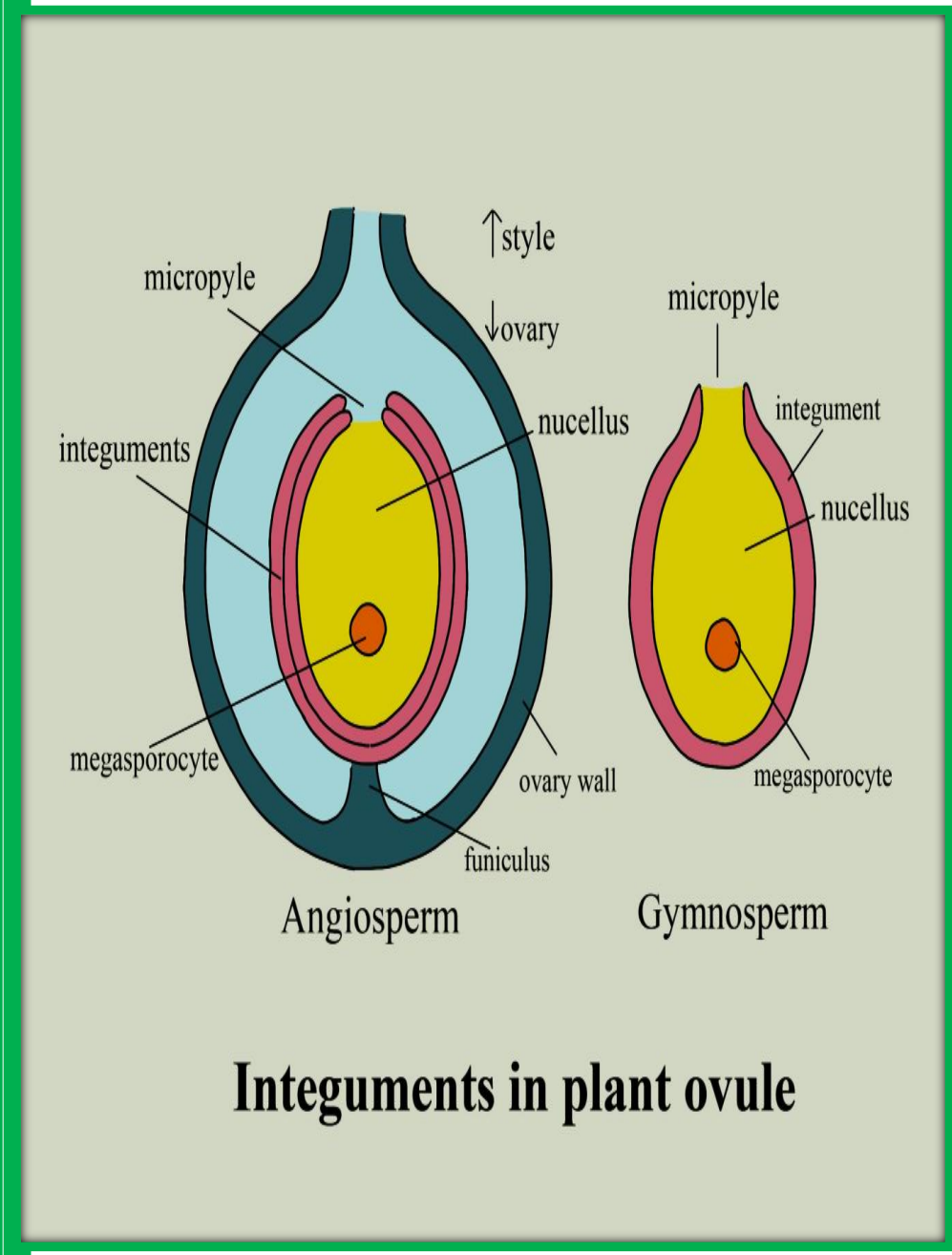


Types of fruits

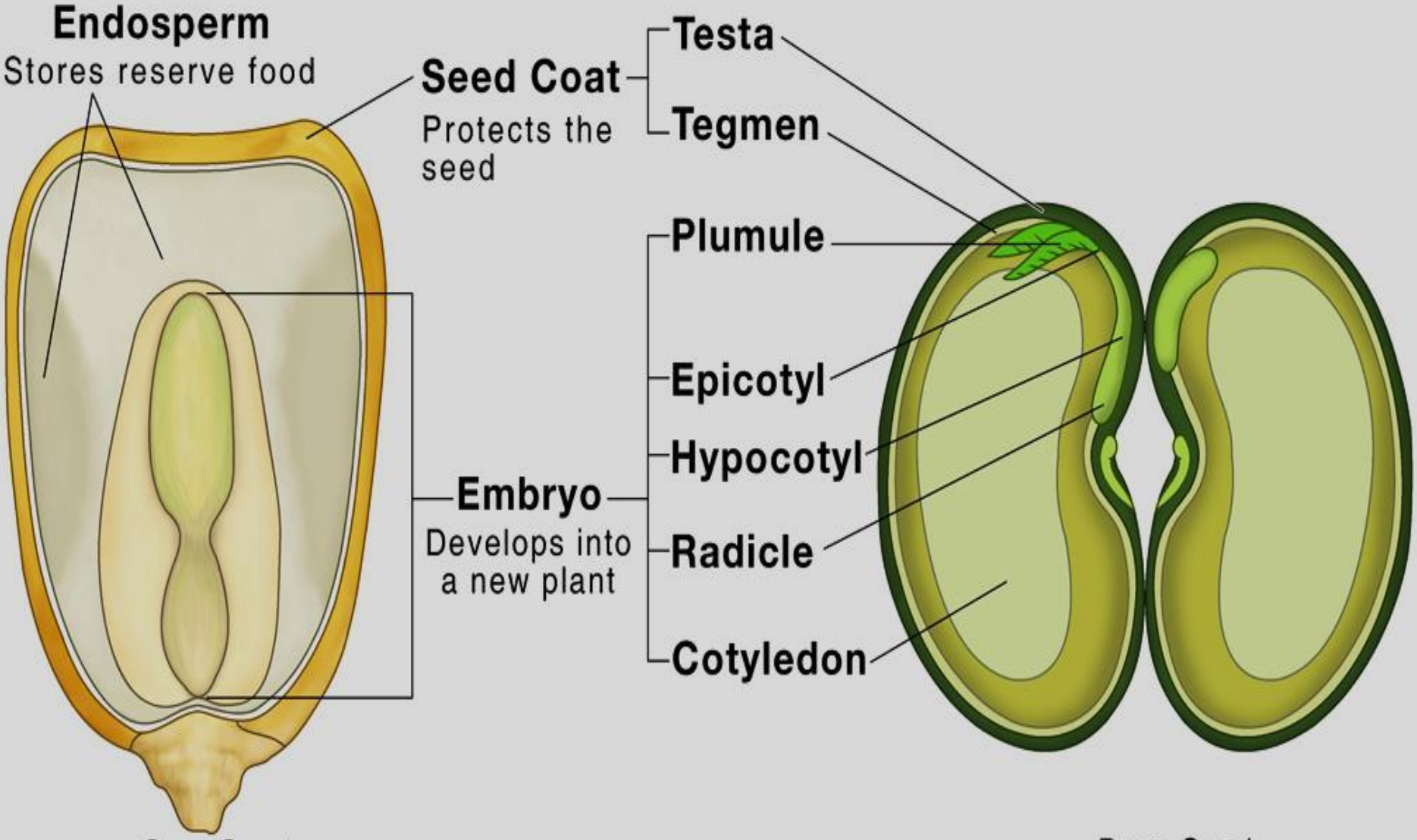


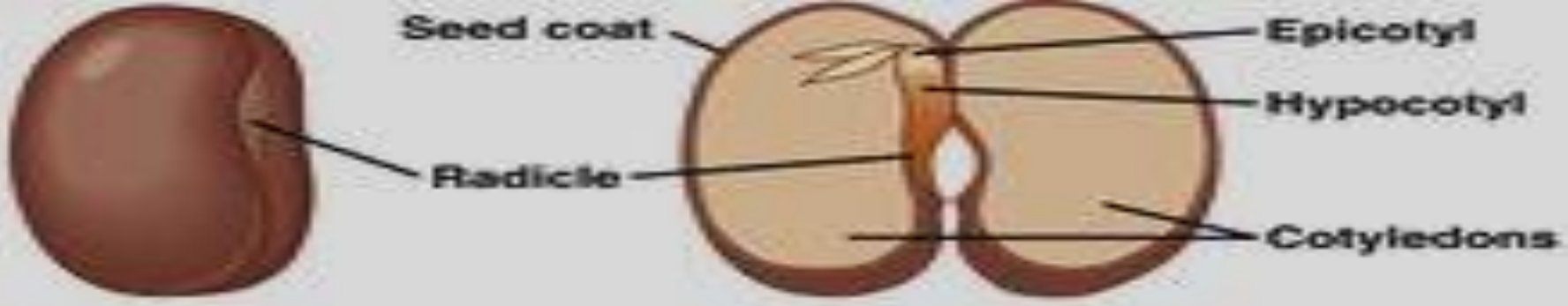
Different types of seeds:





Parts of a Seed with Functions

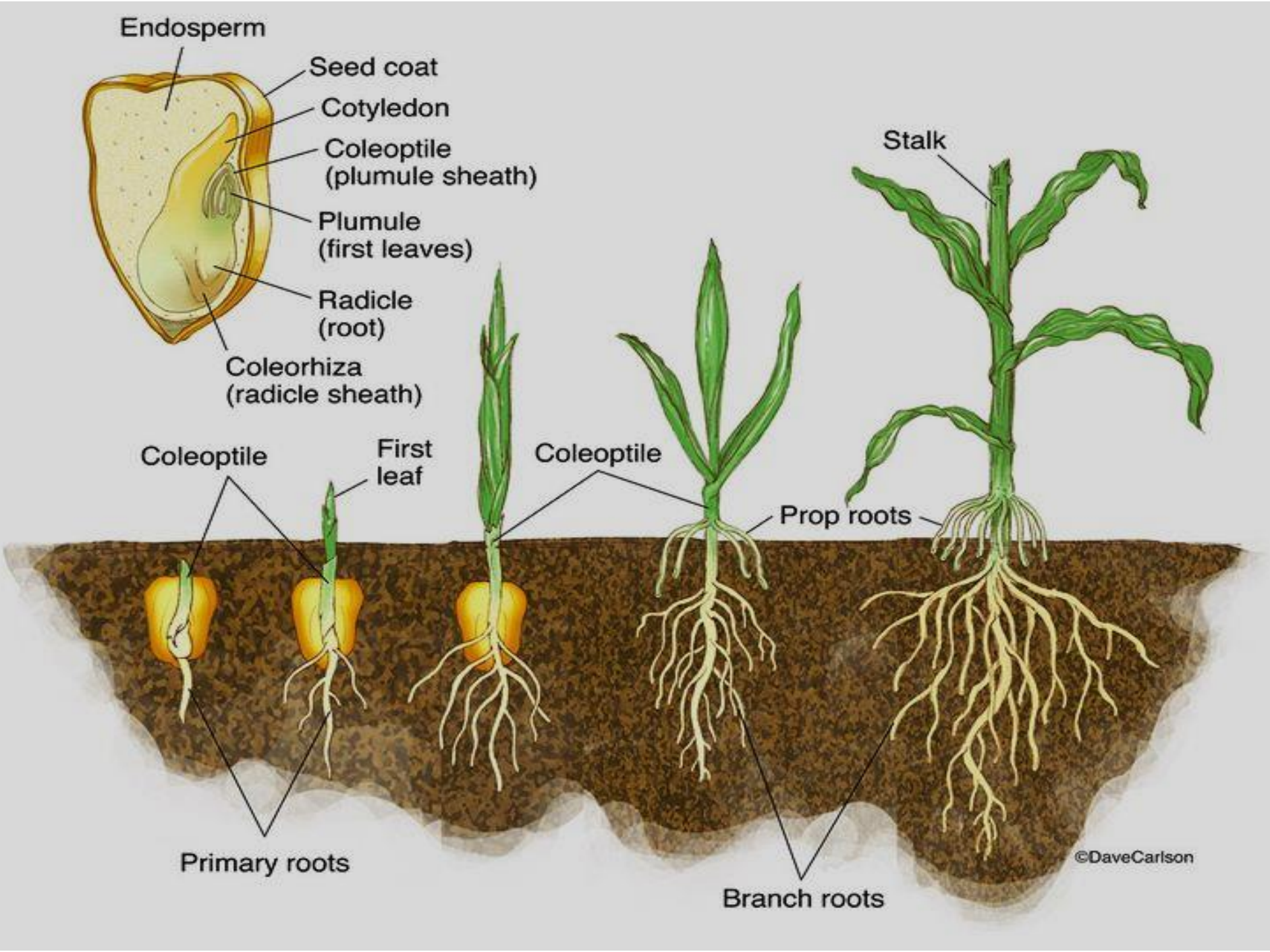




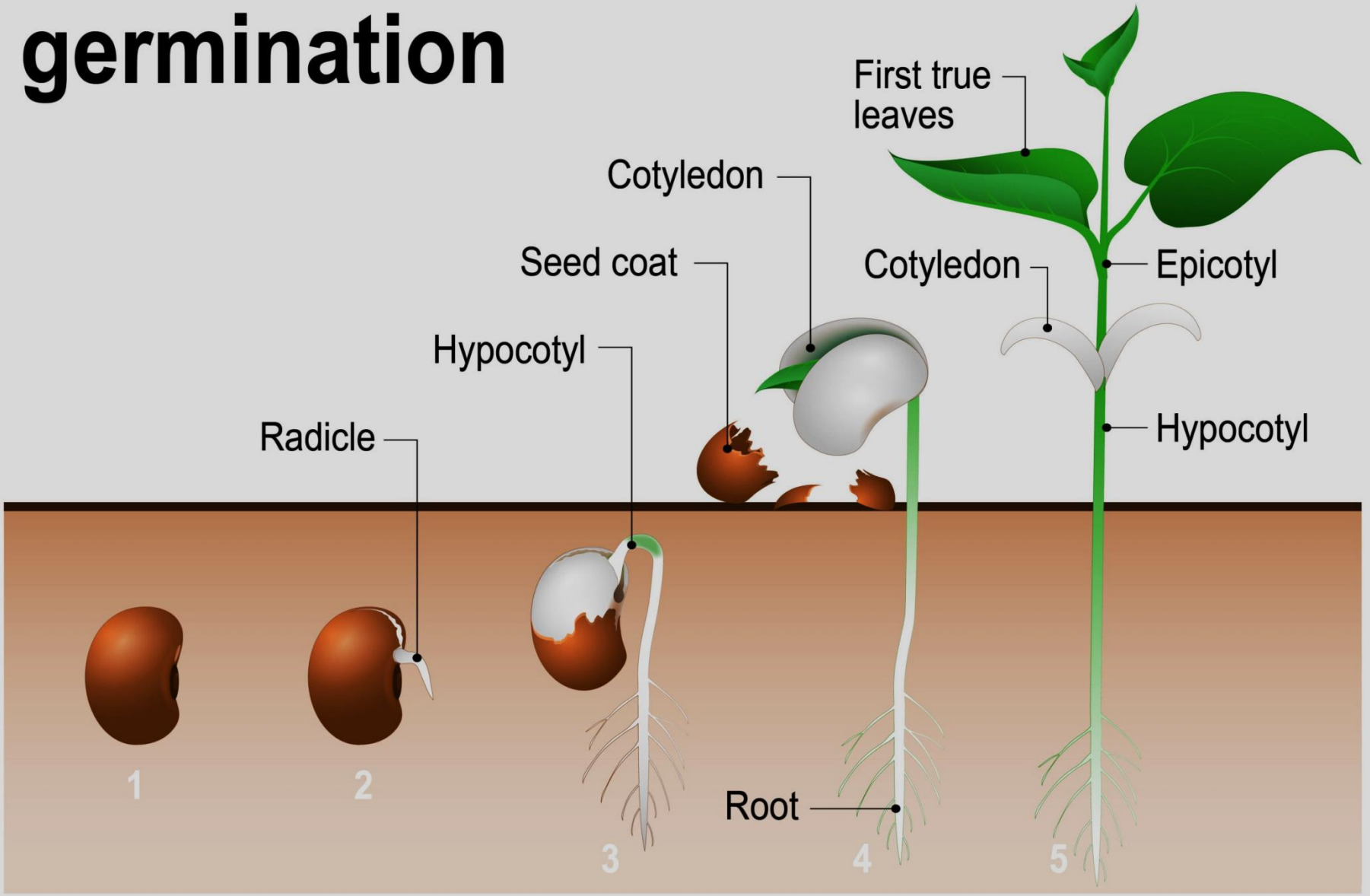
(a) Common garden bean, a eudicot with thick cotyledons

(b) Castor bean, a eudicot with thin cotyledons

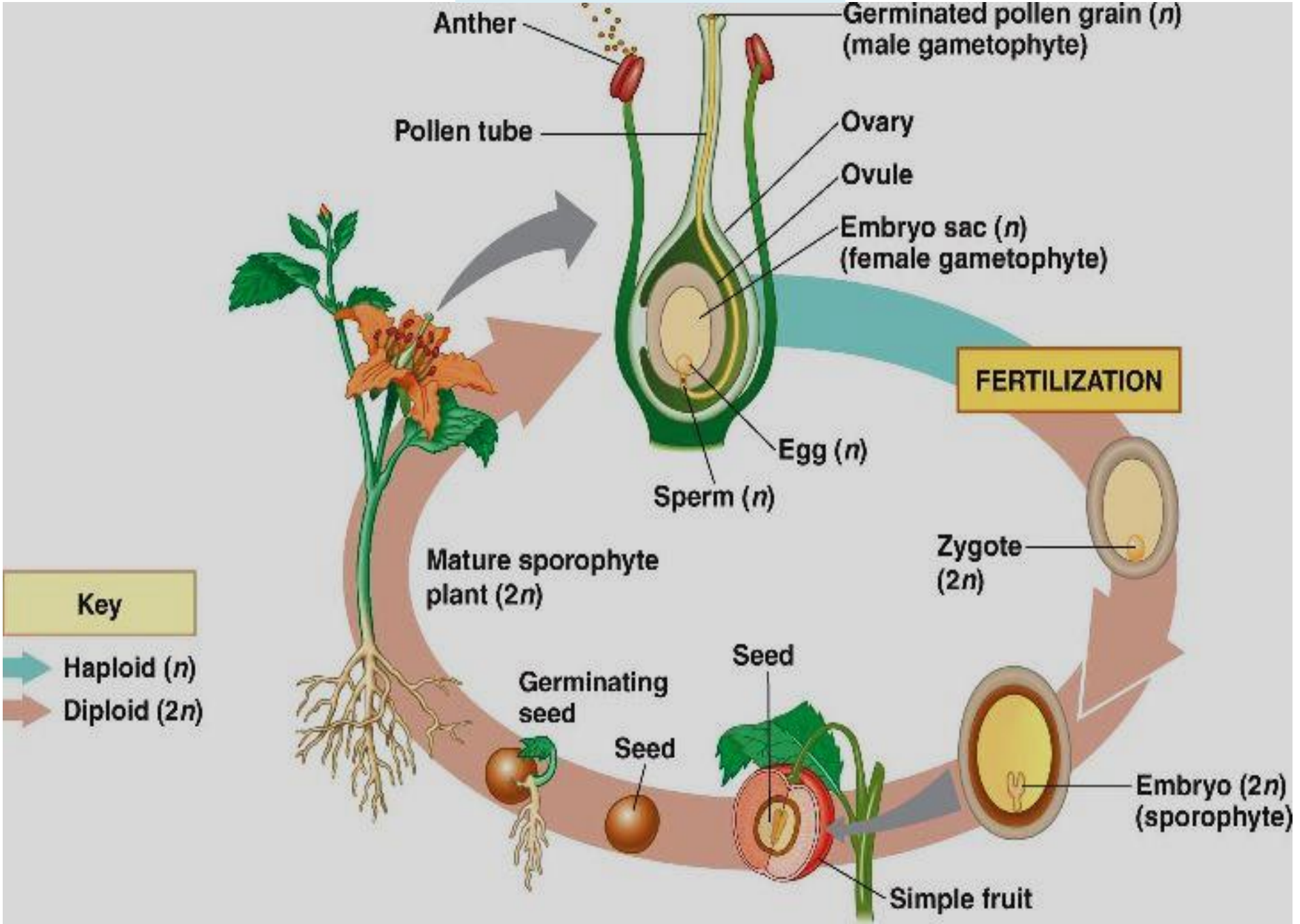
(c) Maize, a monocot

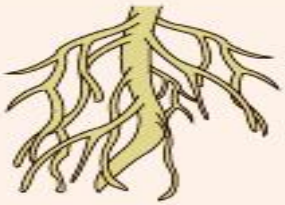
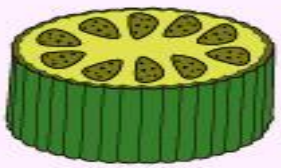

Endosperm
Seed coat
Cotyledon
Coleoptile
(plumule sheath)
Plumule
(first leaves)
Radicle
(root)
Coleorhiza
(radicle sheath)
Stalk
Coleoptile
First
leaf
Coleoptile
Prop roots
Primary roots
Branch roots
©DaveCarlson

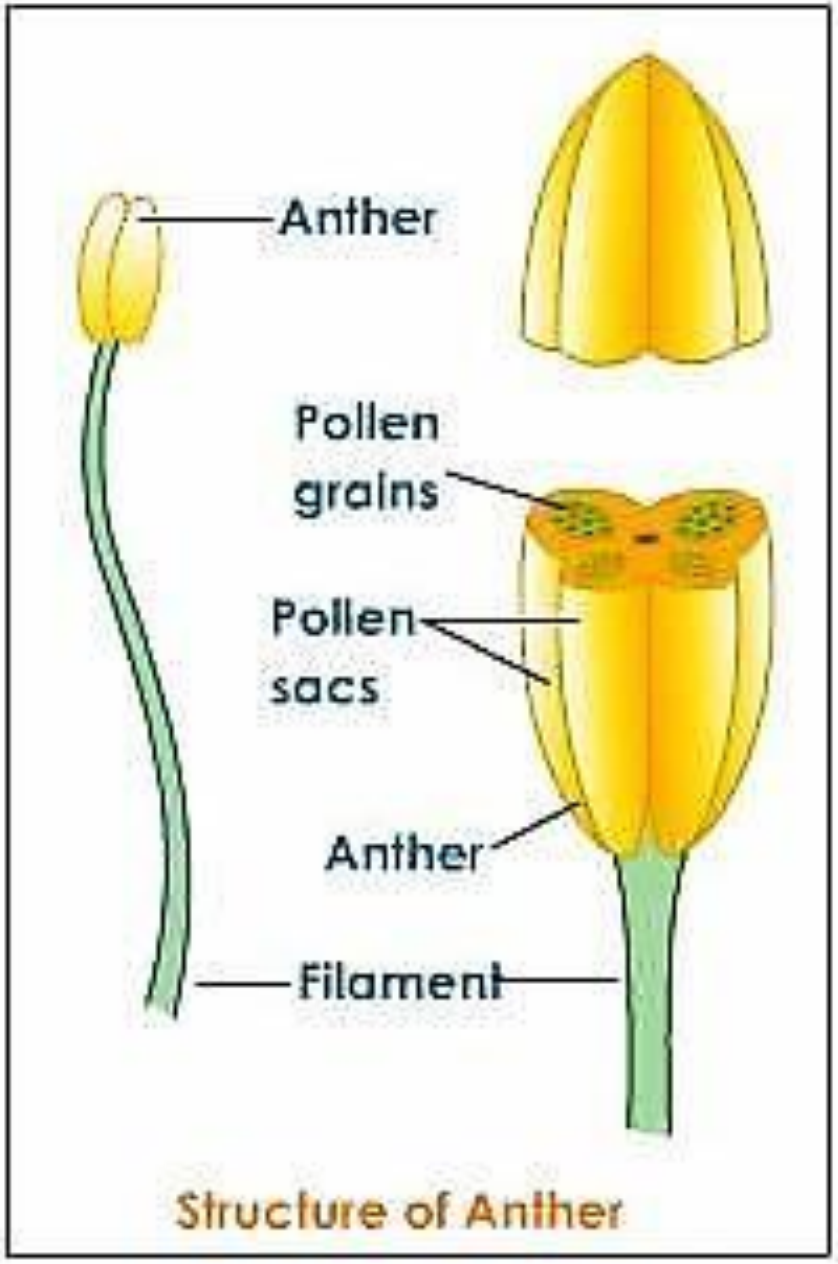
Seed germination

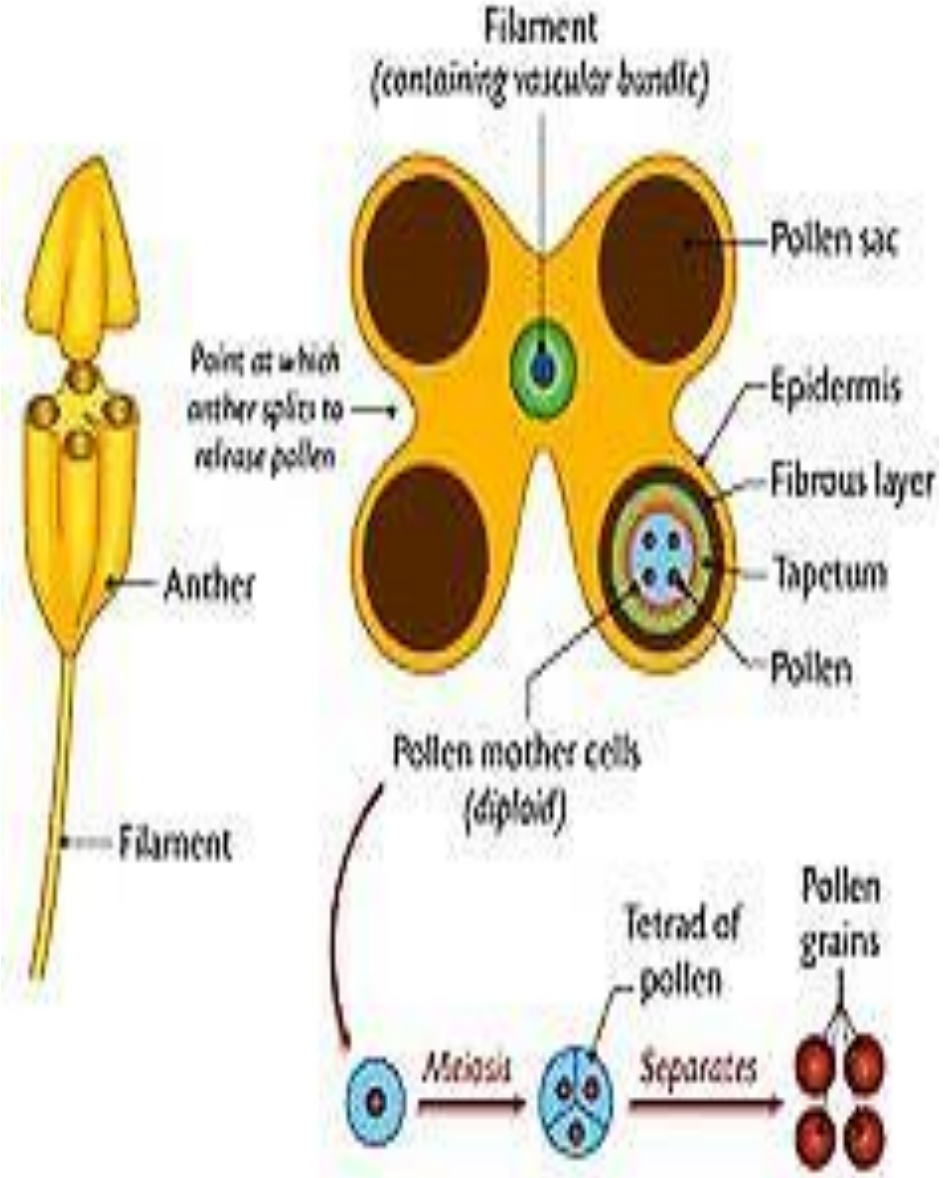


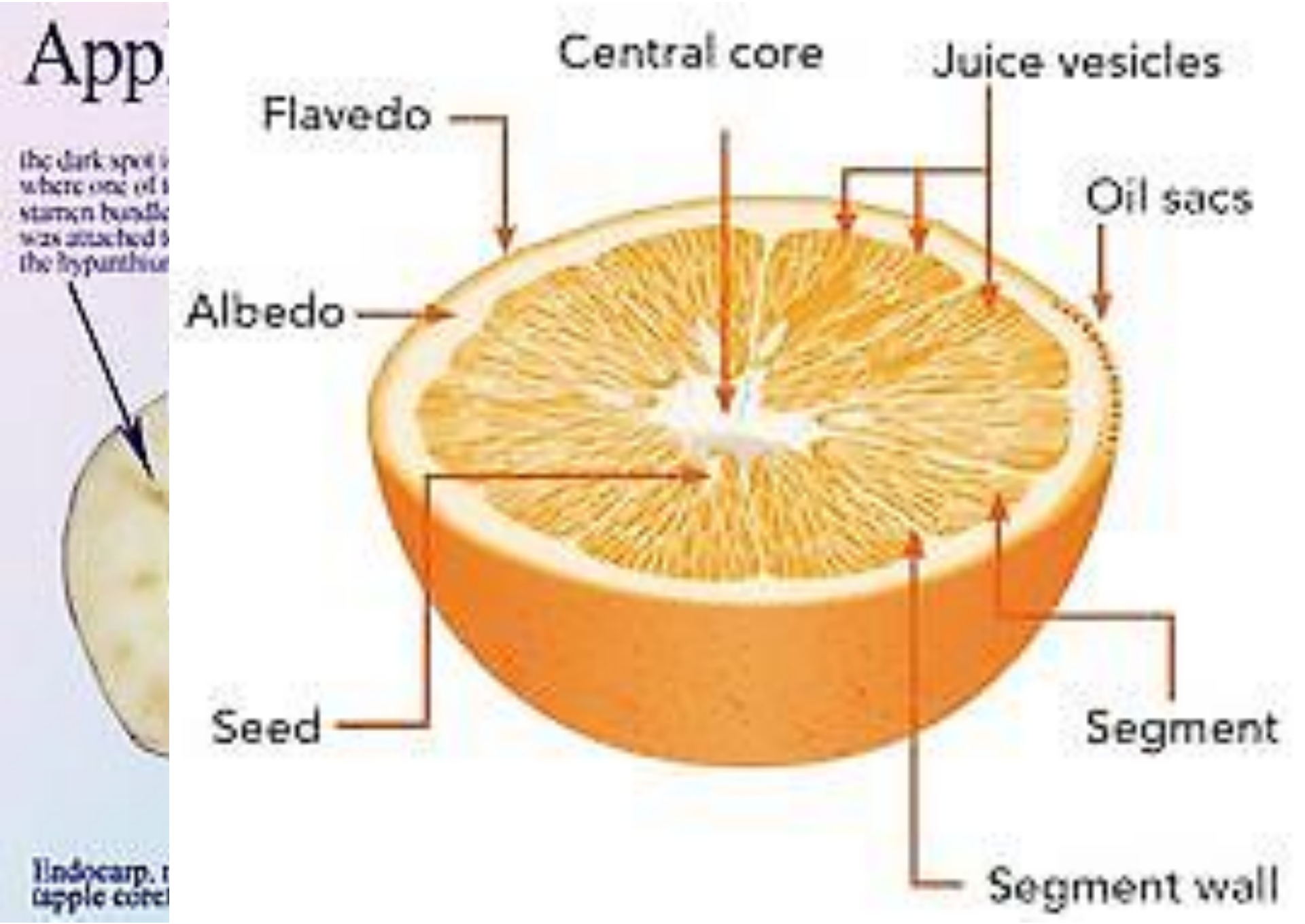
cycle of life of dicotyledons

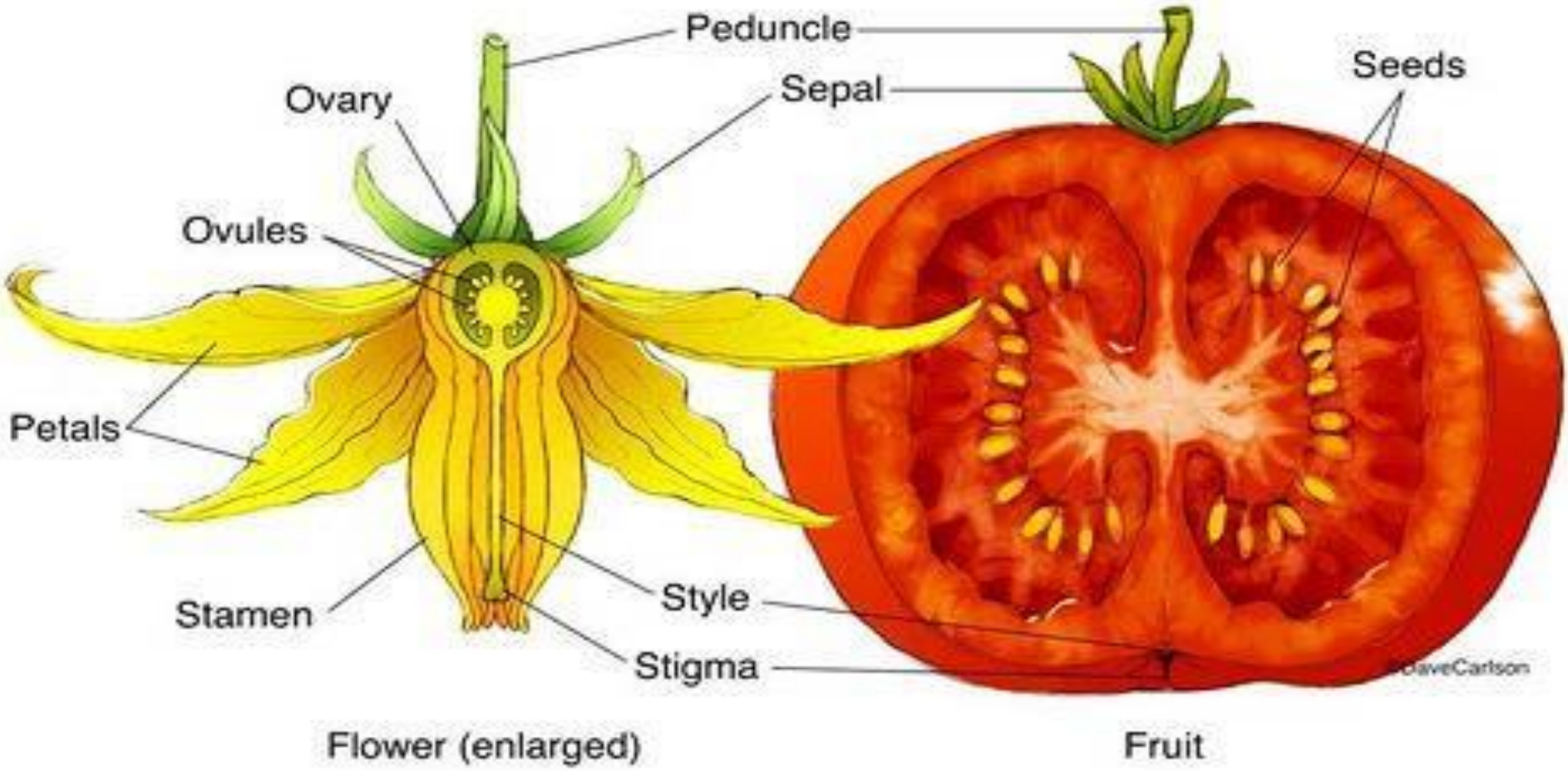


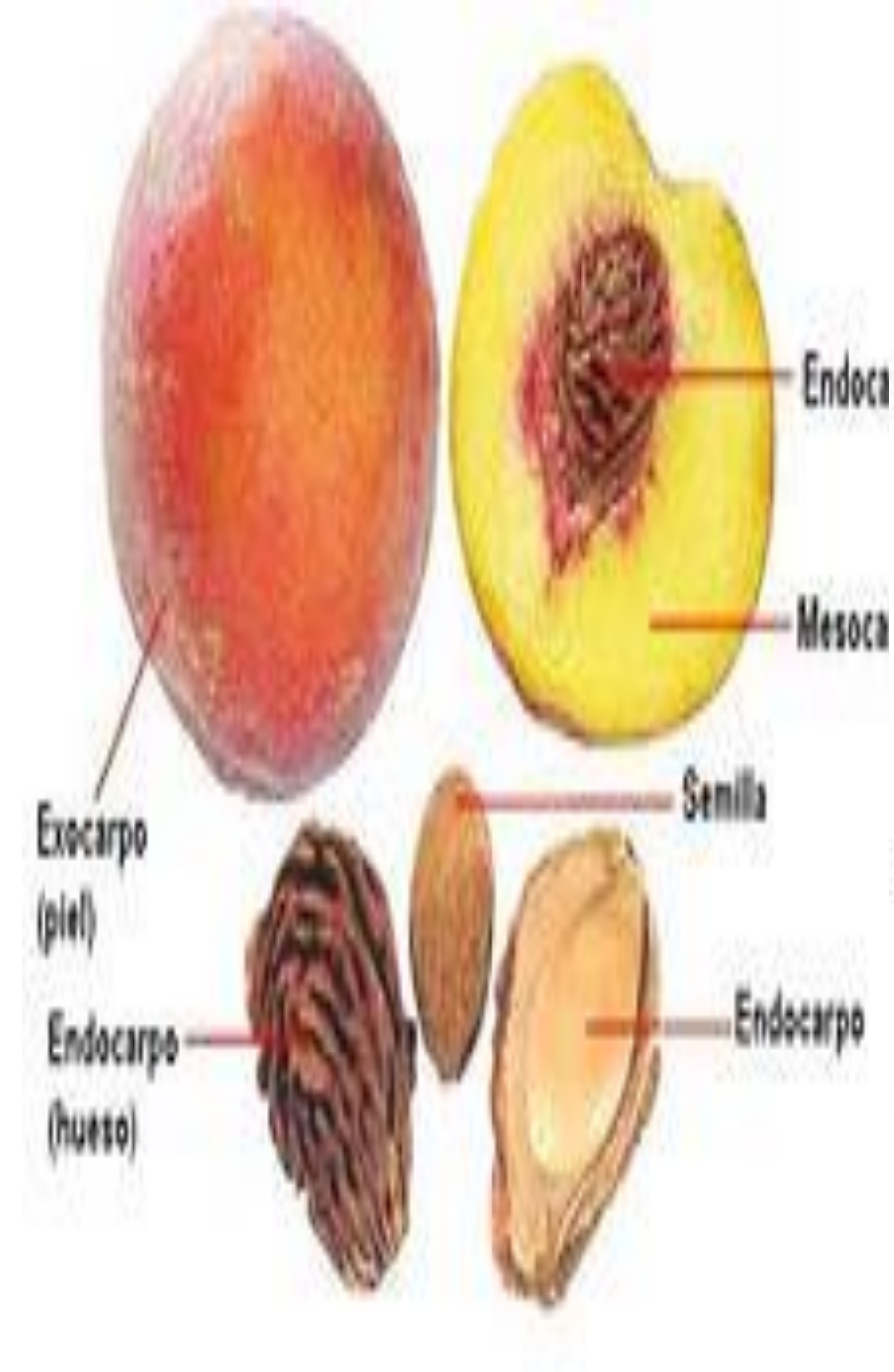
	Monocot	vs	Dicot
Seed	 1 cotyledon		 2 cotyledons
Root	 Fibrous roots		 Tap roots
Flower	 Have petals in multiples of 3		 Have 4 or 5 petals
Leaf	 Narrow, parallel veins		 Oval or palmate, net-like veins
Vascular Bundles	 Scattered		 Ringed
Pollen Grains	 Have 1 pore or furrow		 Have 3 pores or furrows


Anther
Pollen grains
Pollen sacs
Anther
Filament
Structure of Anther

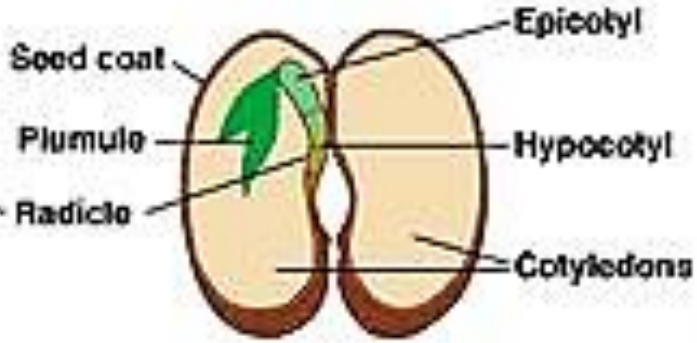

Filament (containing vascular bundle)
Pollen sac
Point at which anther splits to release pollen
Epidermis
Fibrous layer
Tapetum
Pollen
Anther
Filament
Pollen mother cells (diploid)
Tetrad of pollen
Pollen grains
Meiosis
Separates


Central core
Juice vesicles
Flavedo
Oil sacs
Albedo
Seed
Segment
Segment wall


Peduncle
Sepal
Ovary
Ovules
Petals
Stamen
Style
Stigma
Seeds
Flower (enlarged)
Fruit

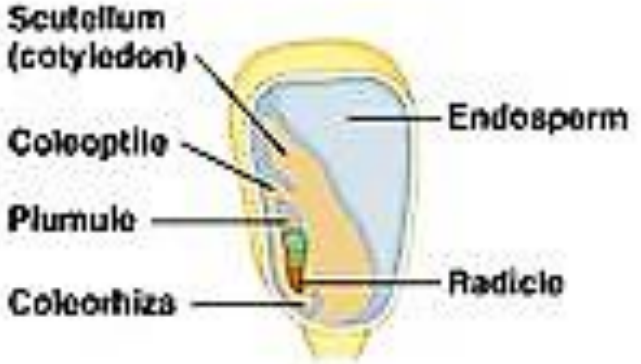


(a) Common bean

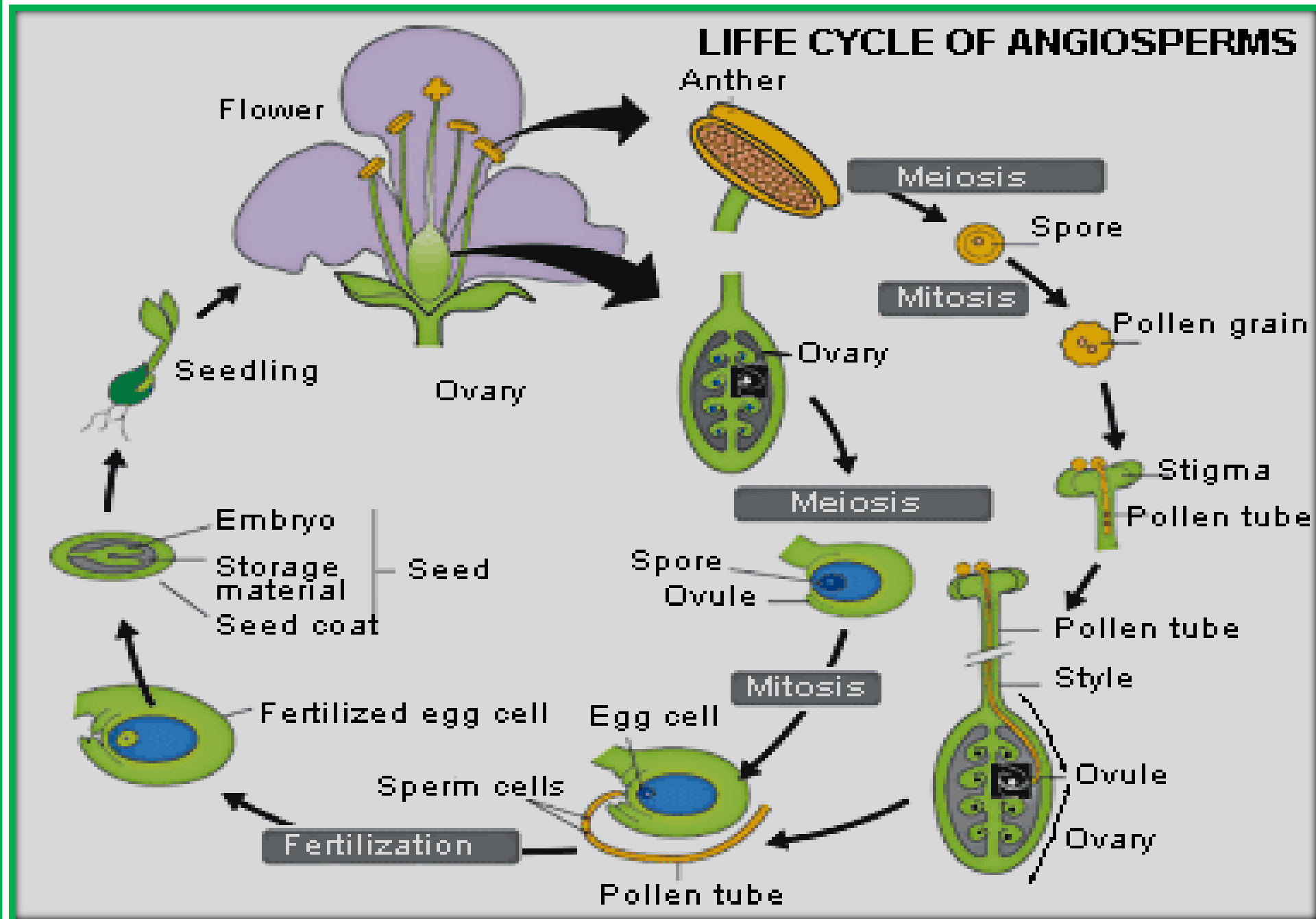


(b) Castor bean

(c) Corn



Concept of development cycle:



Reproduction in Gymnosperms

Gametogenesis:

Fertilization and cycle of life: