

# **Environmental Factors Affecting Plant Growth**

**Ass. Prof. Dr. Shahla Mahmood  
Muhammad**

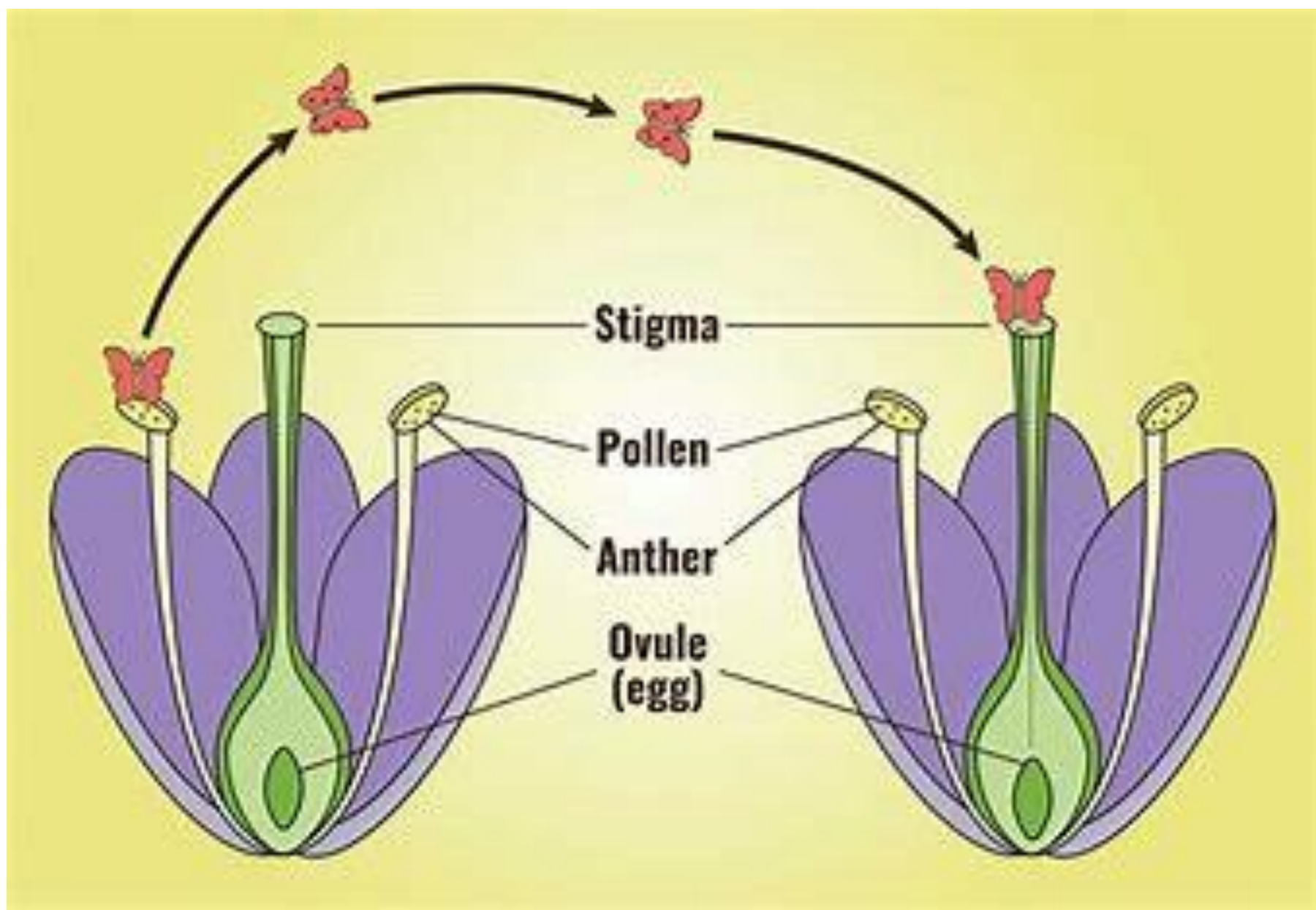
# **Light - Quality, Quantity and Duration**

- Short day length plants
- Long day plant

- Plant hormones and growth regulators:
- There are five groups of plant-growth-regulating compounds:
  - 1. Auxins
  - 2. Gibberellins
  - 3. Cytokinins
  - 4. Ethylene
  - 5. Abscisic acid (ABA) .

- **Pollination and Fertilization:**

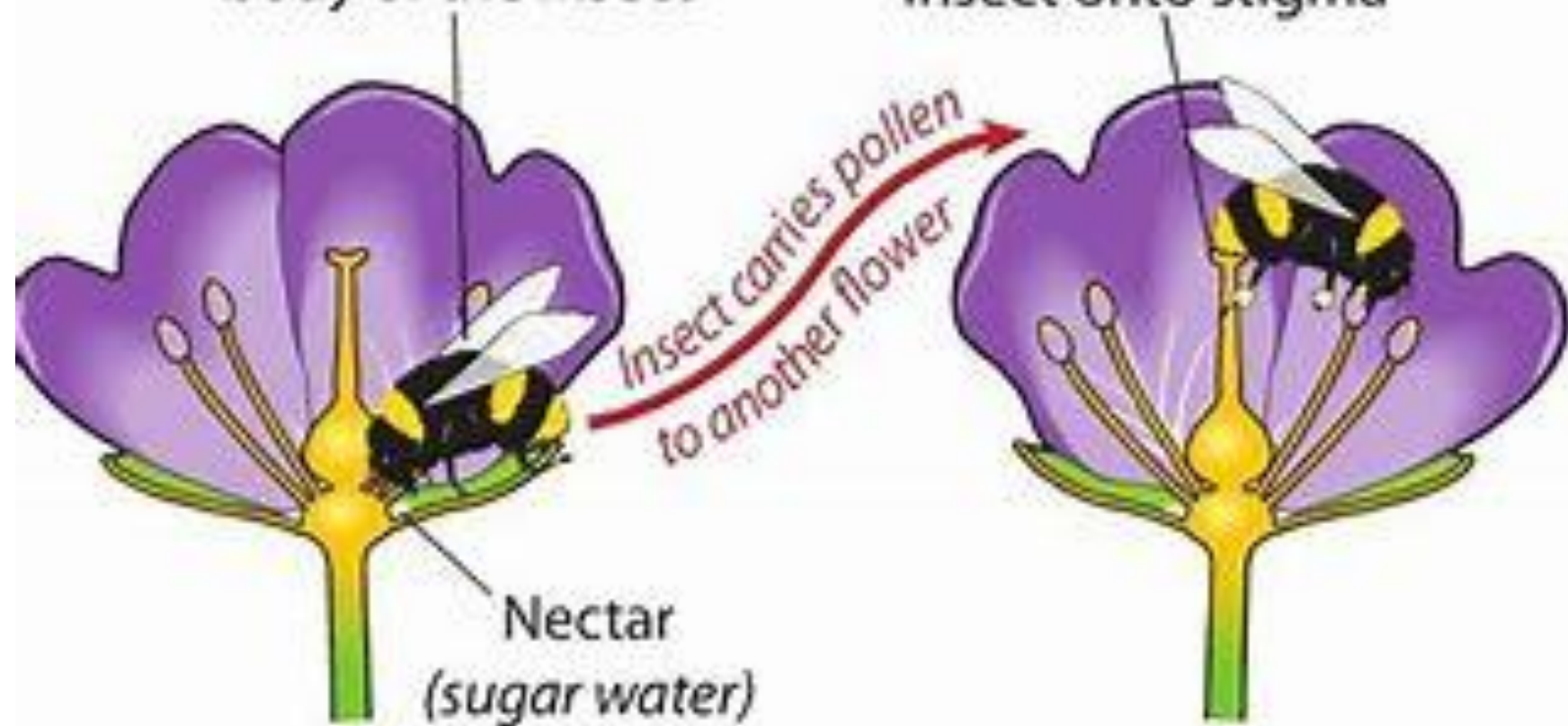
Pollination: The transfer of pollen from the male anther to the female stigma.



## Insect pollination

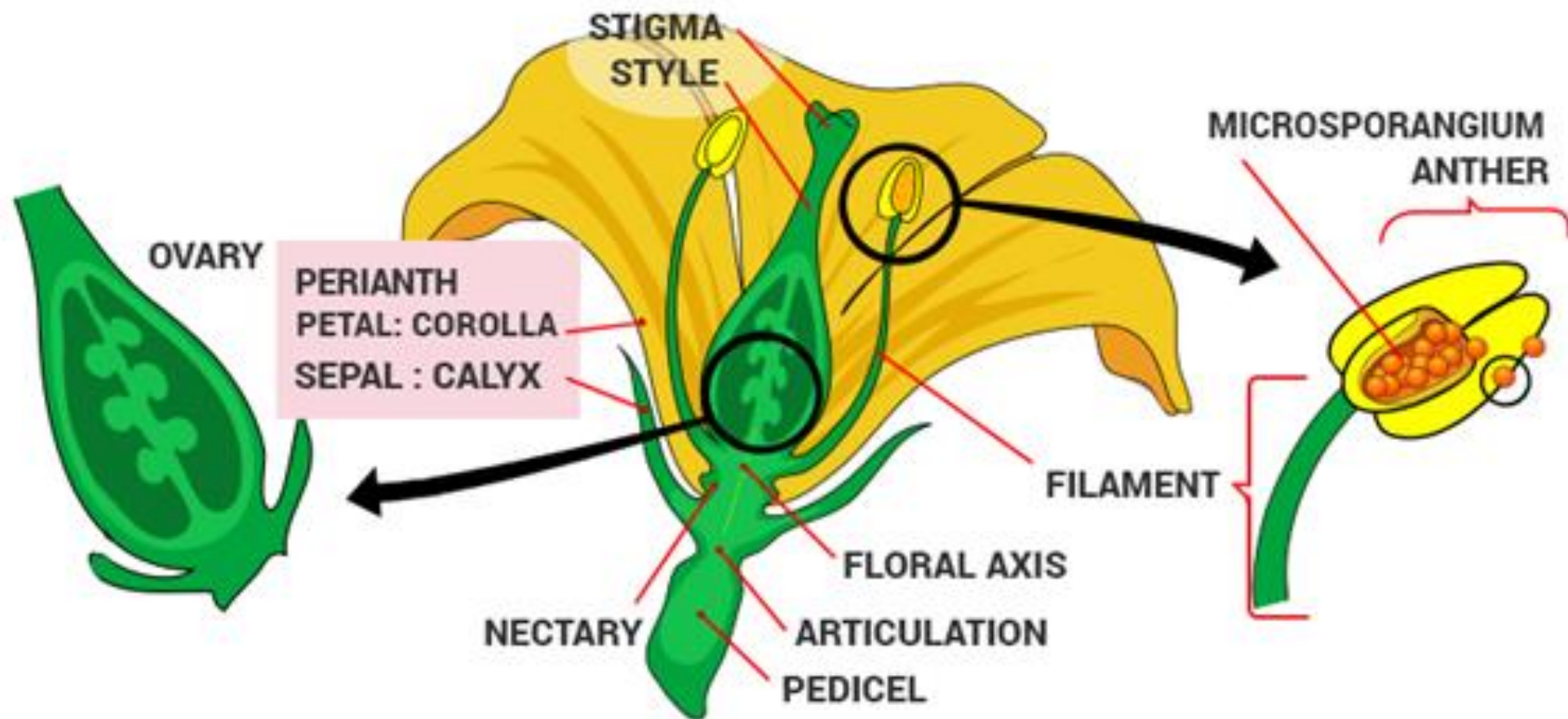
Pollen sticks to the  
body of the insect

Pollen falls from  
insect onto stigma



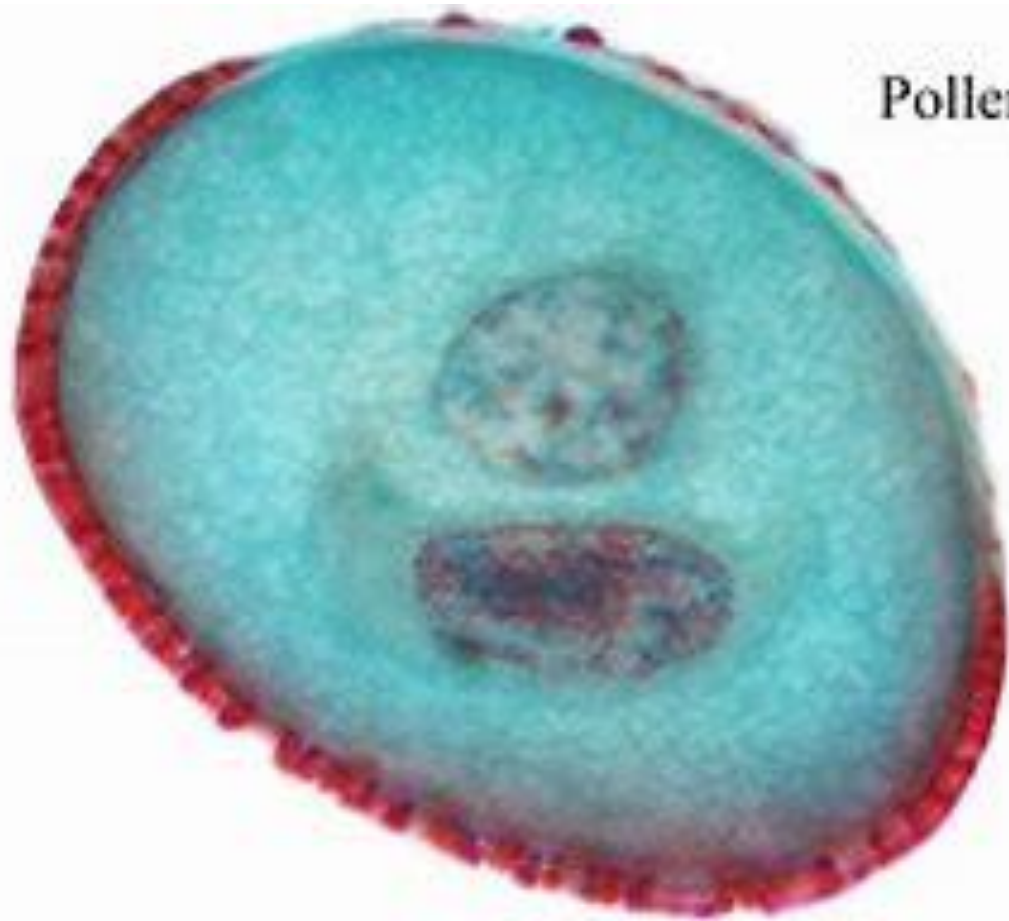
- **Why pollination is important?**
  - 1- Sexual reproduction is important for evolution.
  - 2- Sexual reproduction produces variable offspring, creating diversity and variation among populations (shuffling of genes).
  - 3- You need variation for Natural Selection to occur.
  - 4- Sexual reproduction is advantageous to an organism only if it happens with some one other than itself.
  - 5- Outbreeding .

# FERTILIZATION IN PLANTS

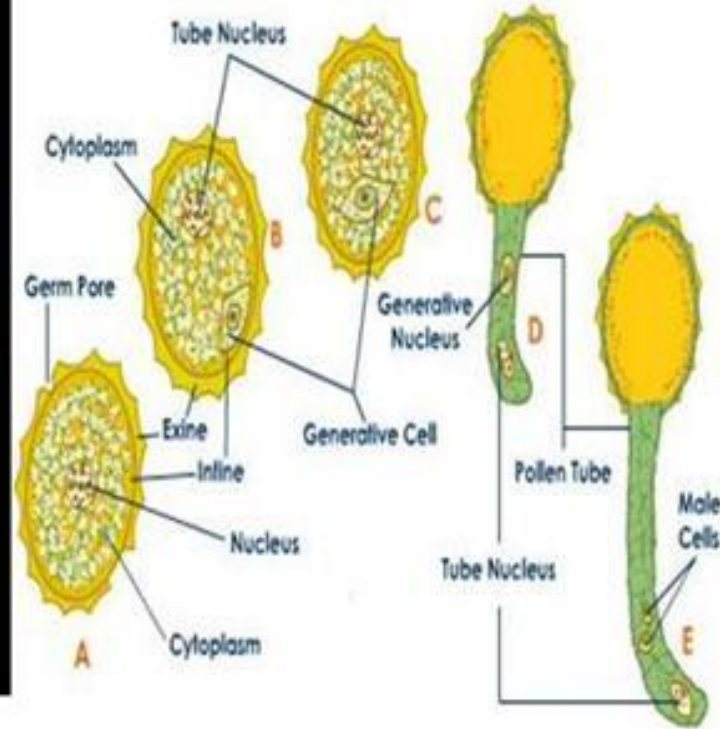
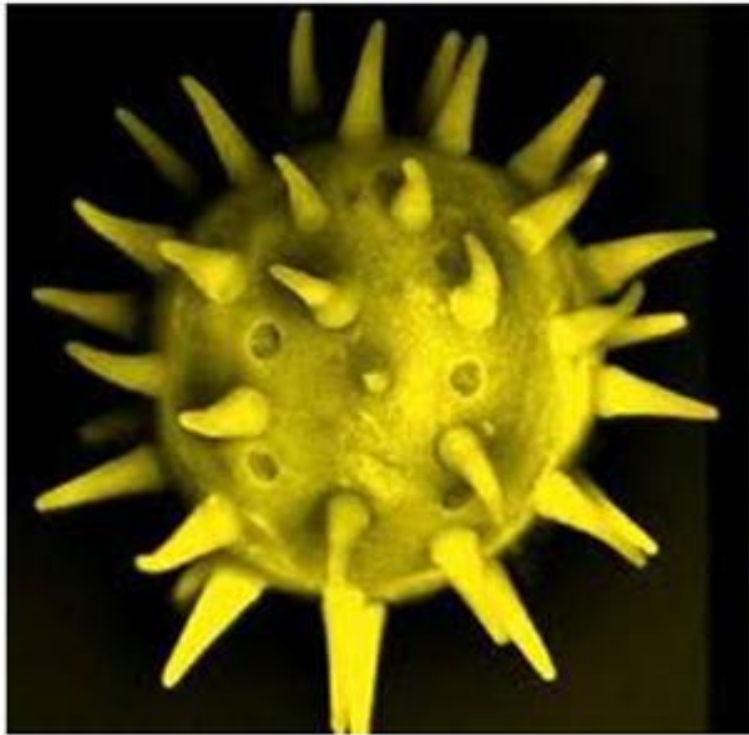




Pollen Grain

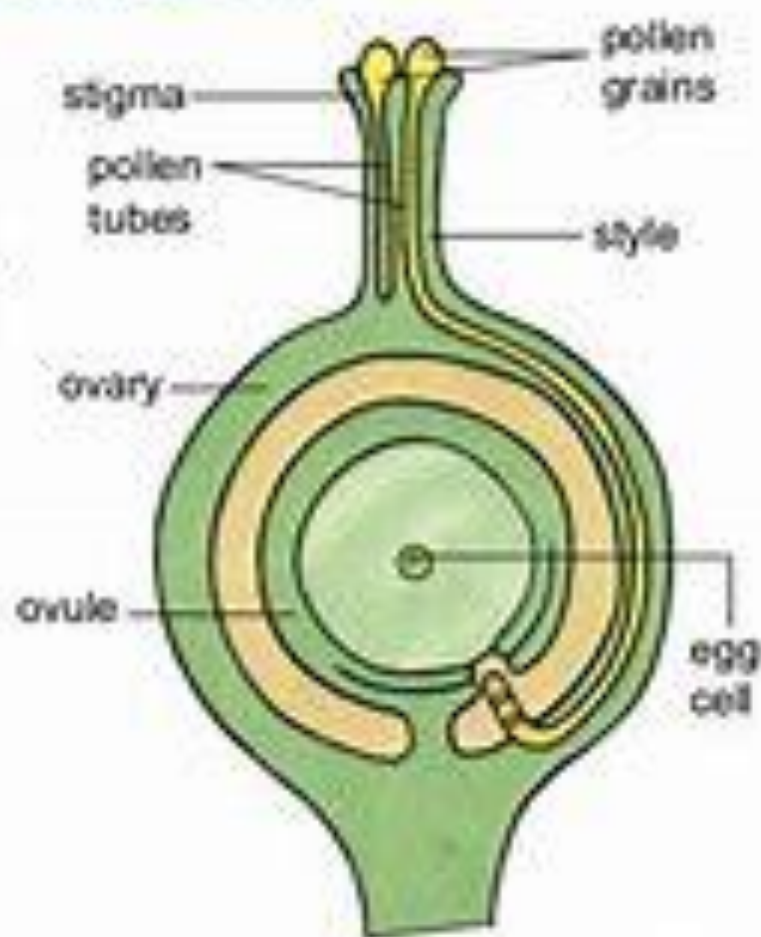


# POLLEN GRAIN, POLLEN MORPHOLOGY, POLLEN GERMINATION, AND POLLEN VIABILITY



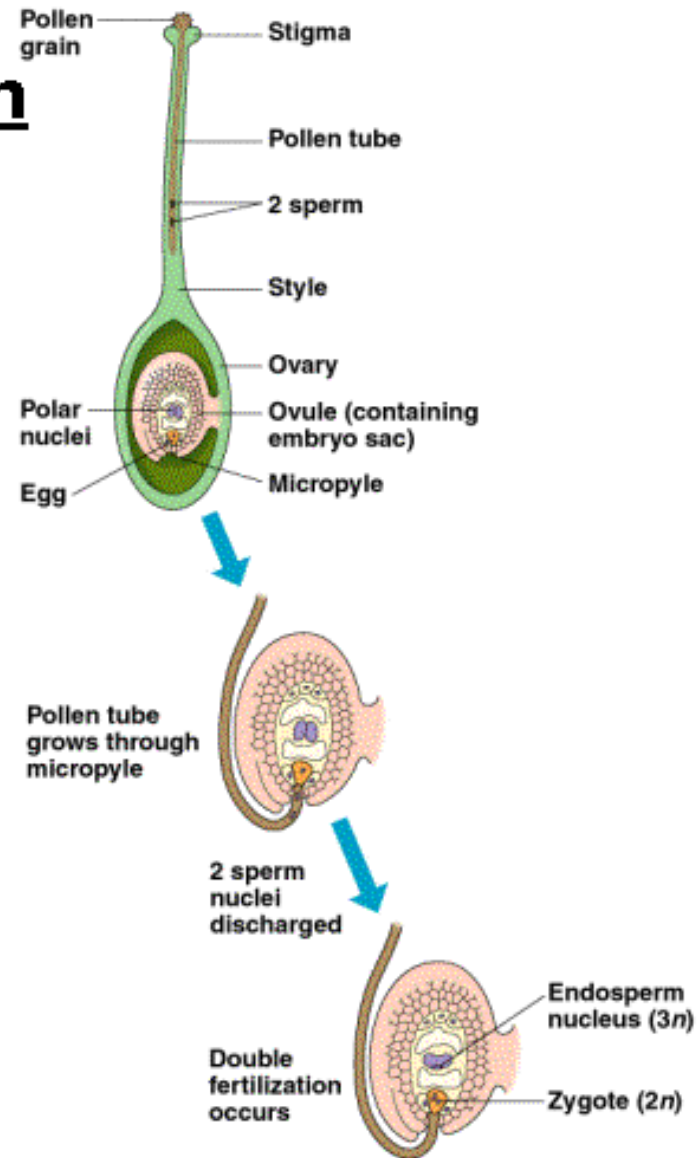
## Fertilisation

- When a pollen grain lands on the surface of a stigma, it produces a tube.
- The inside of the tip of the tube contains the **male cells** of the flower.
- These tubes grow down the style to reach the ovules in the ovary.
- Inside each ovule is an **egg cell**.



# Summary of Fertilization

1. A **pollen tube** grows from pollen grain, down the style, through the **micropyle** and into the **ovule**.
2. Two **sperm nuclei** are discharged into the **embryo sac** resulting in **double fertilization**.
3. The fertilized egg (**zygote**) will develop into the **embryo**.
4. The fertilized **central cell** will develop into **endosperm**.
5. The **ovule** develops into a **seed**.
6. The **ovary** develops into a **fruit** containing one or more seeds.



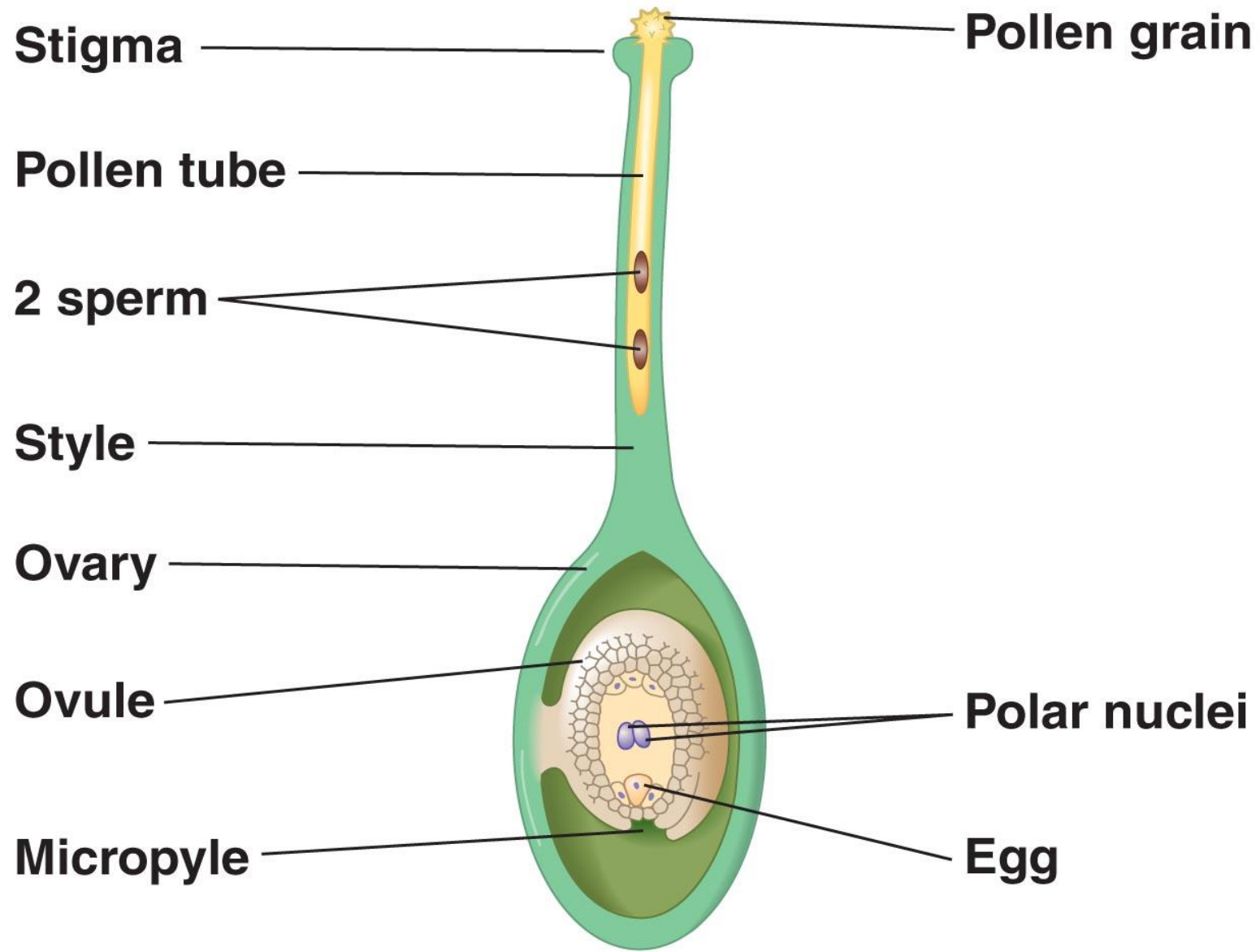
- **Sexual reproduction:**

- In flowering plants, because most flowers have both male and female parts in them, called perfect flowers, so flowering plants have evolved special ways to insure outbreeding/outcrossing – and to prevent inbreeding. Function of flower: To attract pollinators with colorful petals, scent, nectar and pollens.



ovary

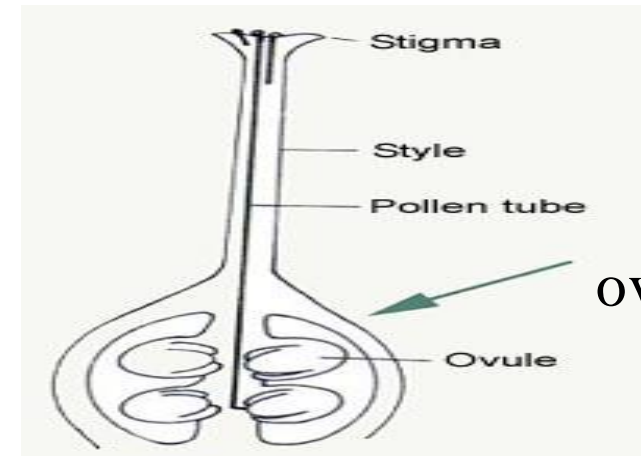
ovules



## Reproductive floral organs: female

Carpel or pistil – female reproductive organs; contains: 1- Stigma – is where pollen sticks to. 2- Style – is the long tube that connects stigma to ovary. 3- Ovary – enlarged structure at the base of carpel/pistil where the ovules are located; it will become the fruit.

- Ovules – contain female gametophyte, becomes the seed.



where

ovary



- Any questions?
- Phone number :07504020846
- Email:  
shahla.muhamaad@su.edu.krd

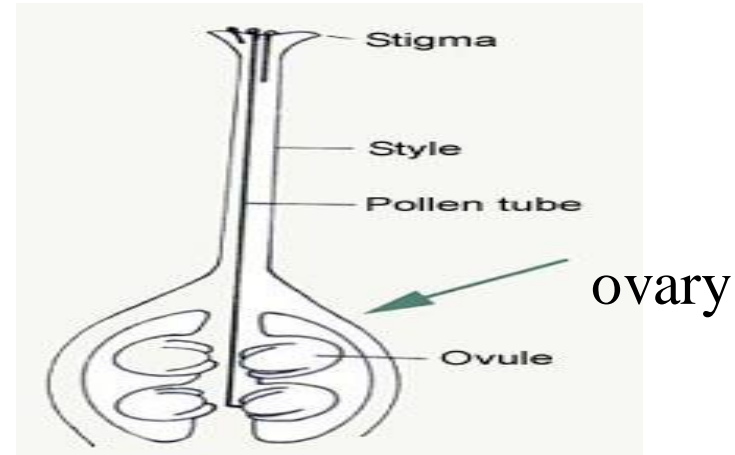
**Reproductive floral organs  
female**

**Ass. Prof. Dr. Shahla  
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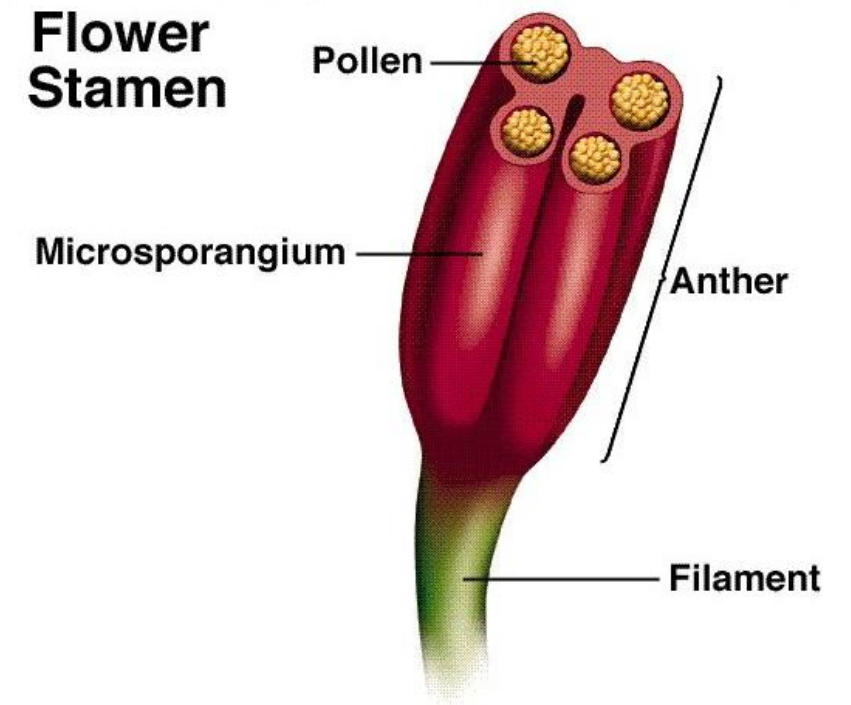
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where

## Reproductive floral organs: male

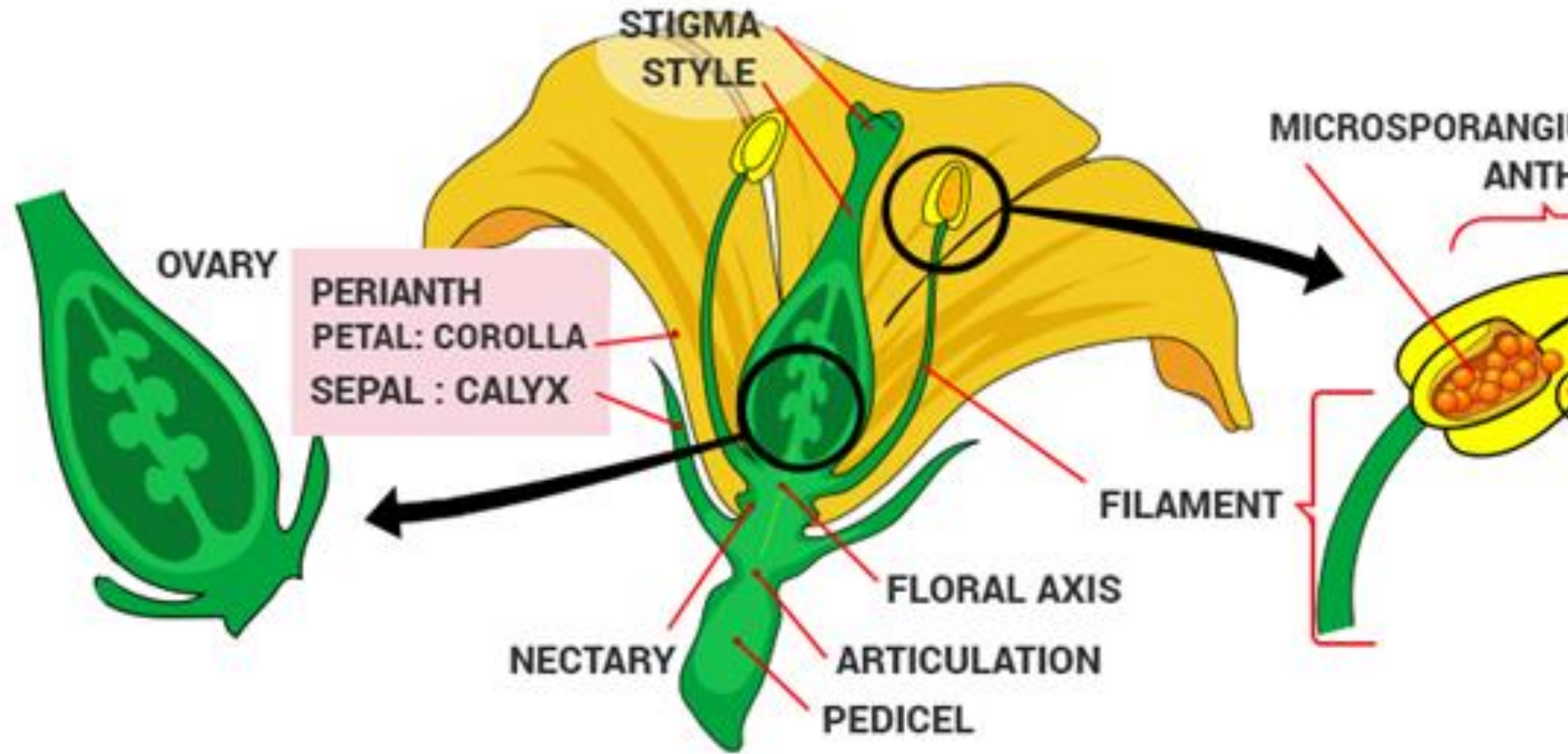
Stamen – male floral organ, consists of: 1- Anther – part of the stamen that produces pollen. 2- Filament – stalk-like structure that holds anther. - Pollen – immature male gametophyte.

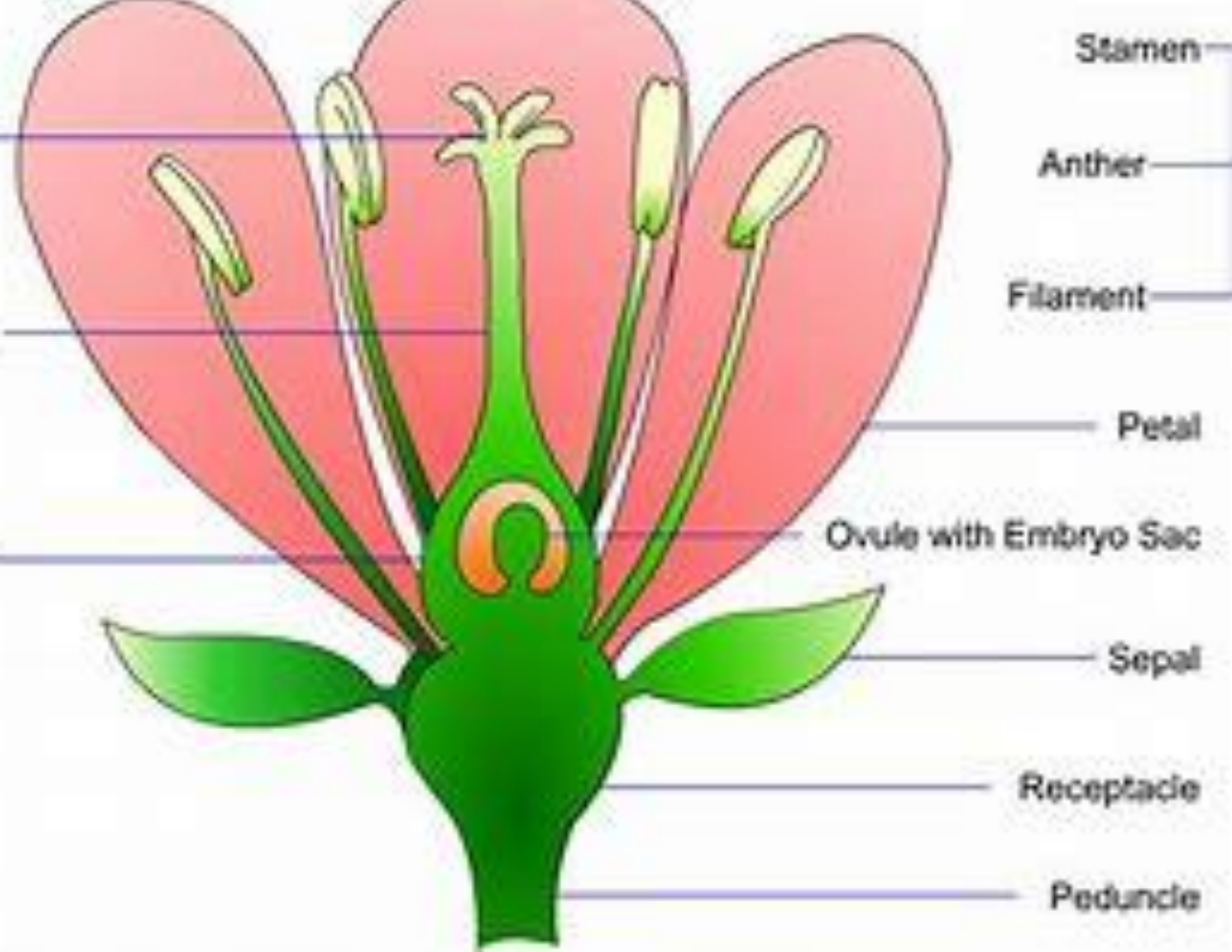


- **Non-reproductive floral organs:**

- 1- Petals – whorl of flower organs that are often brightly colored to attract pollinators.
  - Corolla – whorl of petals in a flower.
- 2- Sepals – whorl of leaf-like organs outside the corolla; help protect the unopened flower bud.
  - Calyx – whorl of sepals in a flower.

# FERTILIZATION IN PLANTS

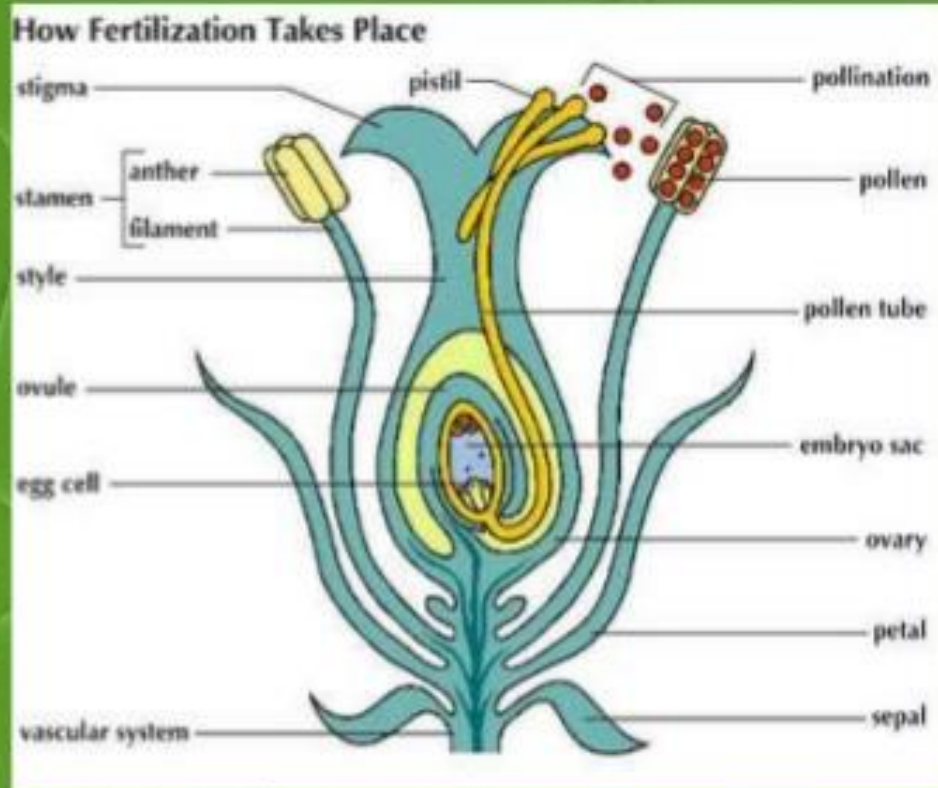




- Pollination and Fertilization: For pollen sperm to successfully fertilize the egg, there must be pollination: a method to get the pollen from the male anther to the stigma. Pollen sticks to the stigma, starts growing a pollen tube. Fertilization begins when tube begins to grow toward the egg.



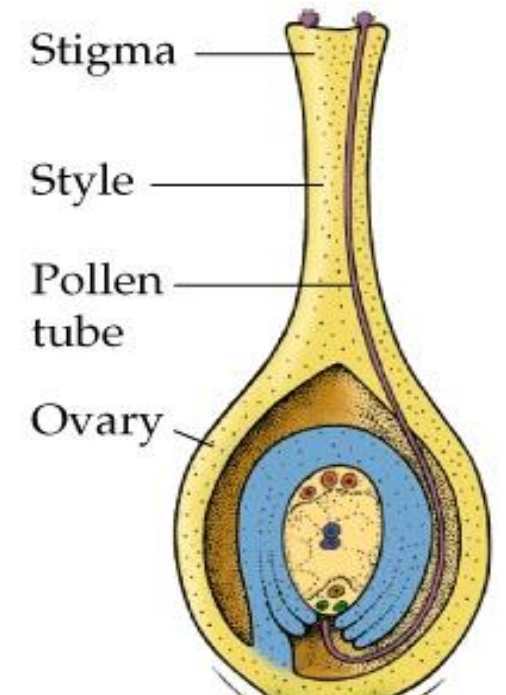
# Fertilization



- Pollen make tube to ovary by secreting enzymes
- One gamete can only fertilize one female gamete
- When the gametes fuse, zygote is formed
- Fertilization has taken place

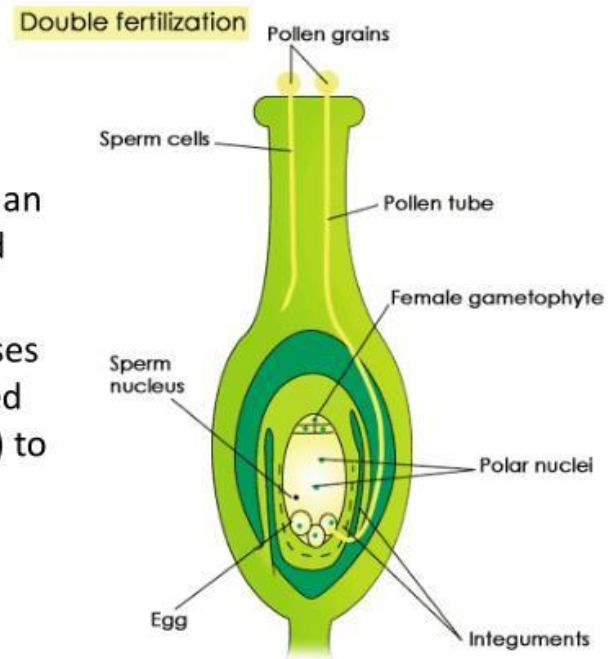
## Double Fertilization:

Double fertilization: One sperm nucleus ( $1n$ ) fertilizes the egg, producing a zygote ( $2n$ ) which becomes the plant embryo inside the seed. Another sperm nucleus fuses with the polar nuclei, resulting in a triploid endosperm ( $3n$ ). Endosperm is a source of food for the young embryo.

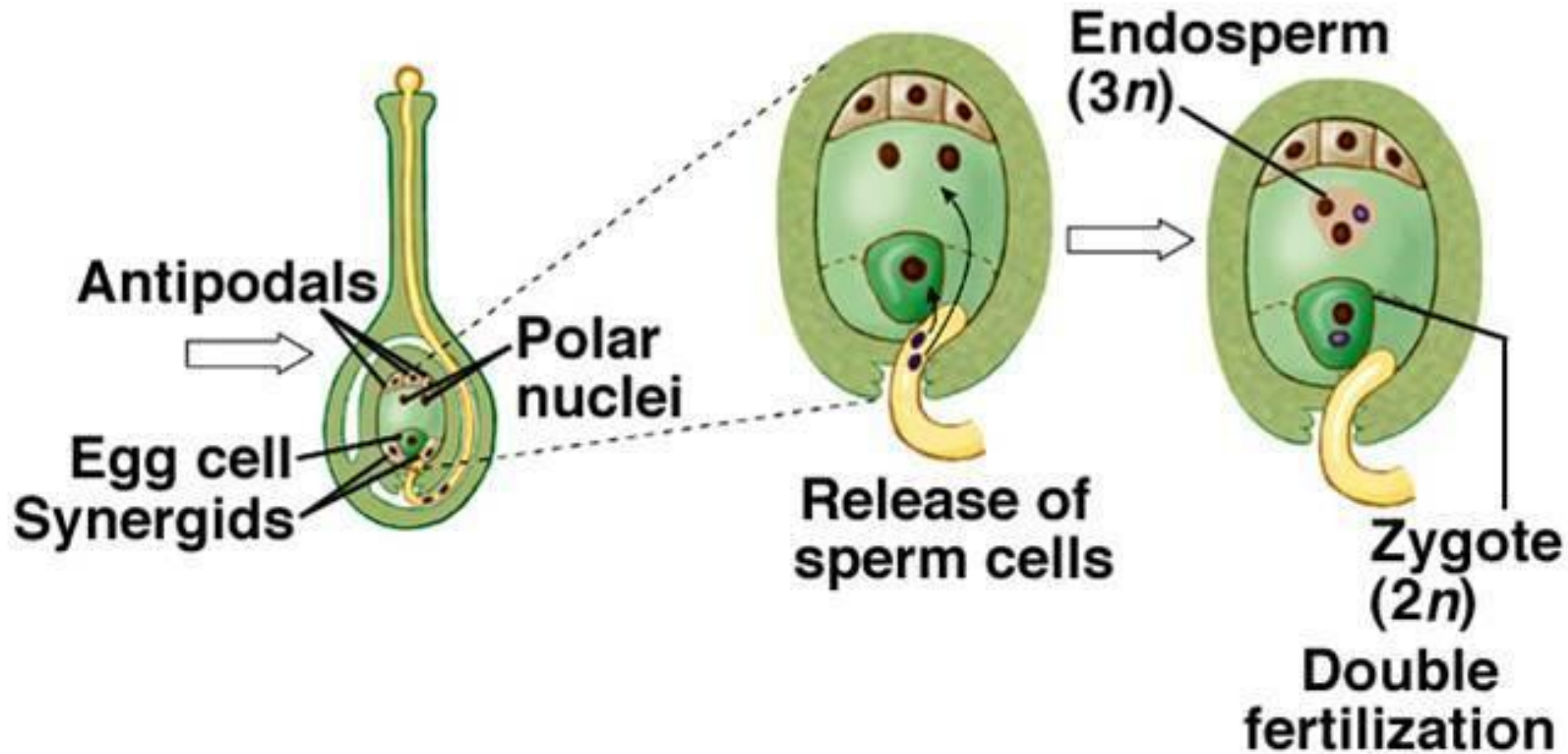


## Double Fertilization

- 2 fertilizations occur in angiosperms (flowering plants):
  - 1 sperm nuclei fuses with an ovule to produce a diploid zygote (plant embryo).
  - A second sperm nuclei fuses with 2 polar nuclei (formed from meiosis in the ovary) to produce the **endosperm**.



# Formation of Pollen Tube and Double Fertilization (Continued)



- Any questions?
- Phone number :07504020846
- Email:  
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