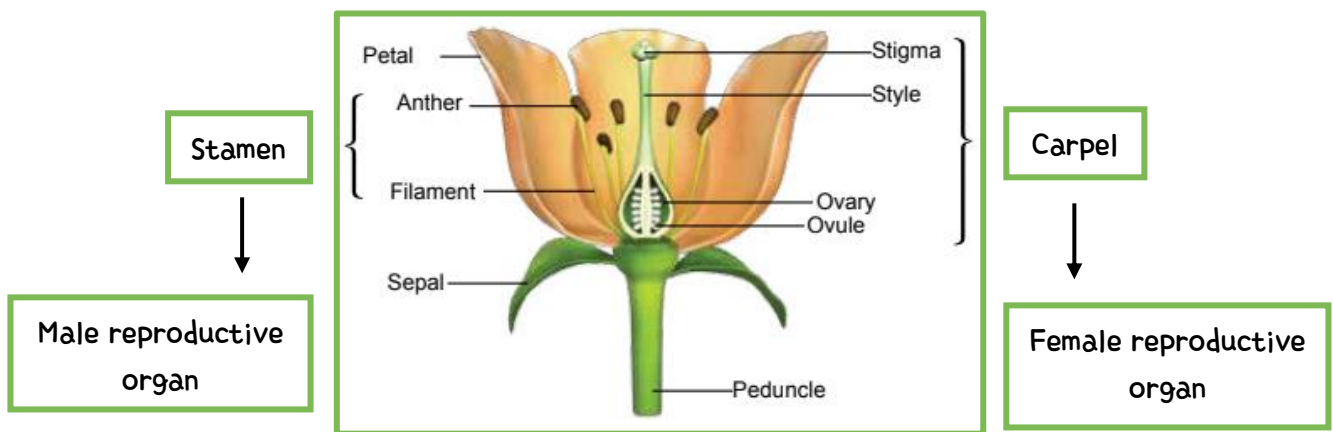


# CHAPTER 6.1 – STRUCTURE OF A FLOWER

## Structure of a flower

- Flowers are the **most distinctive organs** in the angiosperms
- The beauty and scent of flowers which have evolved, not only attract animals and insects, but also play a role in ensuring the survival of species
- Flowers contain **both male** and **female** reproductive organs
- Besides, flowers also have structures called
  - a) Peduncles
  - b) Sepals
  - c) Petals



## Comparison between male and female structures in a flower

### SIMILARITIES

SIMILARITIES	
»	Both produce gametes
»	Both are located at the flower's organ

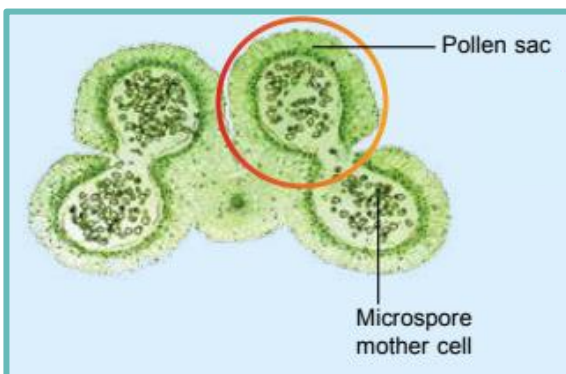
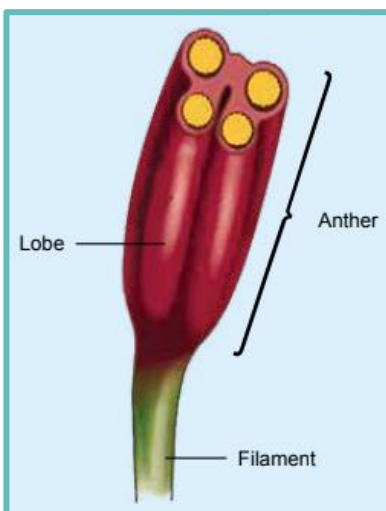
### DIFFERENCES

MALE FLOWER PART	FEMALE FLOWER PART
Consists of stamen	Consists of carpel
Has filament and anther	Has stigma, style and ovary
Produces pollen grains	Produces embryo sac
Projecting out from the base of the ovary	Located in the middle part of the flower

# CHAPTER 6.2 – DEVELOPMENT OF POLLEN GRAINS AND EMBRYO SAC

## The formation of pollen grains in an anther

⊞ The part of a flower that produces pollen grains is the anther



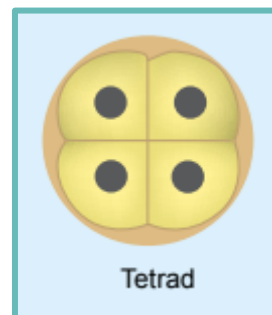
1

- During the development of anther, a group of tissues grows inside each lobe to form four pollen sacs
- In each pollen sac, there are hundreds of pollen mother cells, called microspore mother cells which are diploid (2n)



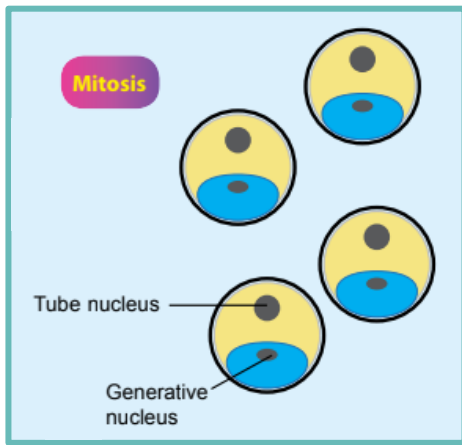
2

- Δ The microspore mother cell divides by meiosis to produce four haploid (n) microspore cells
- Δ These four microspore cells are collectively known as tetrad
- Δ Each cell in the tetrad develops into a pollen grain



3

- ♥ The nucleus in the pollen grain divides by mitosis and produces two nuclei, namely the generative nucleus and tube nucleus
- ♥ The wall of the pollen sac, which is thick and waterproof, breaks when the pollen grain matures
- ♥ The pollen grains are released

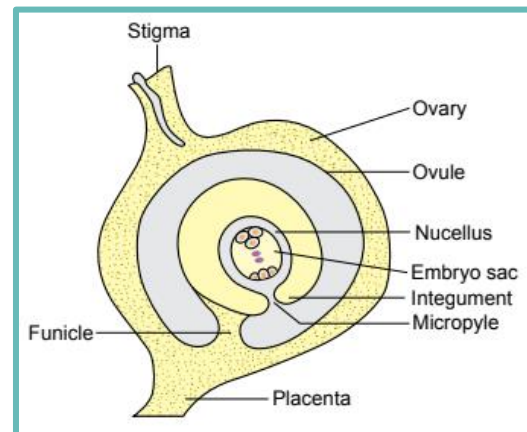


## The formation of embryo sac in an ovule

### STRUCTURE OF A MATURE OVULE

- Ovule are structures of a flower formed inside the carpel that develop from a layer of tissues inside the ovary
- A single ovary may contain one or more ovules that attaches to the ovary wall through a stalk called the funicle
- The area of attachment of the funicle to the ovary is called the placenta that supplies nutrients to the ovule through the funicle
- A mass of tissues inside the ovary develops forming a lump called nucellus that consists of parenchyma tissues and develops into two layers called the integument
- At the end of the integument, there is a little opening, called the micropyle which allows the entry of air and water into the seed during germination
- One of the nucellus cells is the megaspore mother cell or also known

as the embryo sac mother cell which will develop to form an embryo sac



### THE DEVELOPMENT OF THE EMBRYO SAC

1

- ✓ The megaspore mother cell ( $2n$ ) divides by meiosis to produce four haploid ( $n$ ) megaspore cells

2

- ⊕ Three of the megaspore cells degenerate and only one megaspore cell develops

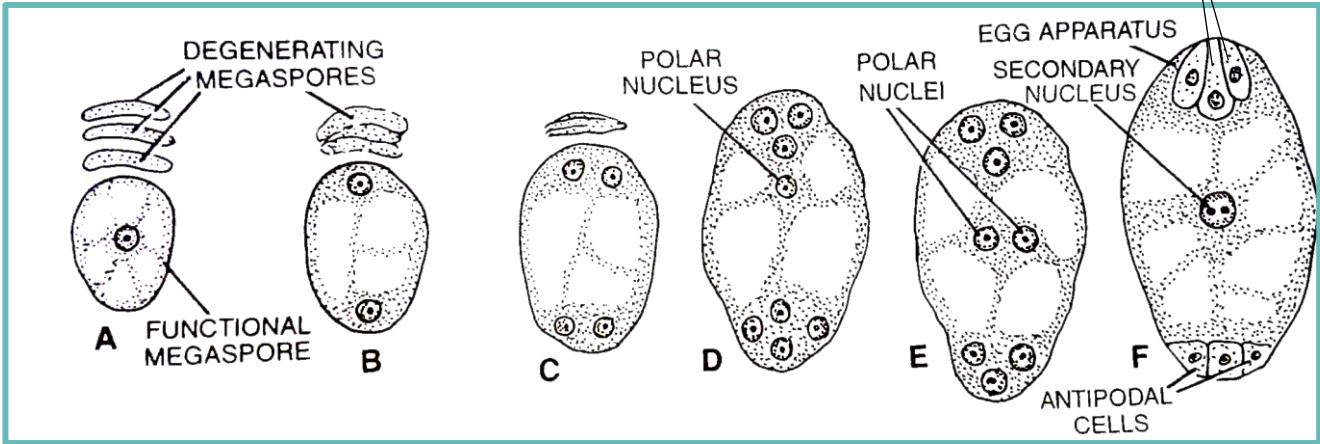
3

- ❖ The nucleus of the cell that has developed, divides mitotically three times to produce a cell with eight nuclei

4

- Three nuclei move to one end of the embryo sac to form three antipodal cells
- Another three nuclei move to the opposite end of the embryo sac and form two synergid cells and one egg cell
- Two nuclei in the centre of the embryo sac form the polar nuclei

Two synergid cells



# CHAPTER 6.3 – POLLINATION AND FERTILISATION

## Pollination

- + Pollination is the process in which pollen grains are transferred from the anther to the stigma
- + This process assisted by pollinating agents (insects, mammals, birds, water or wind)
- + The presence of pollen grains on the stigma triggers the process of fertilisation

### FORMATION OF POLLIN TUBE AND MALE GAMETES

1

- ◇ The wall of anther from mature pollen will dry, shrink and split
- ◇ Pollen grains in the pollen sac are released

2

- » The released pollen grains are transferred to the stigma of the same flower or different flowers by pollinating agent

3

- ⊡ The pollen grains that have been transferred to the stigma will germinate and form a pollen tube
- ⊡ The pollen tube grows down towards the ovule through the style

4

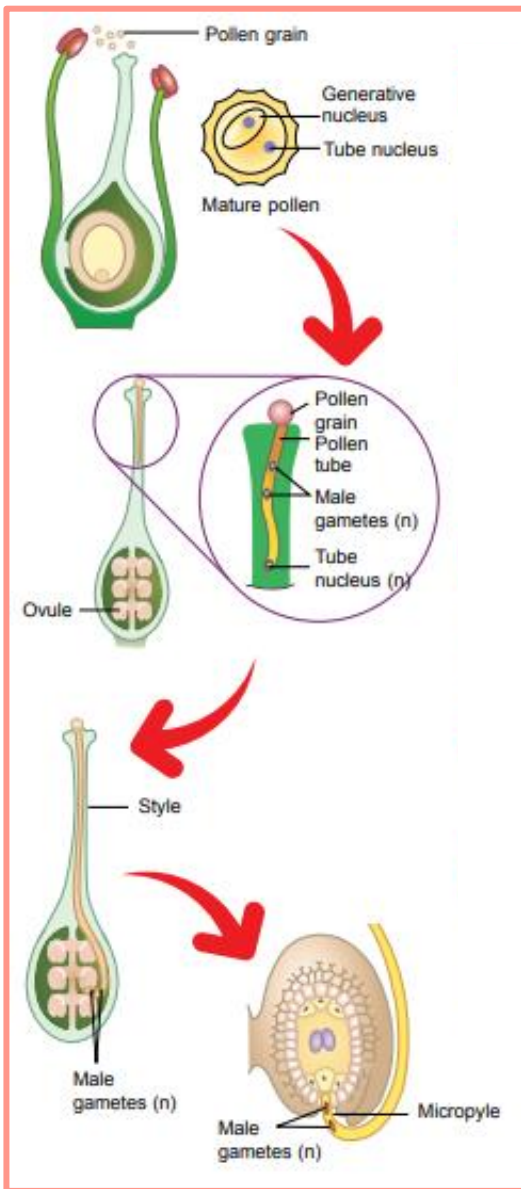
- The generative nucleus will move along the pollen tube towards the ovule
- At the same time, the generative nucleus will divide by mitosis to form two male gametes (n)

5

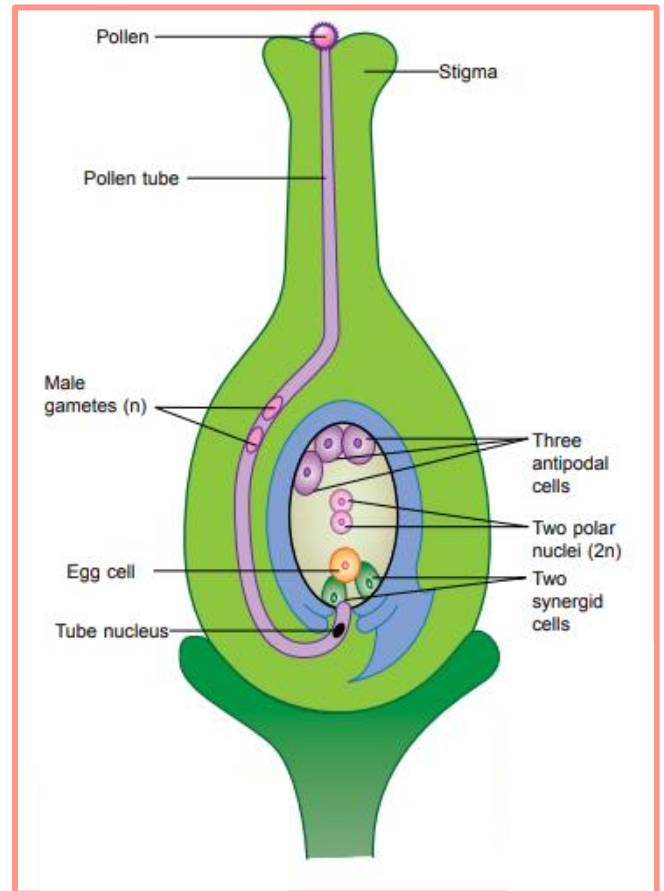
- The end of the pollen tube will secrete an enzyme to digest the tissues of the style

6

- Δ When it reaches the embryo sac, the pollen tube will penetrate the ovule through the micropyle
- Δ The tube nucleus will degenerate and both male gametes enter the embryo sac



◇ The second male gamete fuses with polar nuclei to form a triploid endosperm tissue

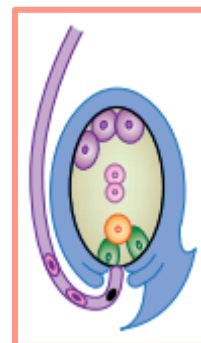


1

- ♥ When it reaches the embryo sac, the pollen tube will penetrate the ovule through the micropyle
- ♥ The tube nucleus will degenerate and both male gametes enter the embryo sac

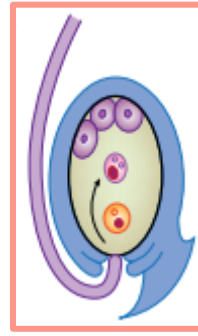
## Double fertilisation in the formation of diploid zygote and triploid nucleus

- ◇ Double fertilisation involves two male gametes that produced from the generative nucleus which undergoes mitosis in the pollen tube and will enter the embryo sac for fertilisation
- ◇ The first male gamete fertilises the egg cell to form a diploid zygote



2

- One of the male gametes fertilises the egg cell and produces a diploid zygote
- The second male gamete fuses with the two polar nuclei to form a triploid endosperm nucleus



# CHAPTER 6.4 – DEVELOPMENT OF SEEDS AND FRUITS

## Double fertilisation and development of seeds and fruits

### DEVELOPMENT OF AN EMBRYO

- ✓ After double fertilisation occurs, the triploid endosperm nucleus divides by mitosis and form the endosperm tissue
- ✓ The endosperm tissue is the food storing tissue which surrounds and supplies nutrients to the embryo

- ✓ The zygote divides by mitosis to form two cells, a larger cell and a smaller cell
- ✓ The larger cell develops into a suspensor that anchors the embryo to the wall of the embryo sac
- ✓ The smaller cell will become an embryo that consists of plumule, radicle and cotyledon

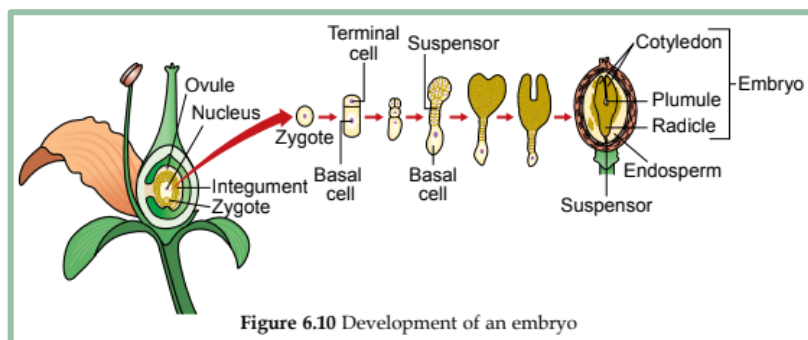


Figure 6.10 Development of an embryo

### DEVELOPMENT OF THE OVARY INTO A FRUIT AFTER FERTILISATION

- ❑ The ovule develops to become the seed in the fruit
- ❑ The integument becomes two layers of seed coat that serves to protect the embryo

- ❑ During the development of ovule and seed, the ovary develops into a fruit
- ❑ Other flower parts (stigma and style) degenerate and leave a scar on the ovary wall
- ❑ The ovary wall becomes the pericarp of the fruit which consists of the exocarp, mesocarp and endocarp

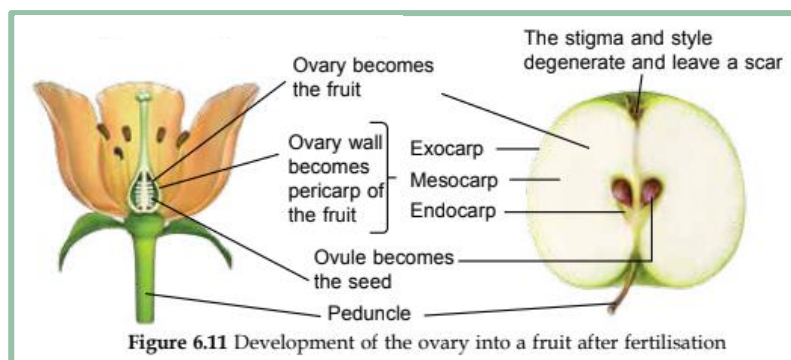


Figure 6.11 Development of the ovary into a fruit after fertilisation

# CHAPTER 6.5 – IMPORTANCE OF SEEDS FOR SURVIVAL

## Importance of seeds for plant survival

- » Seeds contain **embryo** that **germinate** to **form seedlings**
- » Inside the seeds, the **endosperm tissue** or **cotyledon** is the source of nutrients to **supply energy** when germination occurs
- » Seeds are **enclosed** by the **testa** which is **strong** and **water impermeable** to **prevent the seeds from spoiling**
- » Seeds can **form a dormant structure** which enables the seeds to be **stored** for a long time
- » Seeds have **special features** such as **light**, **have spongy tissue**, **strong** and **do not spoil easily**
- » These special features are **important** so that the seeds are **easily dispersed** to another place to **avoid competition**

