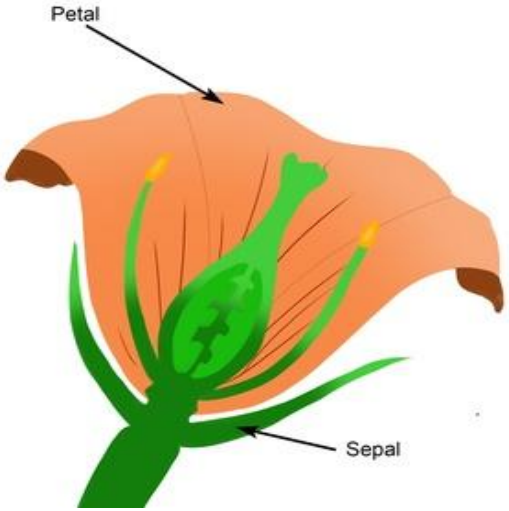
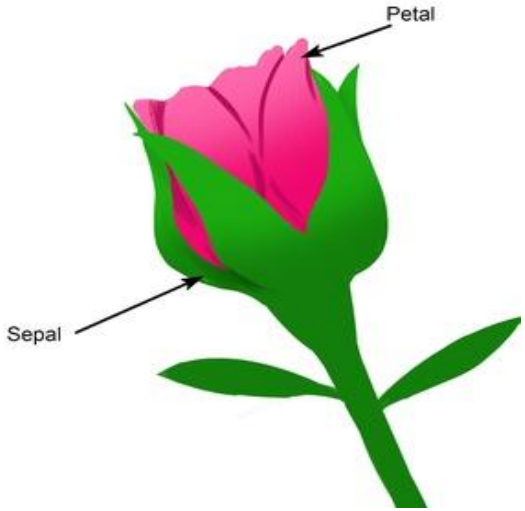
The Parts of a Flower

- Most flowers have four parts:
- sepals,
- petals,
- stamens,
- carpels.

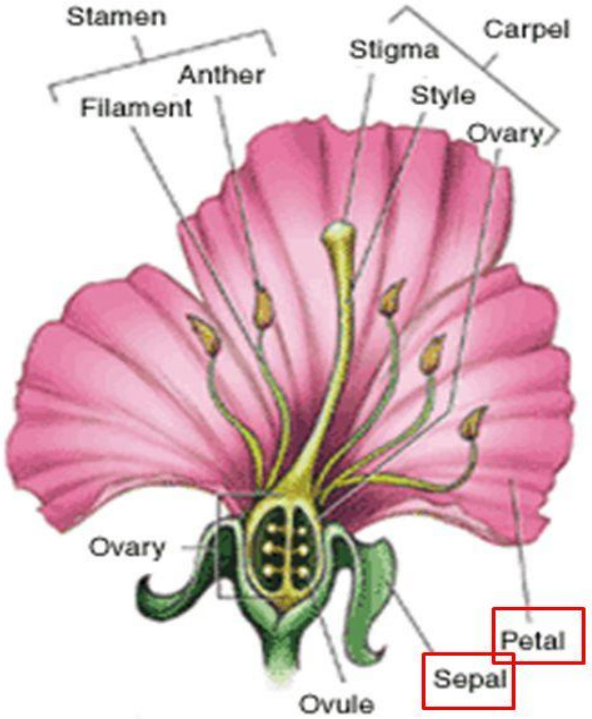


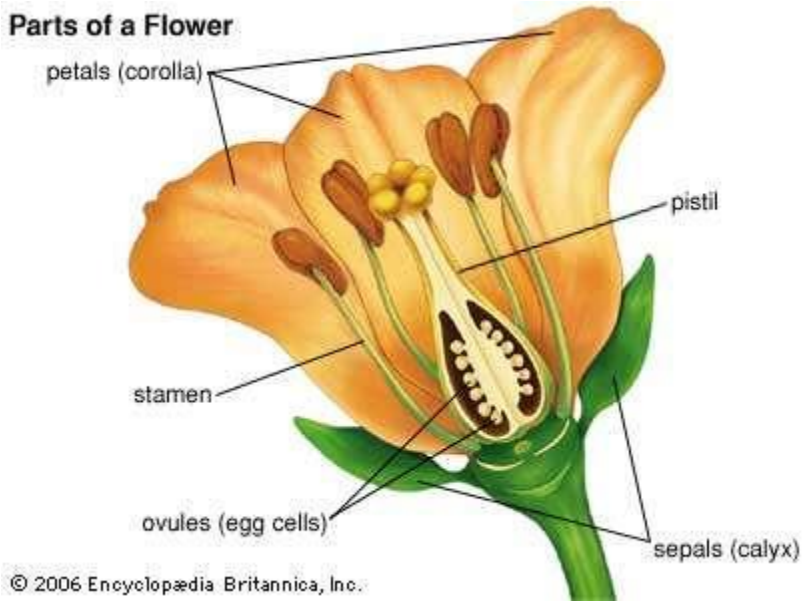


Petals and Sepals

- **Sepals** – outermost circle of flower parts that encloses a bud before it opens

- **Petals** – brightly colored structure just inside the sepals that attracts insects for pollination





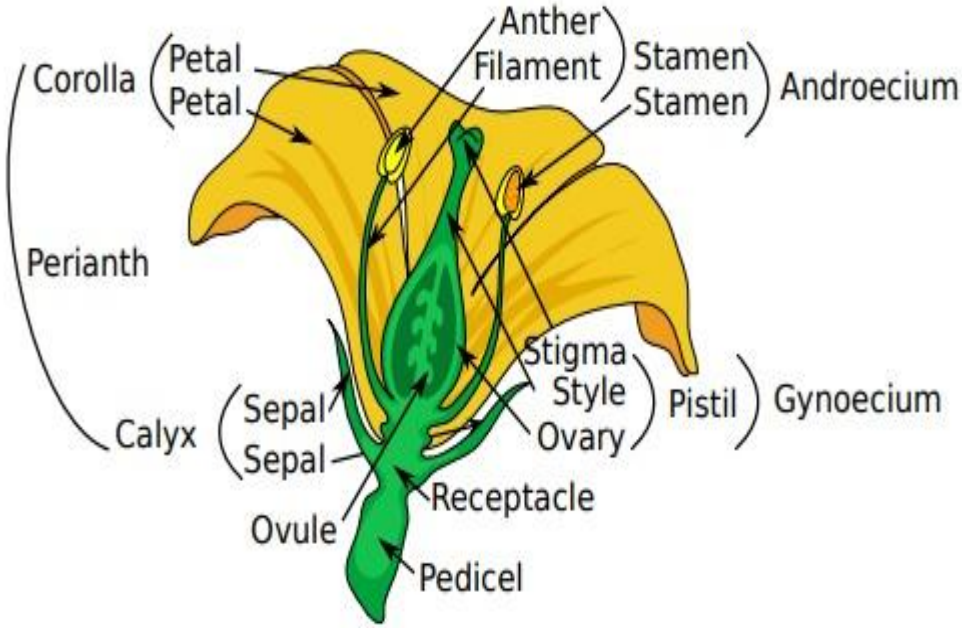
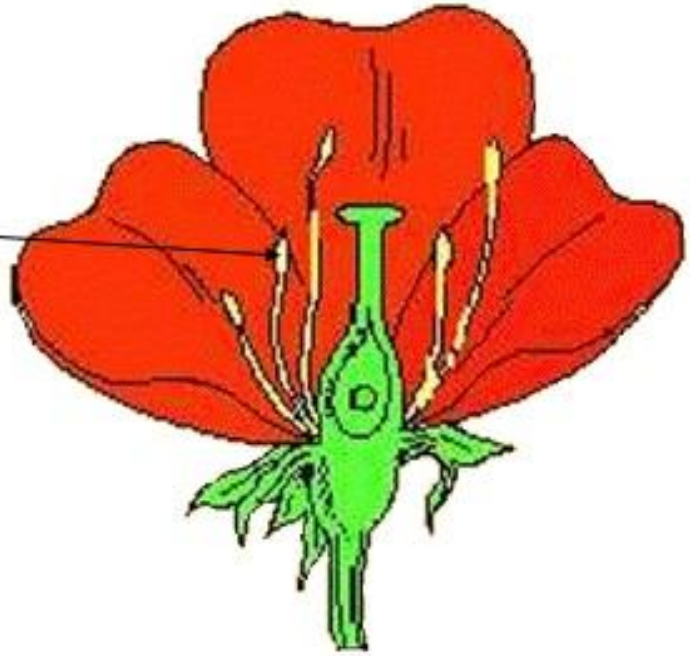
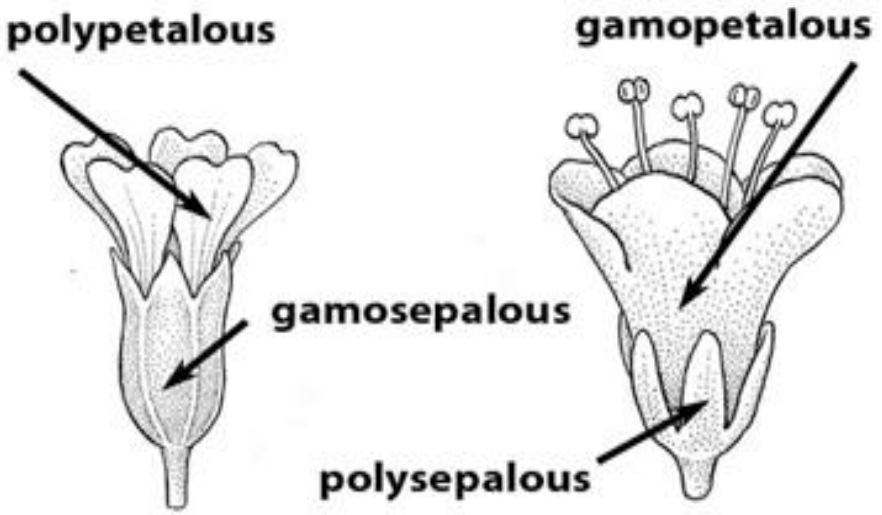


Figure 8.7. Most important parts of the flower.

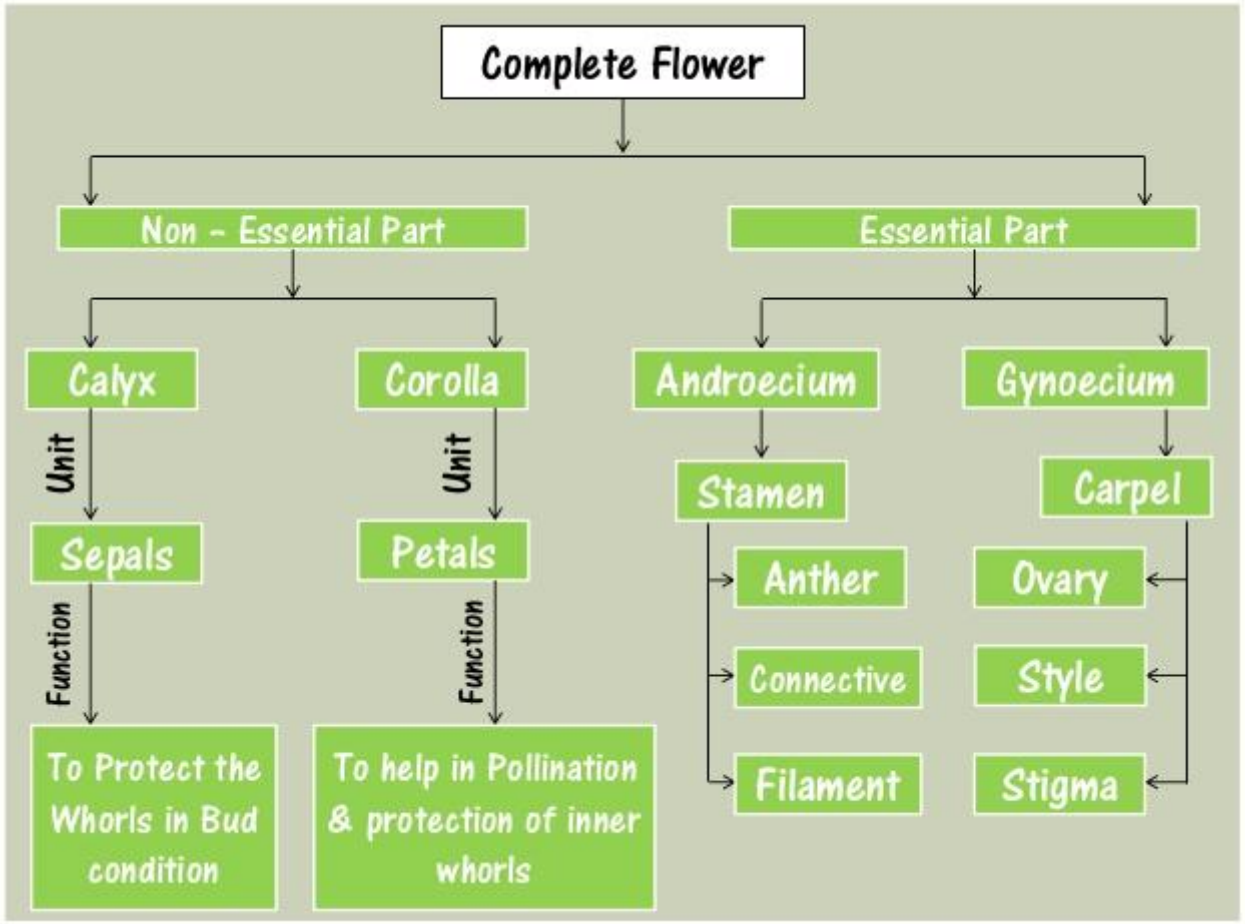
Stamen (male)

- Anther: pollen grains grow in the anther.
- When the grains are fully grown, the anther splits open.





sepal and petal fusion


Complete Flower
Non - Essential Part
Essential Part
Calyx
Corolla
Androecium
Gynoecium
Unit
Unit
Stamen
Carpel
Sepals
Petals
Anther
Ovary
Function
Function
Connective
Style
To Protect the Whorls in Bud condition
To help in Pollination & protection of inner whorls
Filament
Stigma

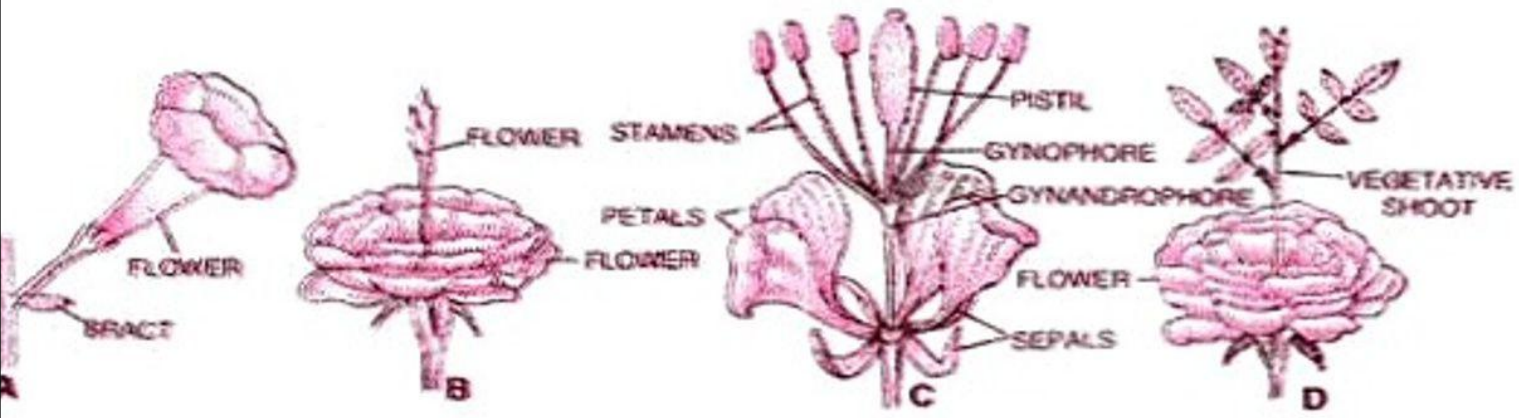
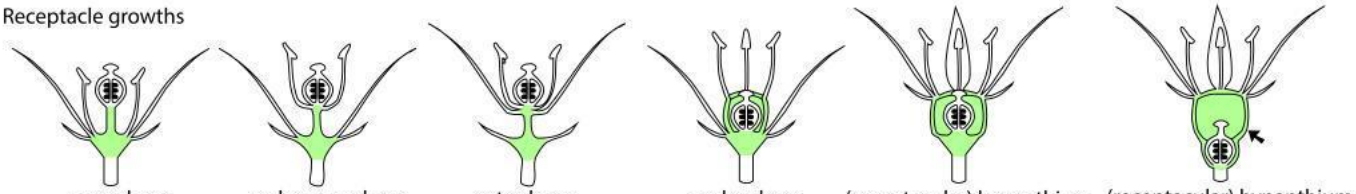


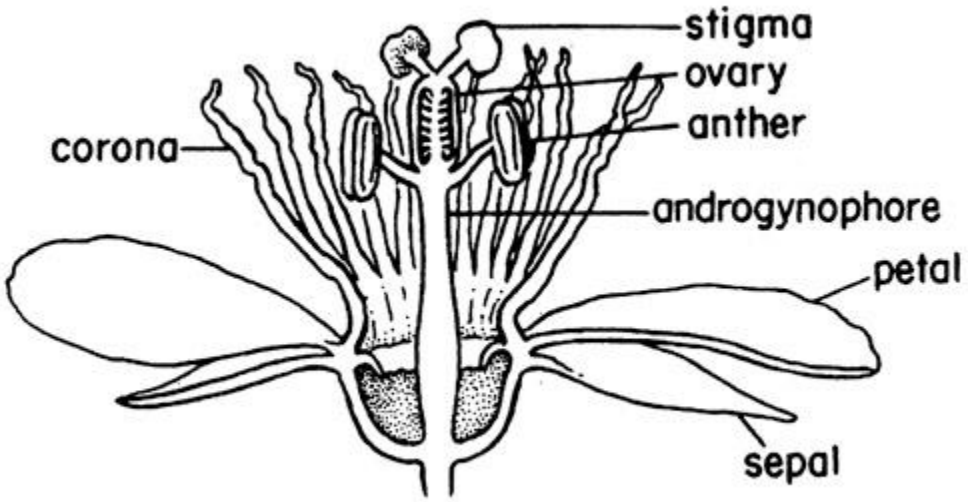
Fig. 5.85. Flower is a modified shoot.
A, axillary origin; C, differentiation of nodes and internodes (gynandrophore and gynophore) in *Cleome* (*Gynandropsis*) *gynandra;* B and D, continuation of growth of tip of thalamus in Rose.

Receptacle growths

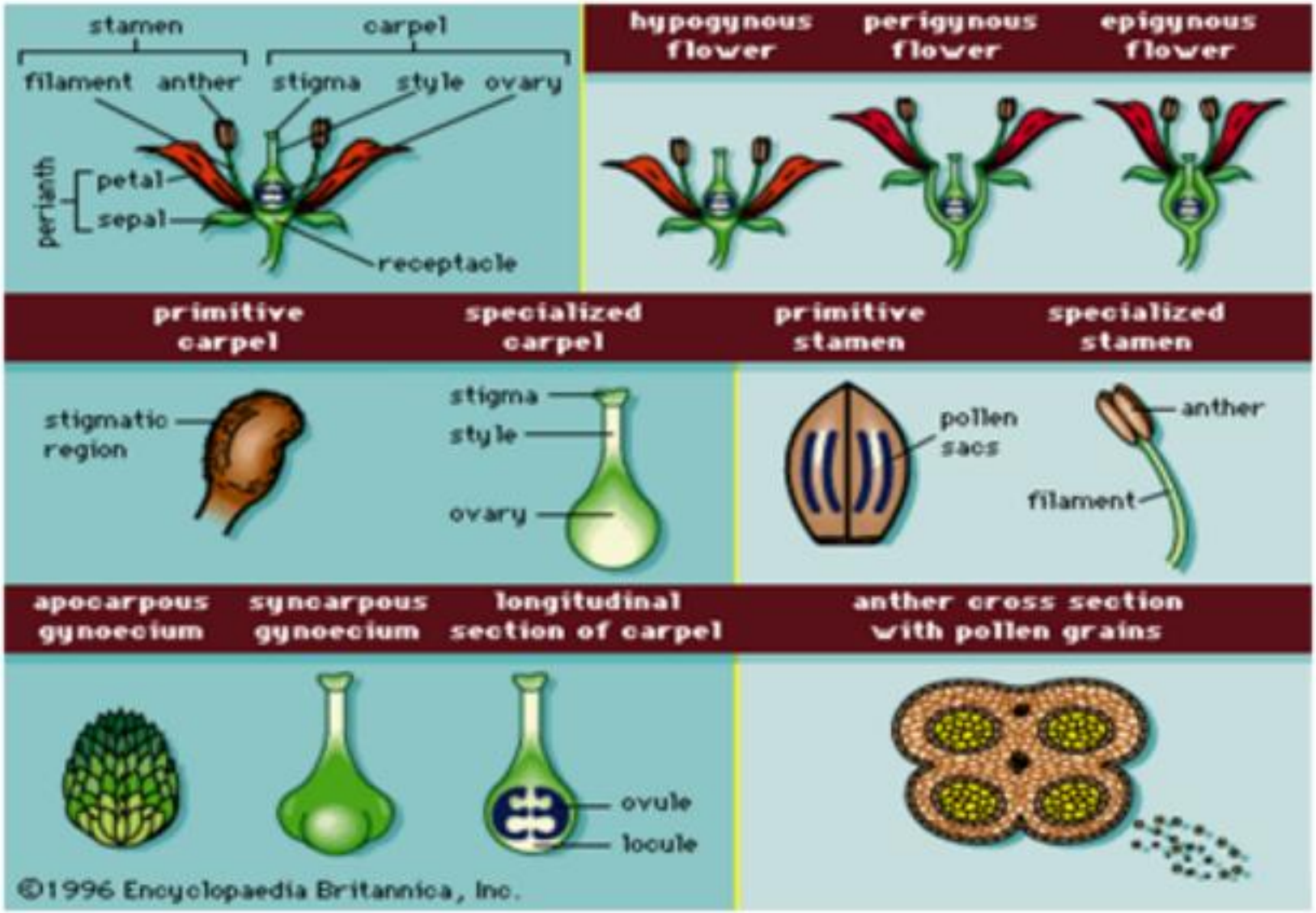


gynophore (≠ stipitate gynoecium) | androgynophore | antophore | androphore (≠ monadelphous stamens) | (receptacular) hypanthium | (receptacular) hypanthium

definitions as in Angiosperm Phylogeny Website glossary



Passifloraceae flower l.s.


stamen
carpel
filament
anther
stigma
style
ovary
perianth
petal
sepal
receptacle
hypogynous flower
perigynous flower
epigynous flower
primitive carpel
specialized carpel
primitive stamen
specialized stamen
stigmatic region
stigma
style
ovary
pollen sacs
anther
filament
apocarpous gynoecium
syncarpous gynoecium
longitudinal section of carpel
anther cross section with pollen grains
ovule
locule
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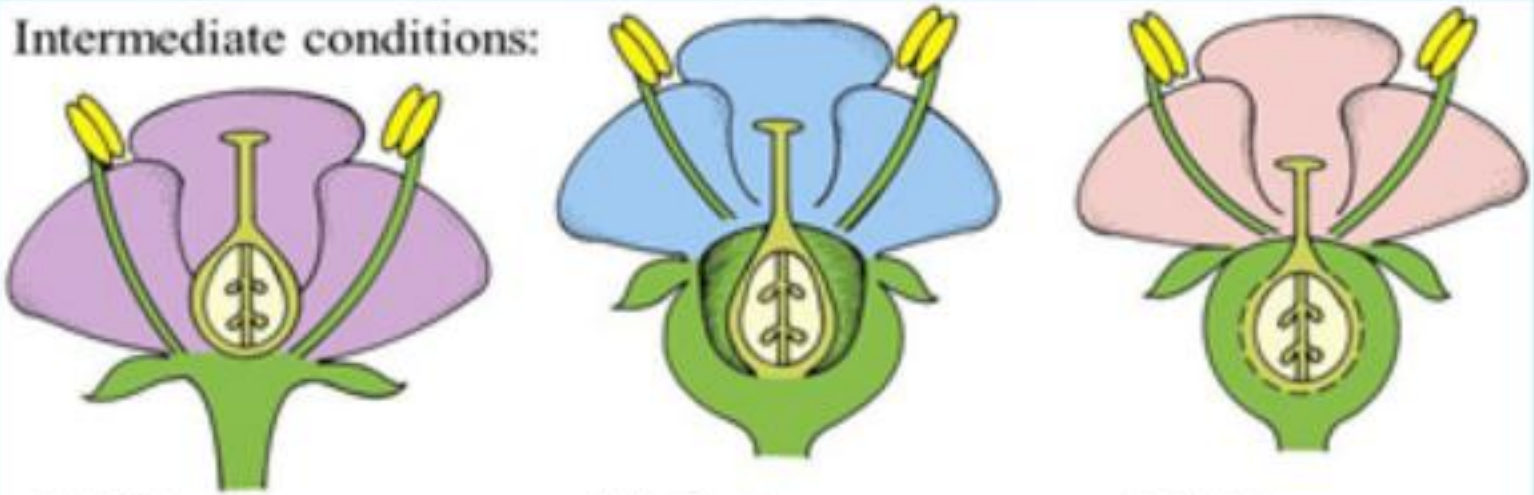
Superior ovary- (ex. lily) sepals, petals, and stamens are attached below the ovary

Inferior ovary- sepals, petals and stamens attached near the top of the ovary

Intermediate conditions:



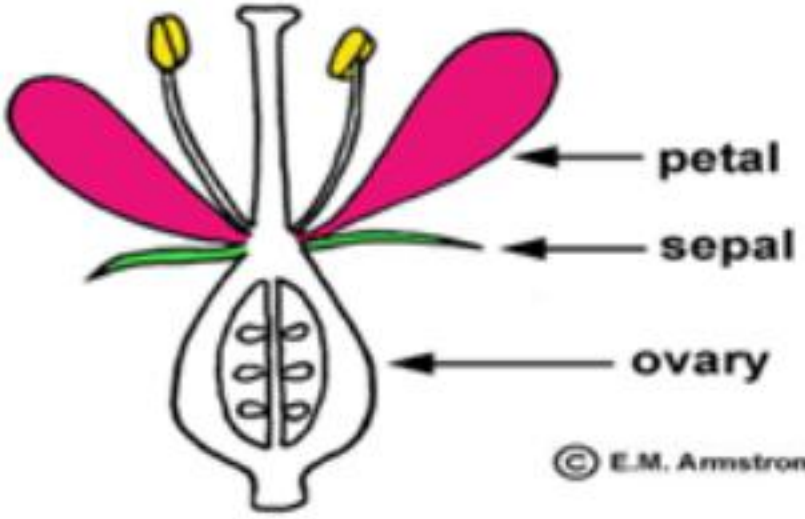
(a) Hypogynous flower

(b) Perigynous flower

(c) Epigynous flower

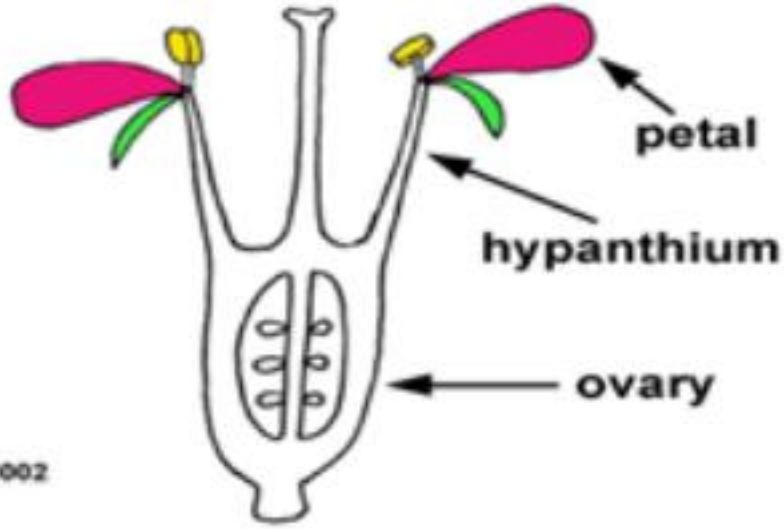
Figure 19-11
Biology of Plants, Seventh Edition

Inferior Ovary: Below the attachment of the petals, sepals and stamens; may have hypanthium adnate to top of ovary.



epigynous

petals, sepals & stamens attached at top of ovary



epigynous

petals, sepals & stamens on the rim of hypanthium

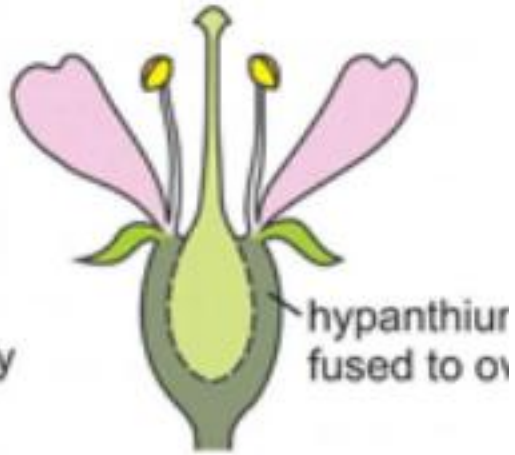
Superior Ovary
(hypogynous flower)

A flower type in which the sepals, petals, and stamens are attached below the ovary to the receptacle.

Half-inferior Ovary
(perigynous flower)

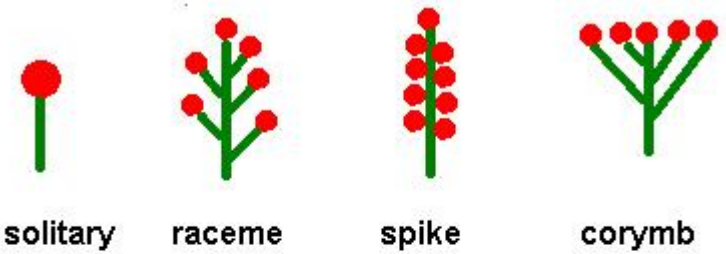
A flower type in which the sepals, petals, and stamens are attached to the rim of the floral tube (hypanthium), which surrounds but is *not fused* to the ovary wall.

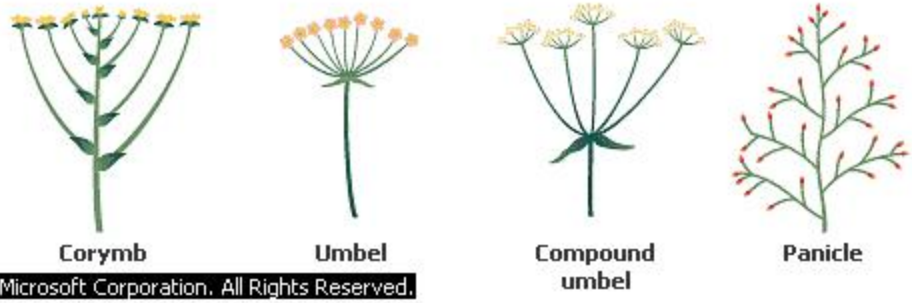
Inferior Ovary
(epigynous flower)

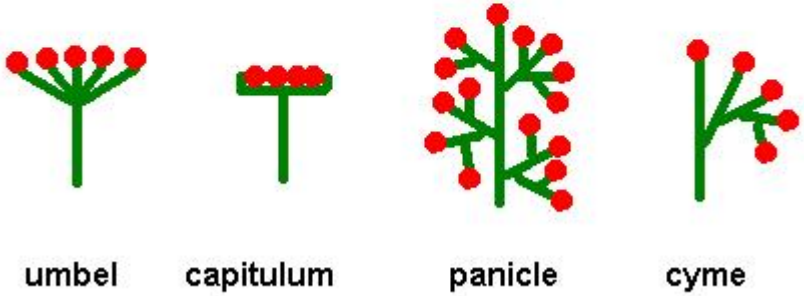


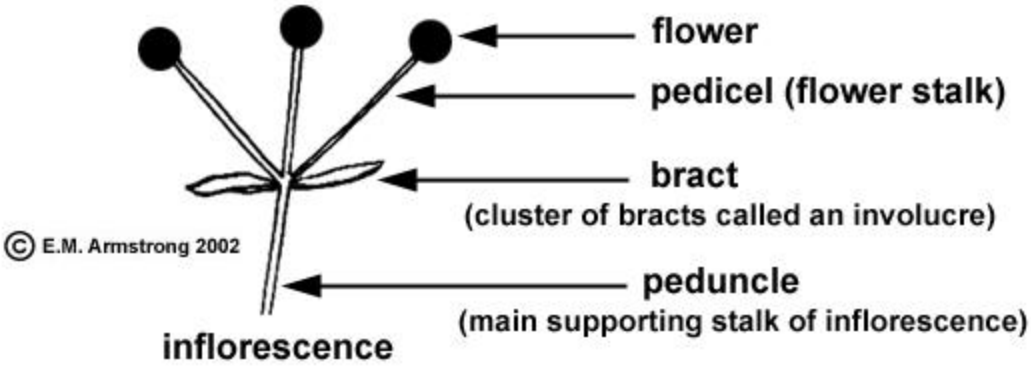
A flower type in which the sepals, petals, an stamens are attached above the ovary to th rim of the hypanthium which is fused (adnat to the ovary wall.

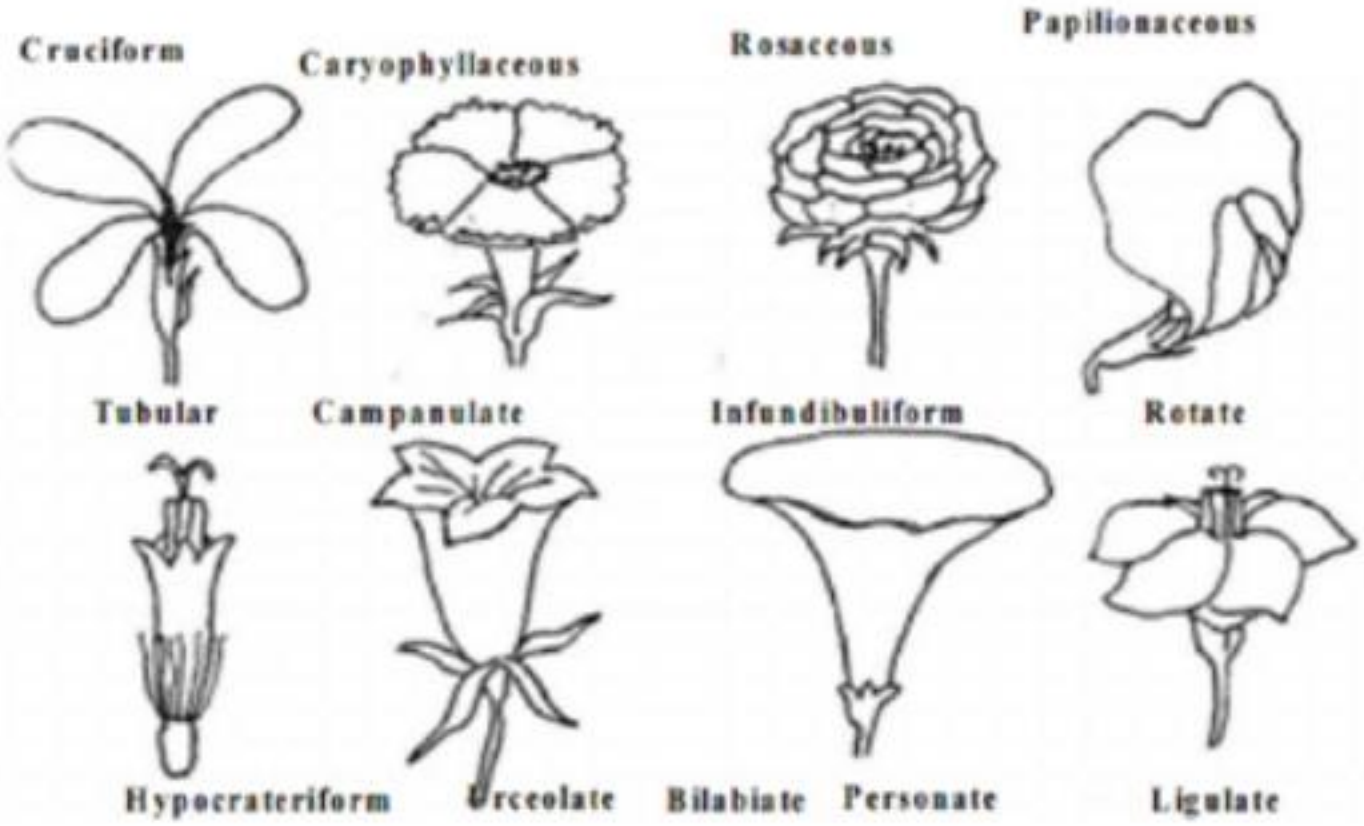
Figure 12. Ovary position in basic flower typ



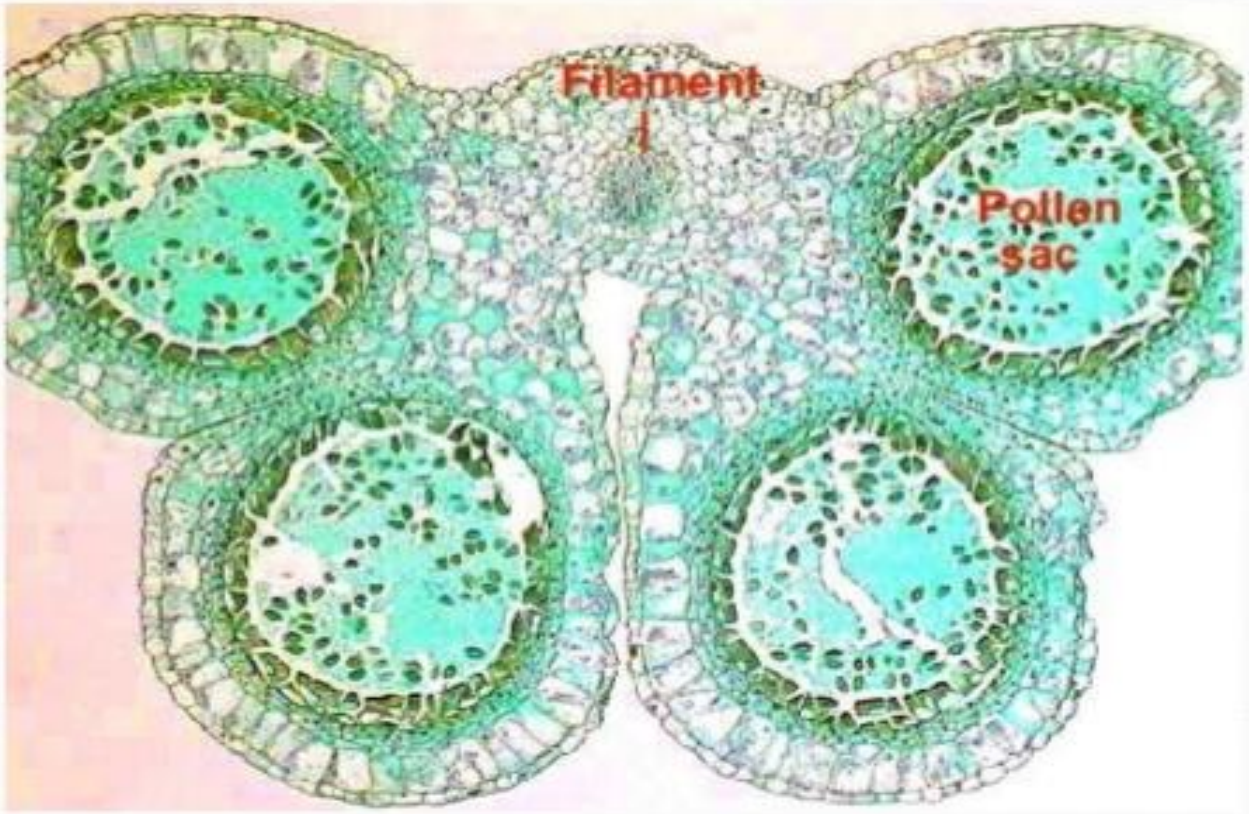







Cruciform
Caryophyllaceous
Rosaceous
Papilionaceous
Tubular
Campanulate
Infundibuliform
Rotate
Hypocrateriform
Urceolate
Bilabiate
Personate
Ligulate

T.S. OF Anther



(a)The Stamen:-

- Stamen in a flower consists of two parts, the long narrow stalk like filament and upper broader knob-like bi-lobed anther .
- The proximal end of the filament is attached to the thalamus or petal of the flower.
- The number and length of stamens vary in different species.

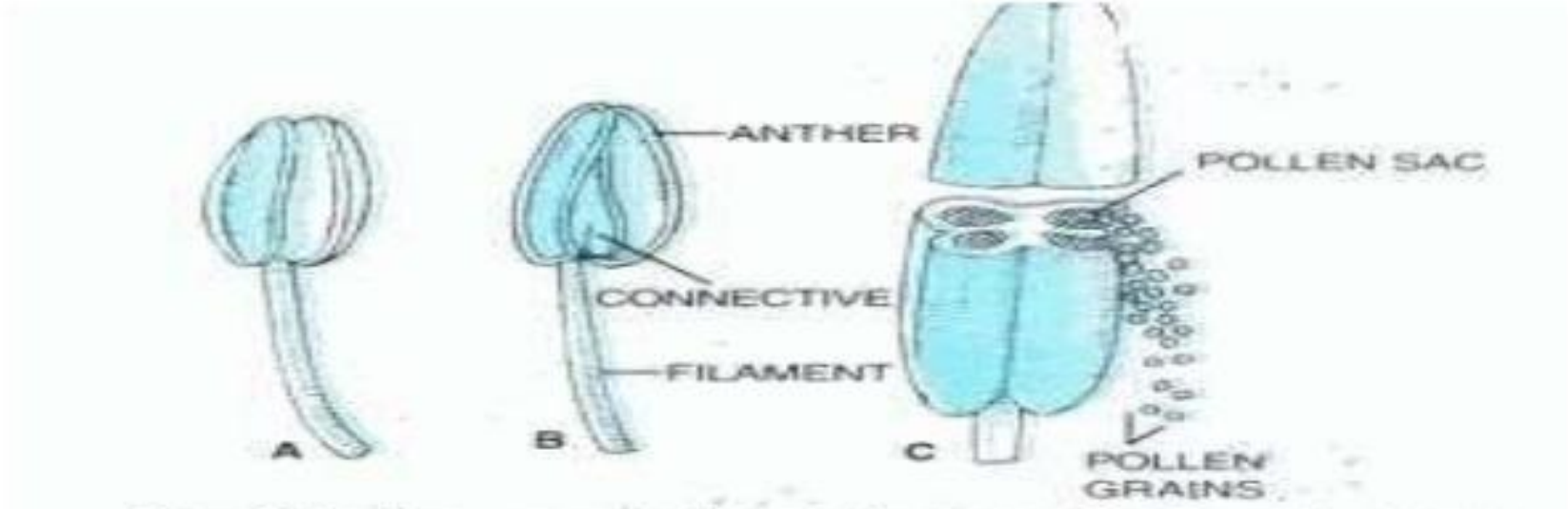
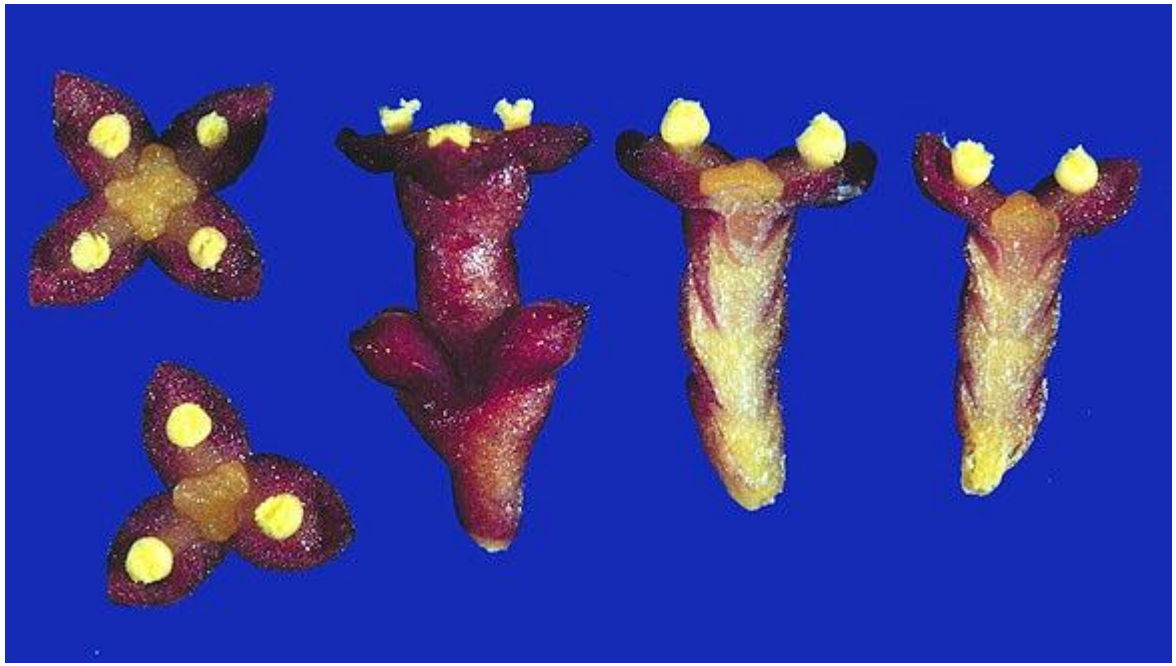


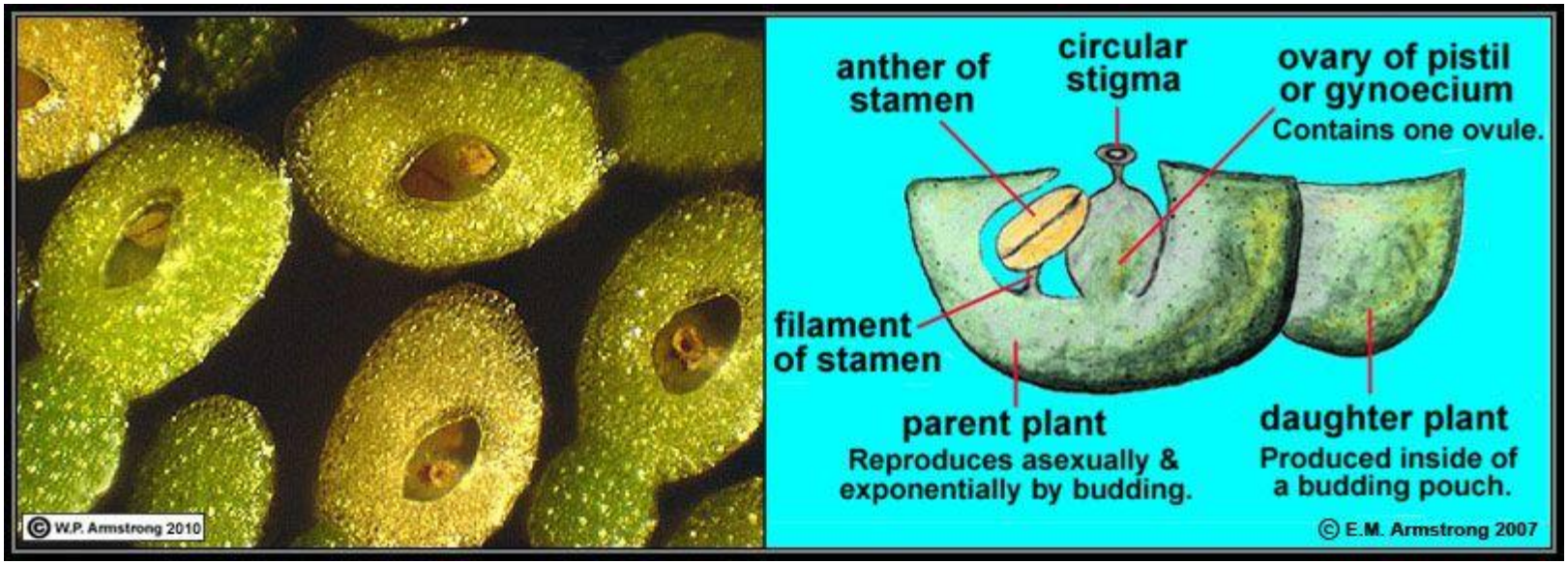
Fig. 2.3. Stamen. A. Ventral view; B. Dorsal view; C. Three dimensional cut section of Anther (Enlarged).

Anther lobes:

- Monothecous: The anthers have only one lobe

- Dithecous: The anthers have only two lobe




anther of stamen
circular stigma
ovary of pistil or gynoecium
Contains one ovule.
filament of stamen
parent plant
Reproduces asexually & exponentially by budding.
daughter plant
Produced inside of a budding pouch.
© W.P. Armstrong 2010
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HCPrecen 2012

Chasmogamous vs Cleistogamous	
Chasmogamous flowers are the flowers that expose their reproductive parts out for pollination.	Cleistogamous flowers are the flowers that do not open and hinder them from exposing the reproductive parts and force self fertilization.
Nature	
Chasmogamous flowers are opened.	Cleistogamous flowers stay closed.
Fertilization	
Chasmogamous flowers show both self and cross fertilization.	Cleistogamous flowers always show self fertilization.
Involvements of Biotic and Abiotic Pollinators	
Chasmogamous flowers are pollinated by biotic or abiotic pollinators.	Pollinators are not involved with Cleistogamous flowers.

b)Structure of anther:-

- A normal bithecous or dithecous anther is made up of two anther lobes, which are connected by a strip of sterile part called connective.
- Two anther lobes contain four elongated cavities or pollen sacs (microsporangia) in which pollen grains are produced.

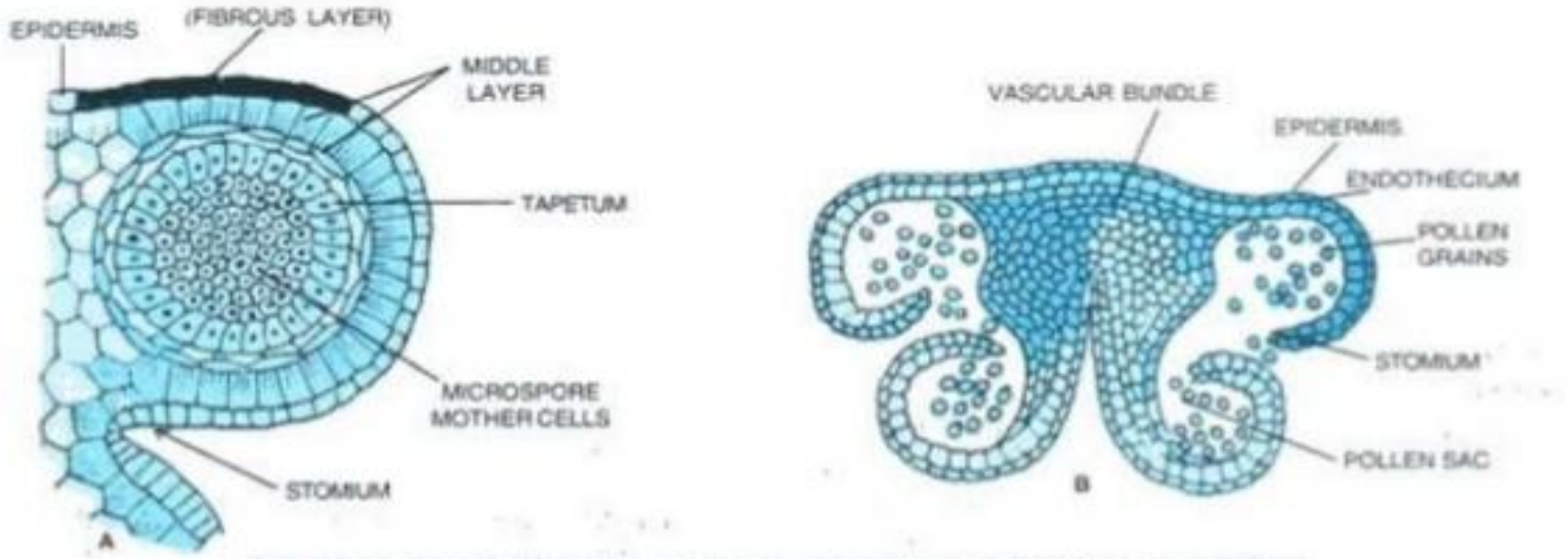
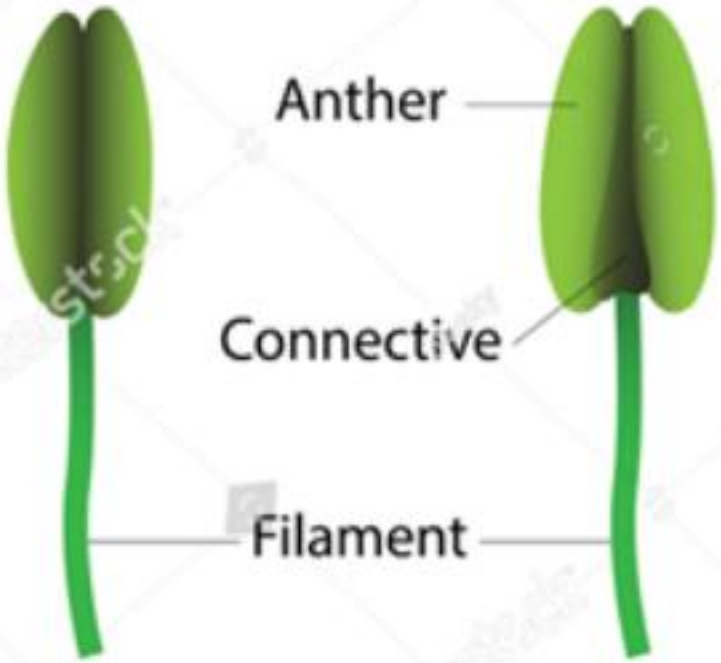


Fig. 2.5. A. Detailed structure of one young pollen sac; B. T.S. mature anther.

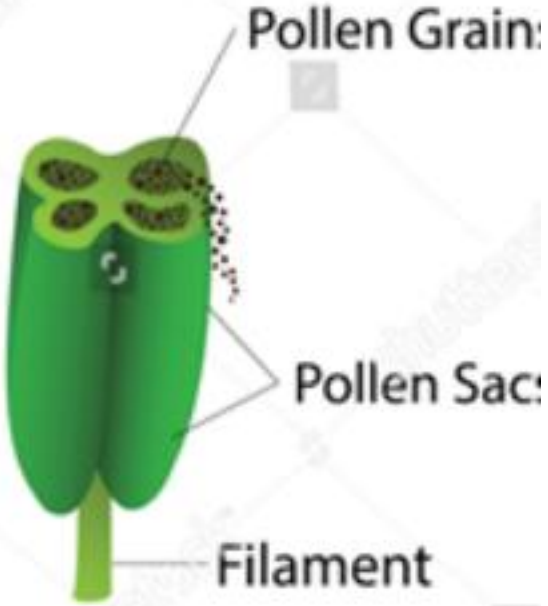
Structure Of Anther (Microsporangium)

- Bilobed and dithecus.
- A longitudinal groove separate the theca.
- In a cross- section anther is a tetragonal structure, consisting of 4 microsporangia, two in each lobes.
- Later two microsporangia of each lobe fuse as a pollen sac.

Structure of Anther



Stamen



Section of anther

Structure Of Anther

- A microsporangium is circular and surrounded by 4 layers.
- These layers are -

- Epidermis,
- Endothecium,
- Middle layers
- Tapetum.

- Outermost layers protect the pollen and help in dehiscence of anther to release pollen.

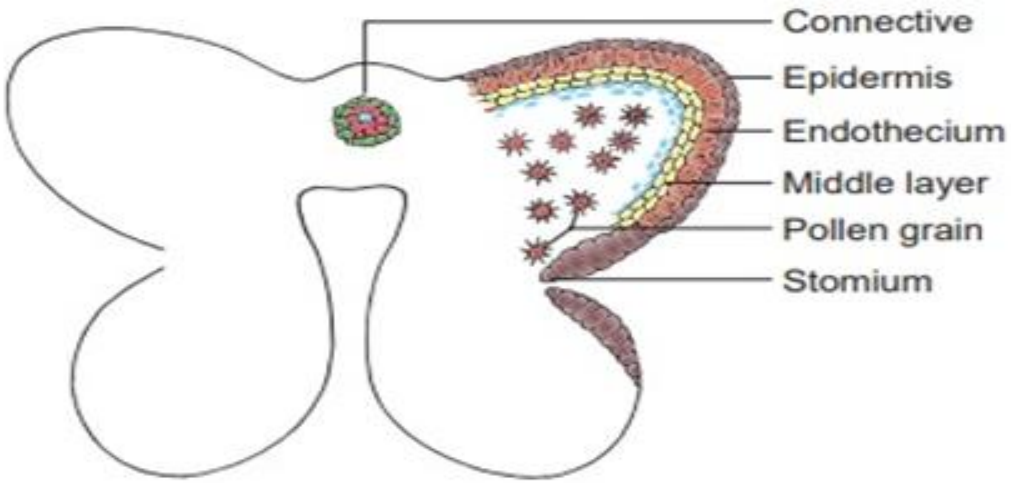
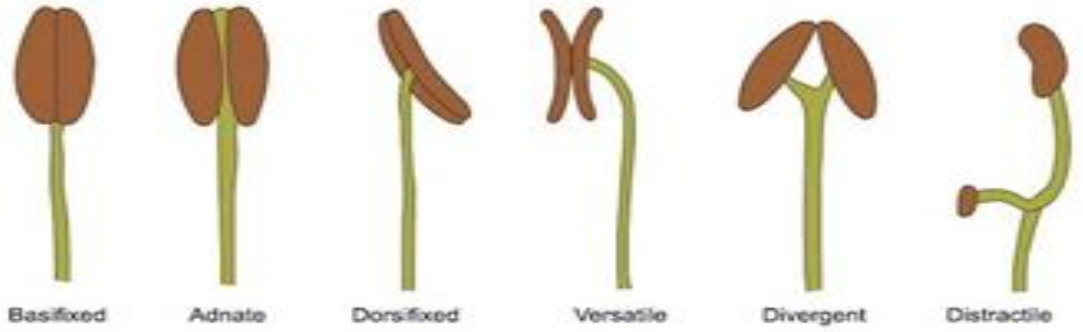
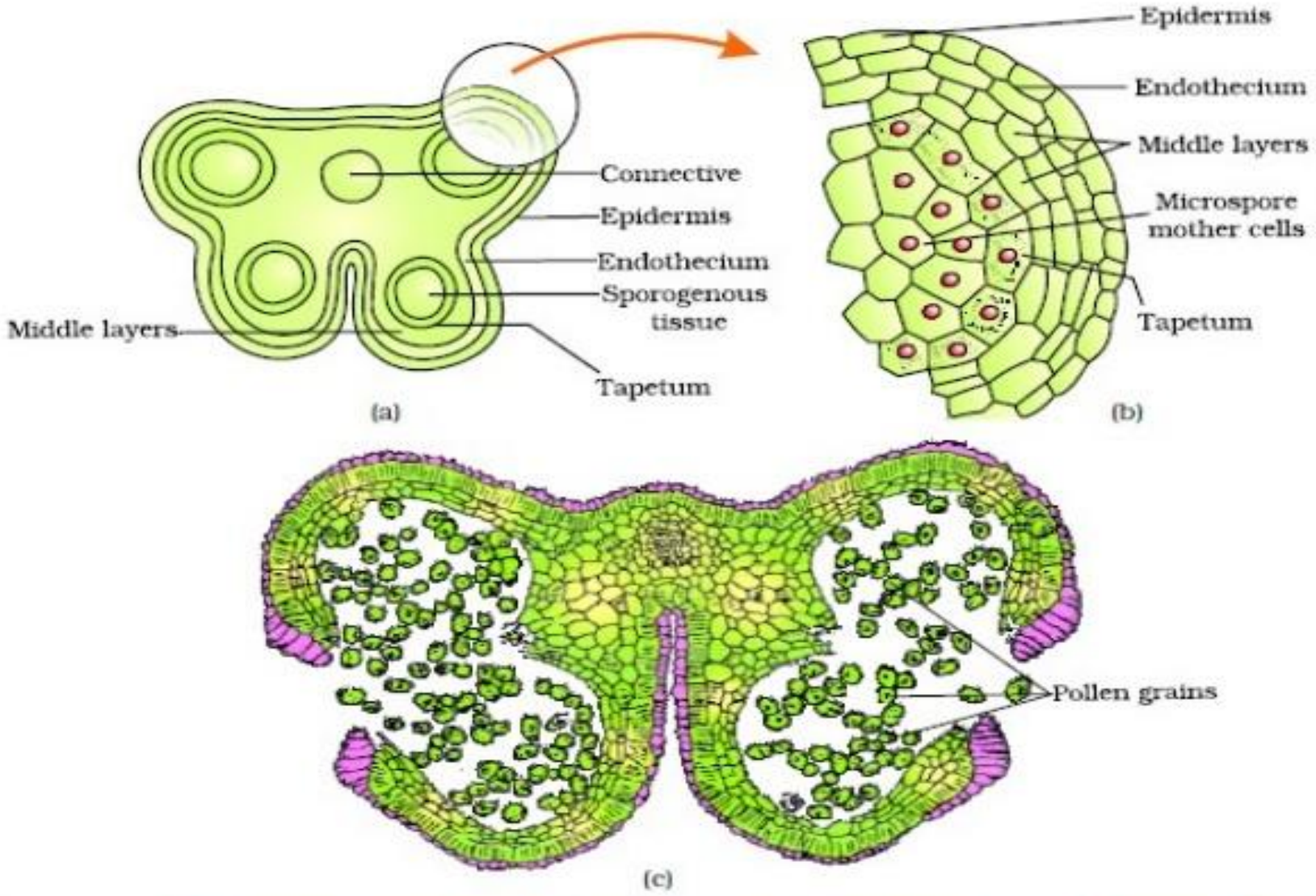


Figure 1: Pollen grain stage of anther

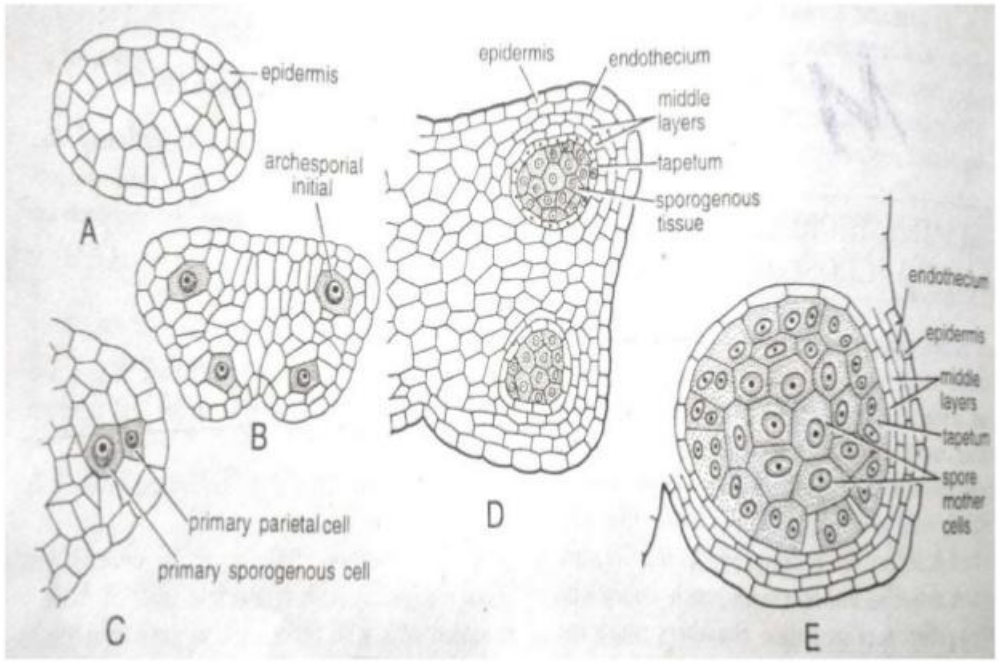


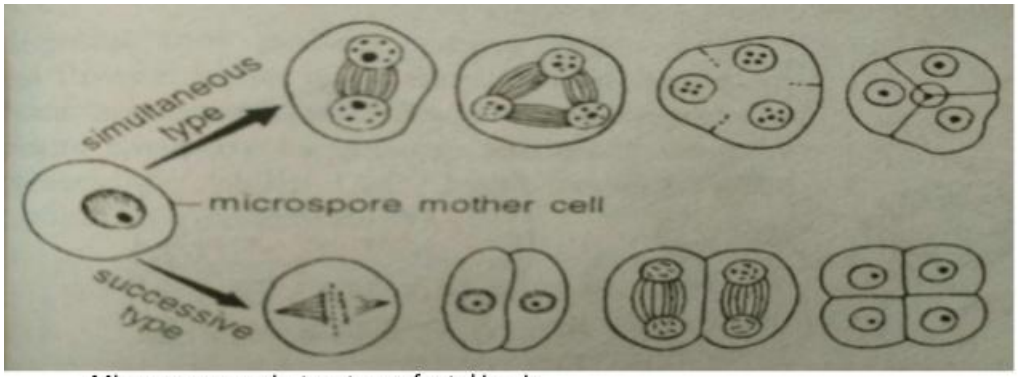
Types of fixation of anthers



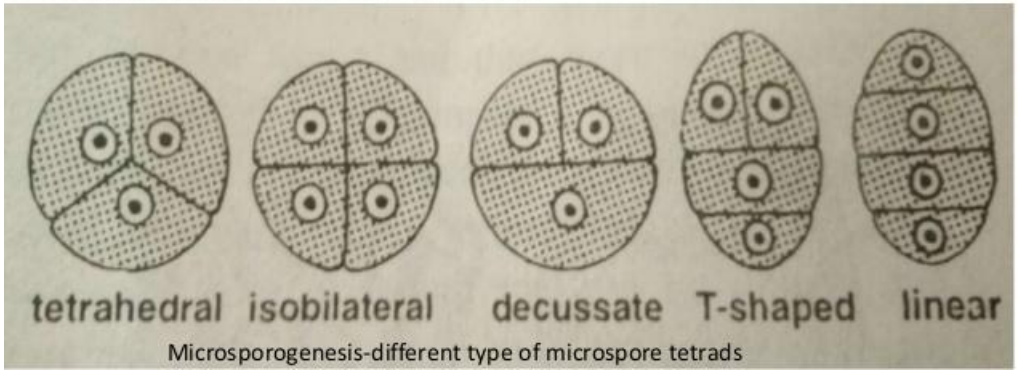
(a) Transverse section of a young anther; (b) Enlarged view of one microsporangium showing wall layers; (c) A mature dehisced anther

DEVELOPMENT OF ANTHER:-





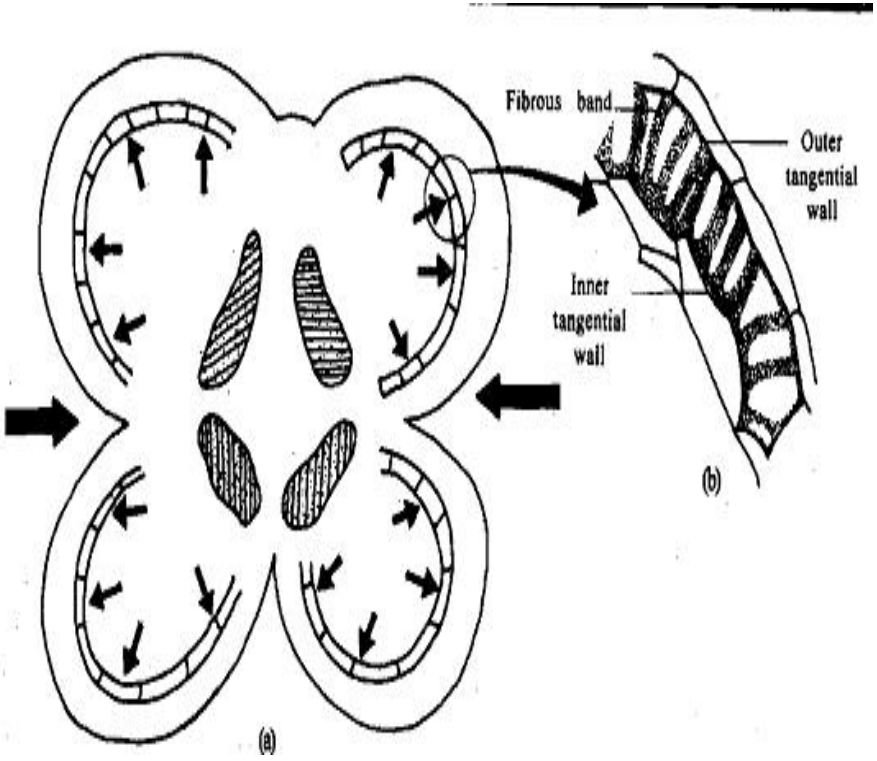
Microsporogenesis- two type of cytokinesis



Microsporogenesis-different type of microspore tetrads

ANTHER WALL

- **Epidermis** – it is outermost layer of anther which is single cell in thickness
- The cells of thin layer divide only anticlinicaly in order to cope up with the growing anther
- **Endothecium-** next to epidermis is endothecium
- The cell of endothecium are radially elongated and develop cellulosic fibrous band in their inner and tangential walls


Fibrous band
Outer tangential wall
Inner tangential wall
(a)
(b)

- **Middle layers-** next to endothecium are 1-3 middle layers.

- All of them degenerate at the time of meiosis in microspore mother cell

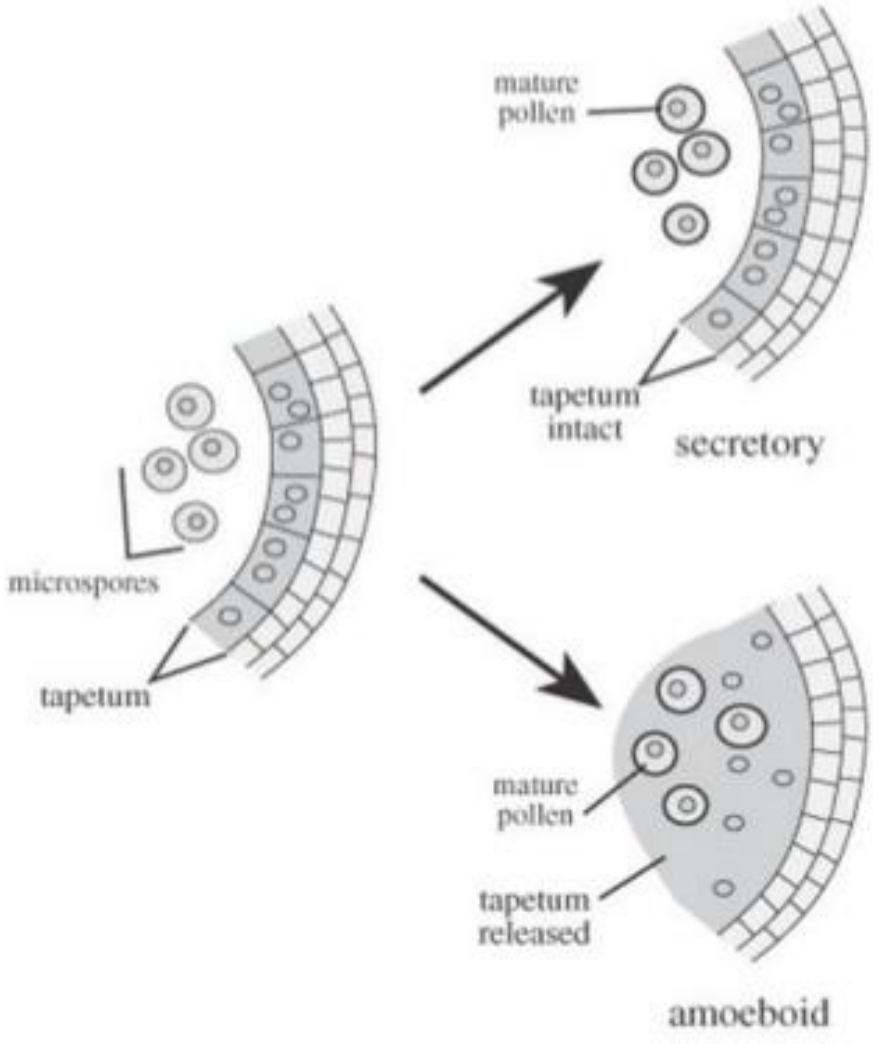
- **Tapetum**- it is the innermost layer of anther wall

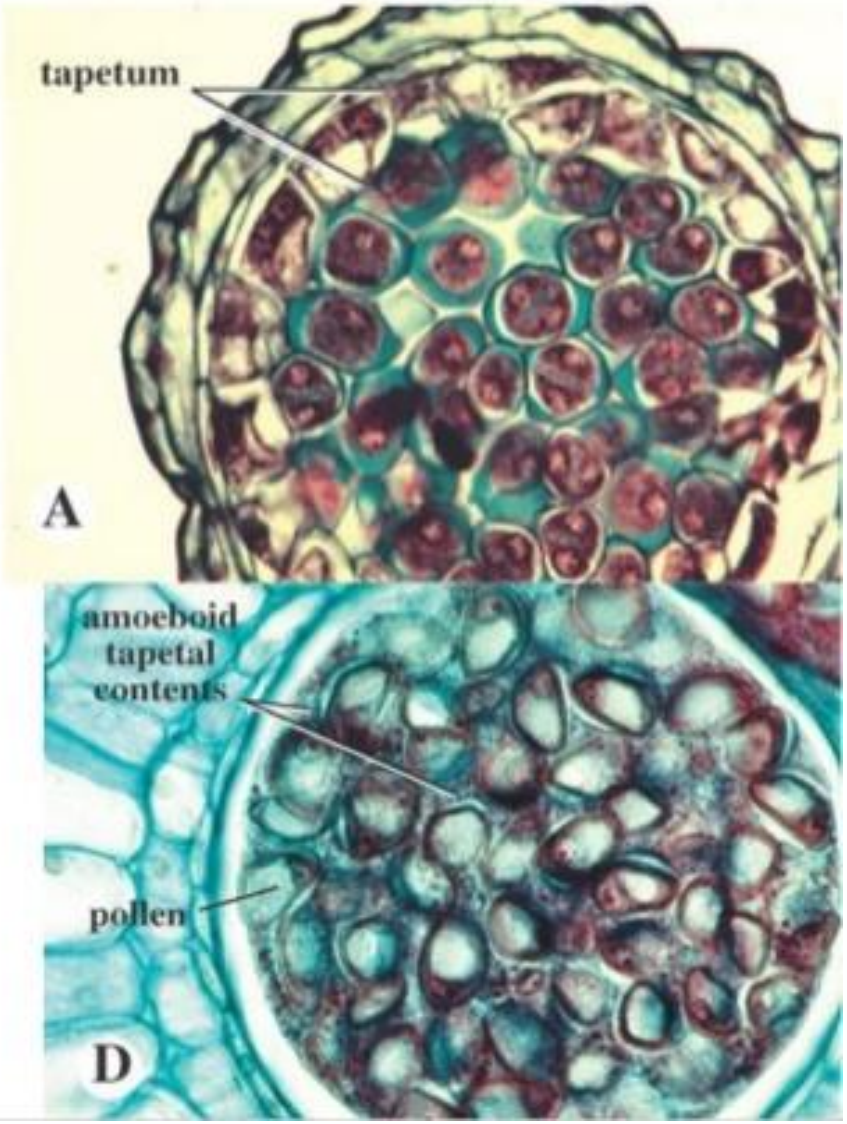
- It is composed of single layer of cell characters by dense protoplasm and prominent nuclei

- Depending upon behavior tapetum is of 2 type

1. Amoeboid tapetum- it is of primitive type. later during the drying up process of anther, periplasmodium hydrates and deposits as tryphine on the wall of pollen grain.
2. Secretory tapetum-secretory tapetal cell remain attached to middle layer till the development of pollen grains . It is more common among angiosperm

Tapetum type



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Function of tapetum

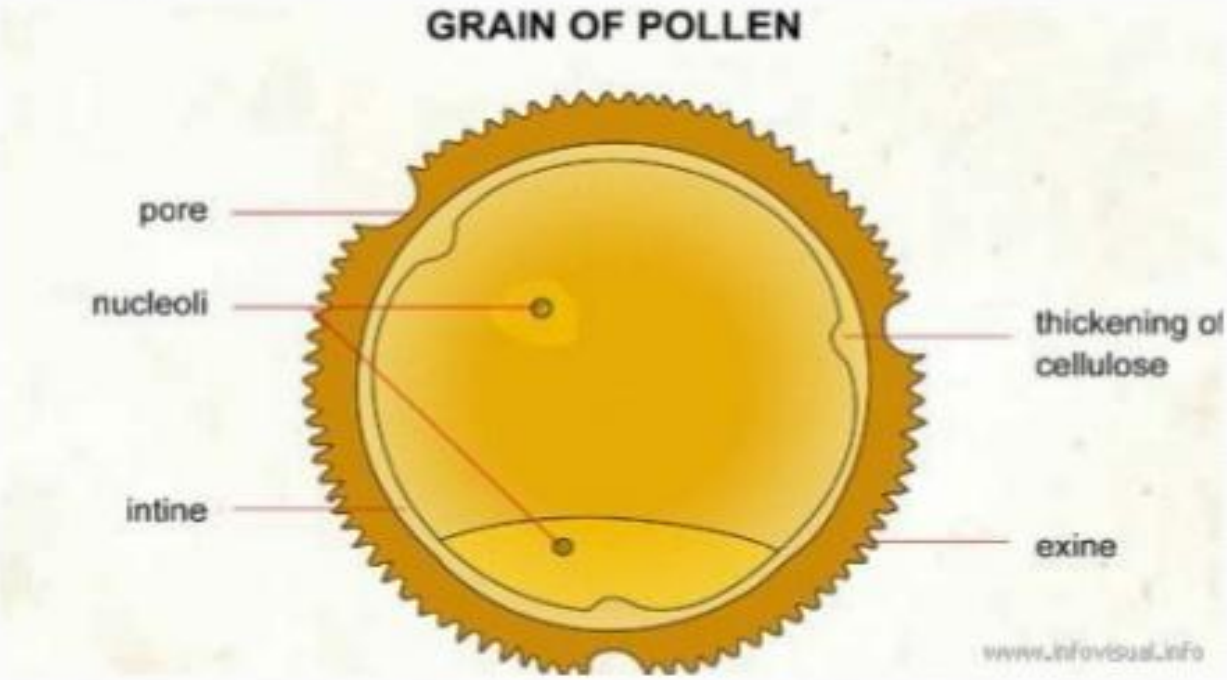
- It provide nourishment to the developing pollen grain
- it help in the formation of exine
- It hepls in the transport of food material to inside of the anther
- Tapetum helps in the formation of pollen wall

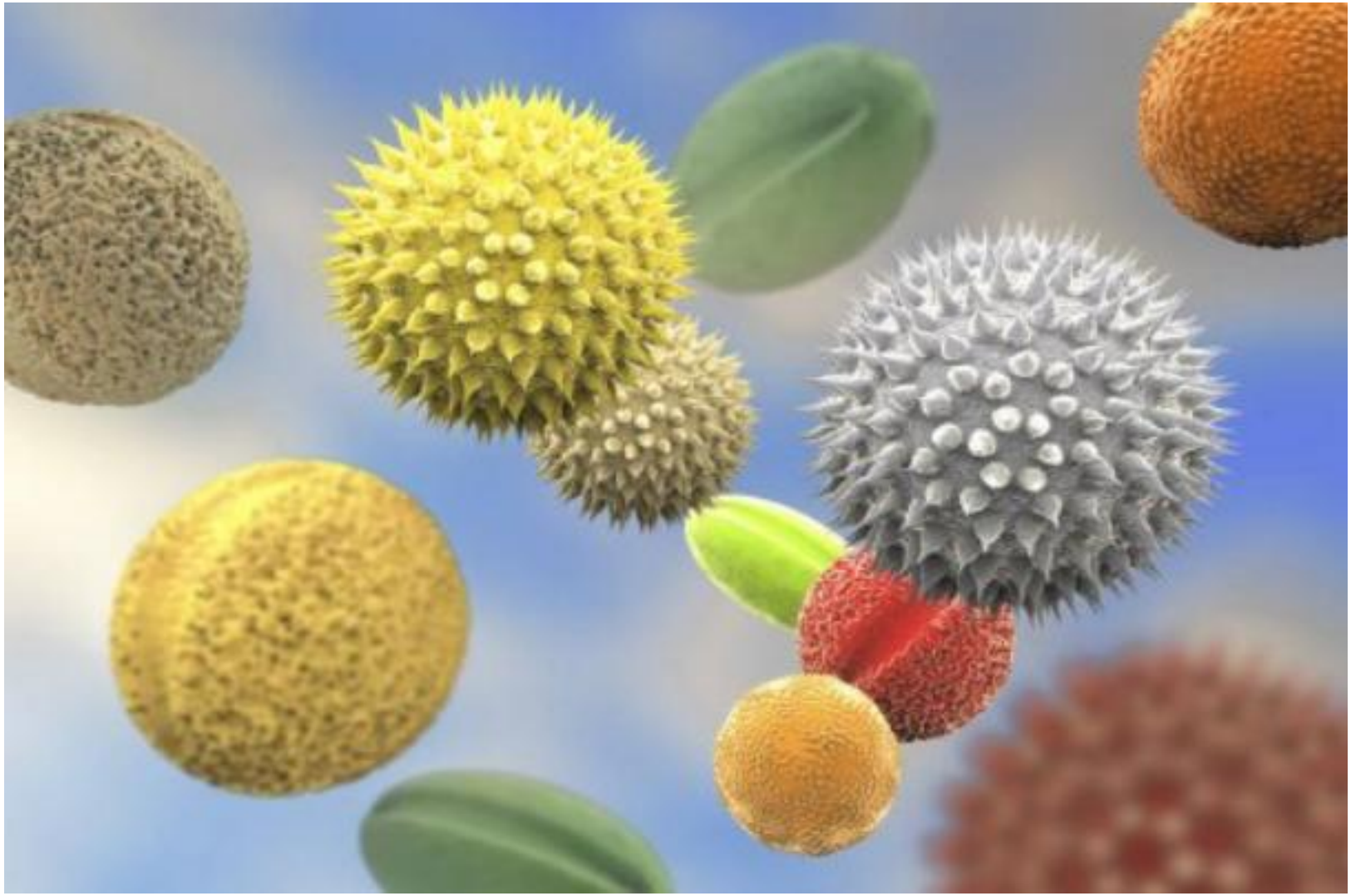
Sporogenous tissue

- Primary sporogenous tissue give rise to microspore mother cell
- Some of sporogenous cell remain non functional and serve as the food material for the developing microspore
- MMC under goes meiosis to form microspore tetrad which seprate out to form microspore or pollen grain
- The process of formation of microspore from MMC is called microsporogensis

Microsporogenesis

- The process of formation of microspores from a pollen mother cell through meiosis is called microsporogenesis.
- The cells of sporogenous tissue undergo meiosis to form **microspore tetrad** arranged in a cluster of 4 cells..
- As each cell of sporogenous tissue has potential to form tetrad, so each cell is a microspore mother cell (PMC).
- On maturation and dehydration of anther, the spores dissociate and develop into pollen grains.
- Pollen grains release with the dehiscence of anther.


GRAIN OF POLLEN
pore
nucleoli
intine
thickening of
cellulose
exine
www.infovisual.info

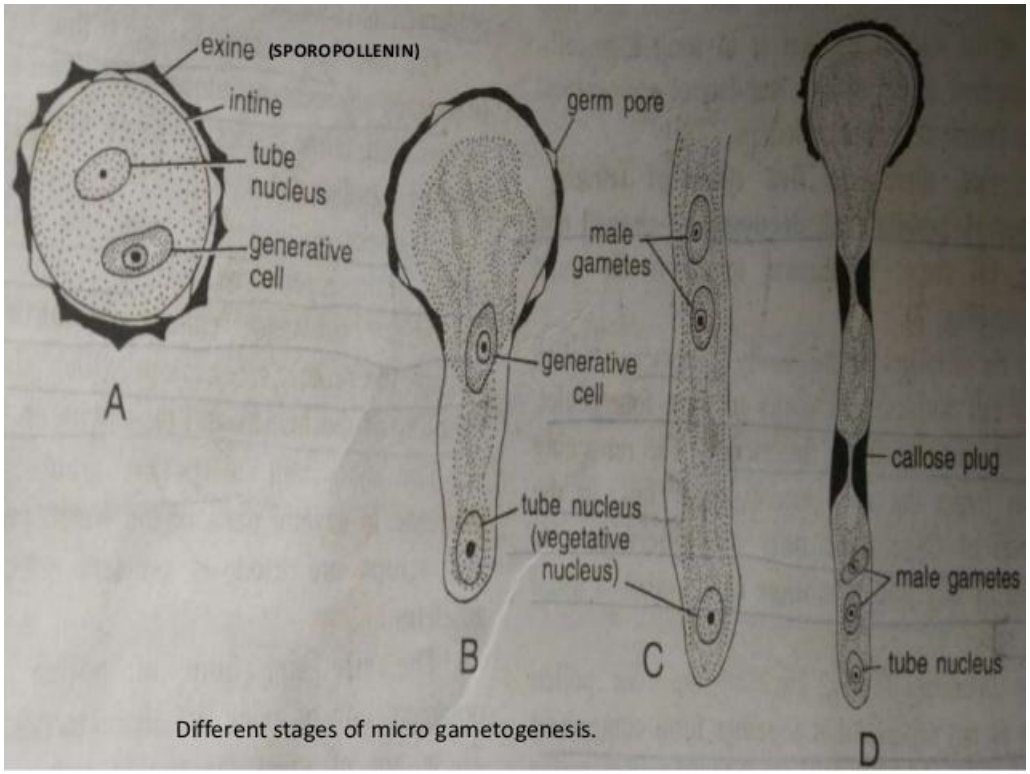


Pollen Grain (Male Gametophyte)

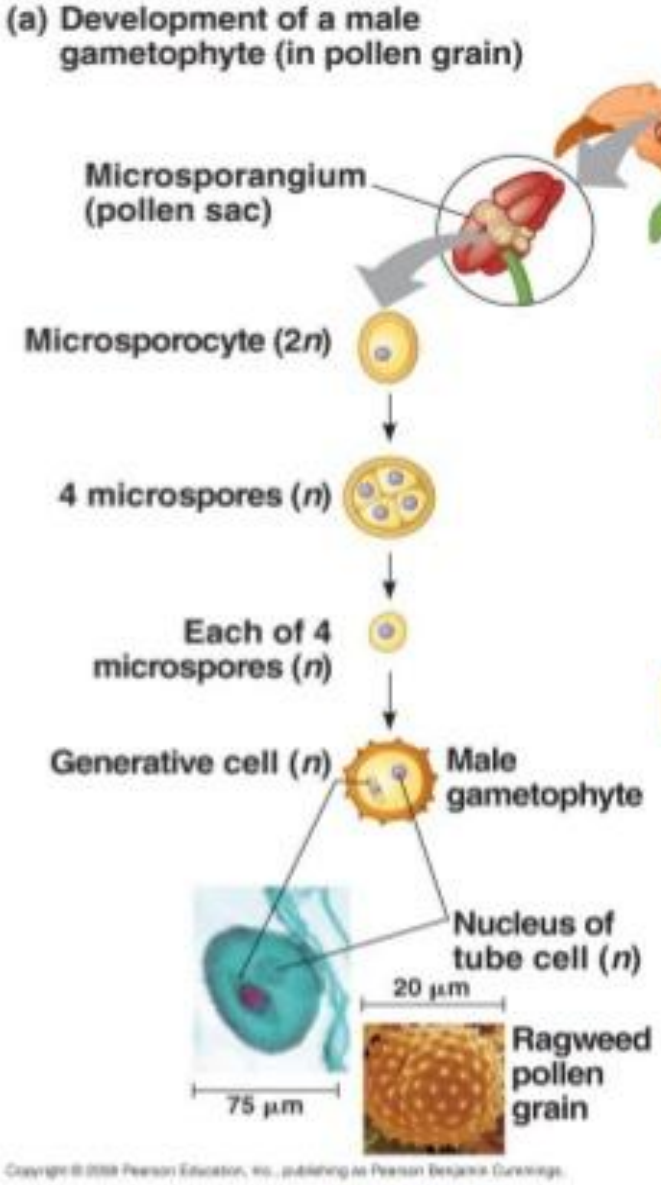
- Spherical in shape.
- Have two layered wall- outer hard **exine** layer and inner thin **intine.**
- **Exine**- made up of sporopolenin. Resistant to organic matter, withstand high temperature, acids, alkalis and enzymes. It has prominent apertures called **germ pores**, where sporopolenin is absent.
- **Intine**- It is thin, continuous layer, made of cellulose and pectin.

Pollen Grain (Male Gametophyte)

- Pollen grain cytoplasm is surrounded by plasma membrane.
- Mature pollen grain has 2 cells- (i) vegetative cell (ii) generative cell.
- Vegetative cell- bigger, abundant food reserve, large irregular nucleus.
- Generative cell- small, spindle shaped with dense cytoplasm and a nucleus, floats in vegetative cell cytoplasm.
- In 60% species pollen grains are shed in 2 celled stage where as 40% species shed in 3 celled stage in which generative cell divides mitotically into 2 male gametes.



Different stages of micro gametogenesis.



Microsporogenesis- formation of spores called microspores

Microgametogenesis- development of microspore into the microgametophyte or the pollen grain containing sperm cells