LO: Define asexual reproduction as the process resulting in the production of genetically identical offspring from one parent

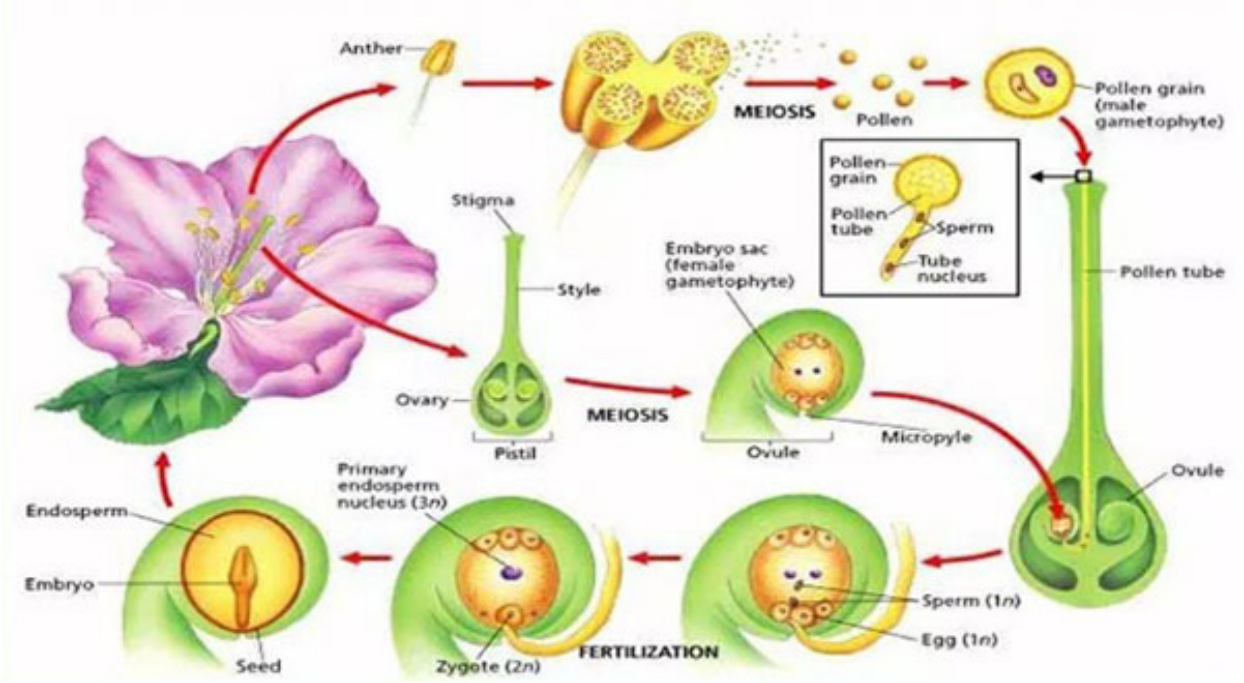
The process resulting in the production of genetically identical offspring from one parent, without the fusion of nuclei of haploid gametes. (E.g. through mitosis / binary fission)

LO: Define sexual reproduction as the process involving the fusion of nuclei to form a zygote and the production of genetically dissimilar offspring

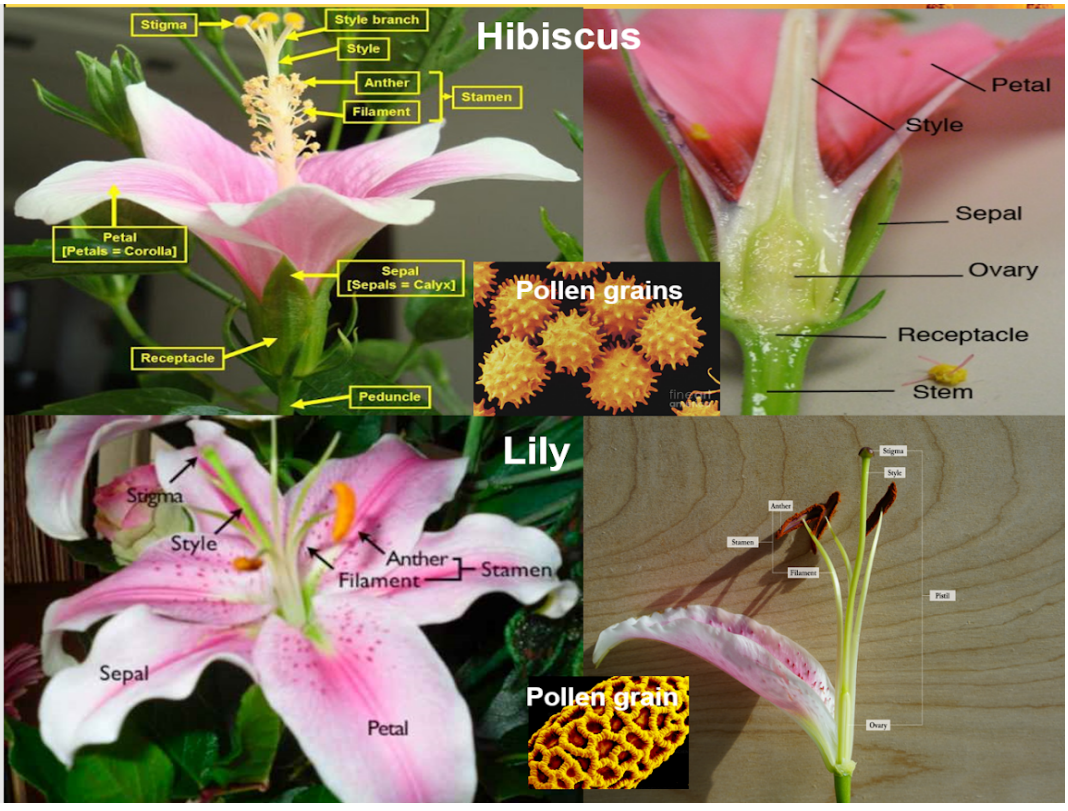
The process involving the fusion of nuclei of the haploid female gamete and the haploid male gamete to form a diploid zygote and the production of genetically dissimilar offspring.

Differences between asexual reproduction and sexual reproduction:

Asexual Reproduction	**Sexual Reproduction**
Does not involve **fusion** of **nuclei** of gametes	Involves the **fusion** of a **haploid nucleus** of **male gamete** with a **haploid nucleus** of **female gamete** to form a **diploid** zygote
Only **one** parent required	Requires **two** parents (except for plants with bisexual flowers)
Offspring are **genetically identical**	Offspring are **genetically different**
Relatively **quicker** method	**Slower** method



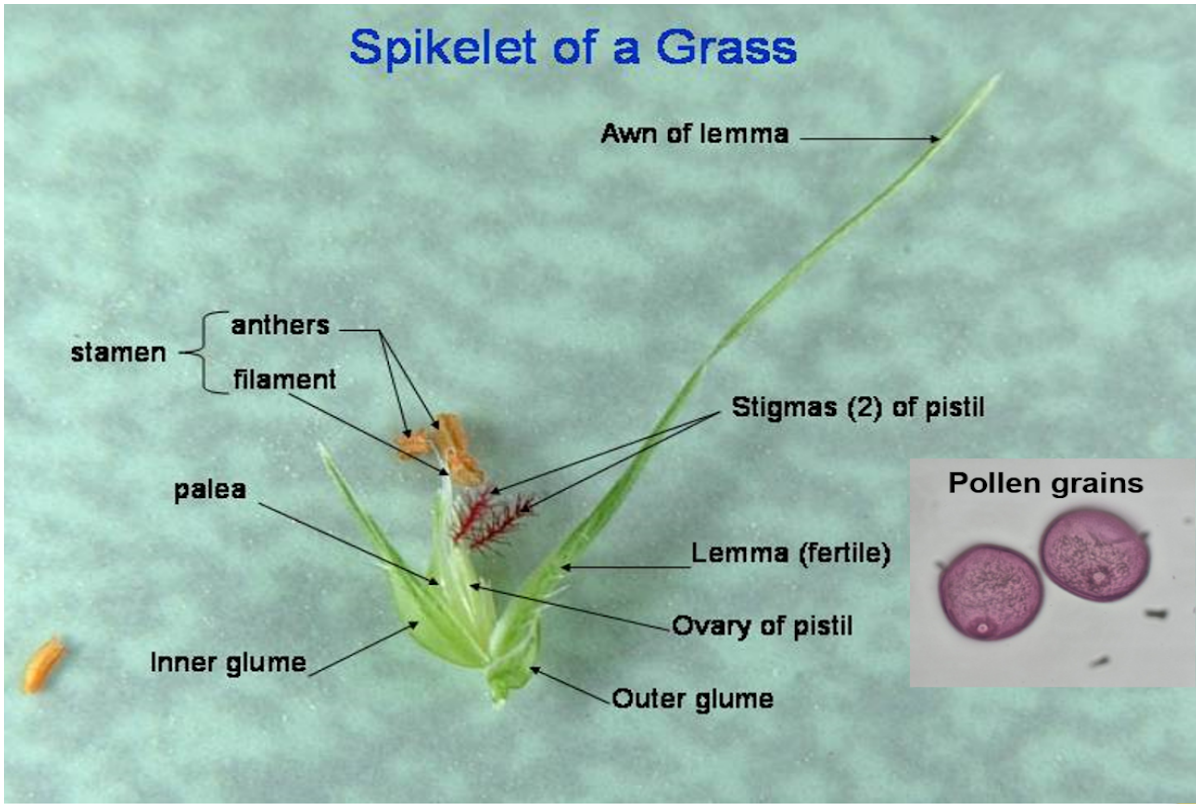
LO: Identify and draw, using a hand lens if necessary, the sepals, petals, stamens and carpels of one, locally available, named, insect-pollinated, dicotyledonous flower, and examine the pollen grains using a microscope



LO: State the functions of the sepals, petals, anthers and carpels

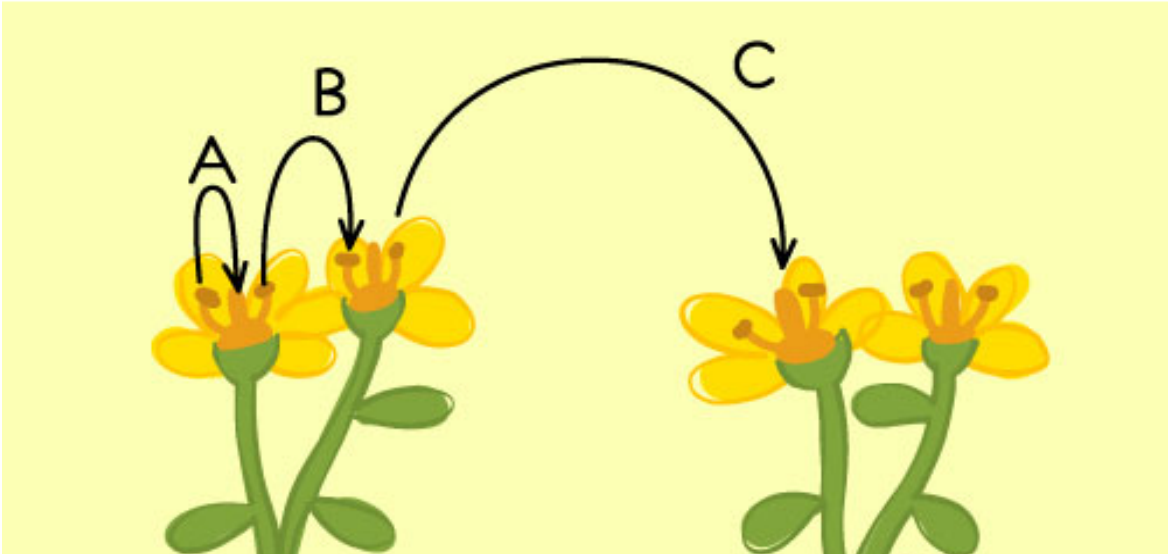
Sepals	Modified leaves which enclose and protect the other parts of the flower in the bud stage.
Petals	Brightly coloured and conspicuous modified leaves to attract insects for pollination and provide a platform for insects to land.
Stamen	Consists of anther and filament; anther has 2 lobes, each contains 2 pollen sacs which produce pollen grains. The pollen grain contains two male gametes.
Carpel (pistil)	Consists of one or more stigmas which capture pollen grains, a style through which pollen tube grows, and an ovary which contains ovules. The ovum is in the ovule.

LO: Use a hand lens to identify and describe the stamens and stigmas of one, locally available, named, wind-pollinated flower, and examine the pollen grains using a microscope



LO: Outline the process of pollination and distinguish between self-pollination and cross-pollination

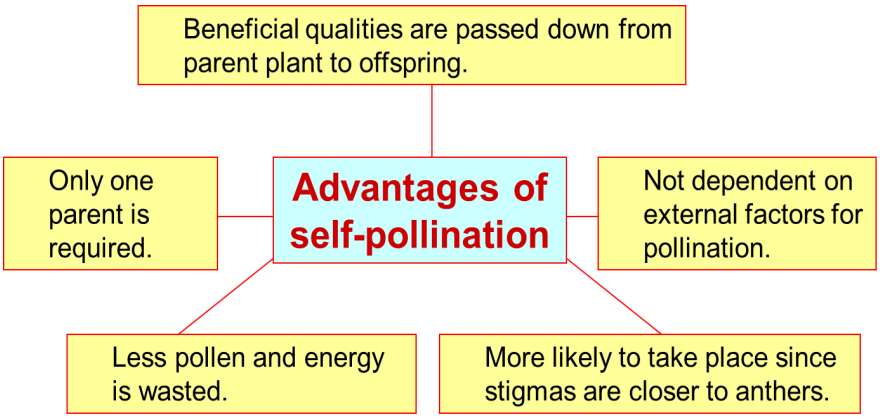
- Pollination is the <u>transfer of pollen grains from the anther to the stigma.</u>



Self-pollination (A and B):

- The process of pollination whereby the pollen grains from the anther are transferred to the stigma of the same flower or a different flower in the same plant.

- **Advantages:**

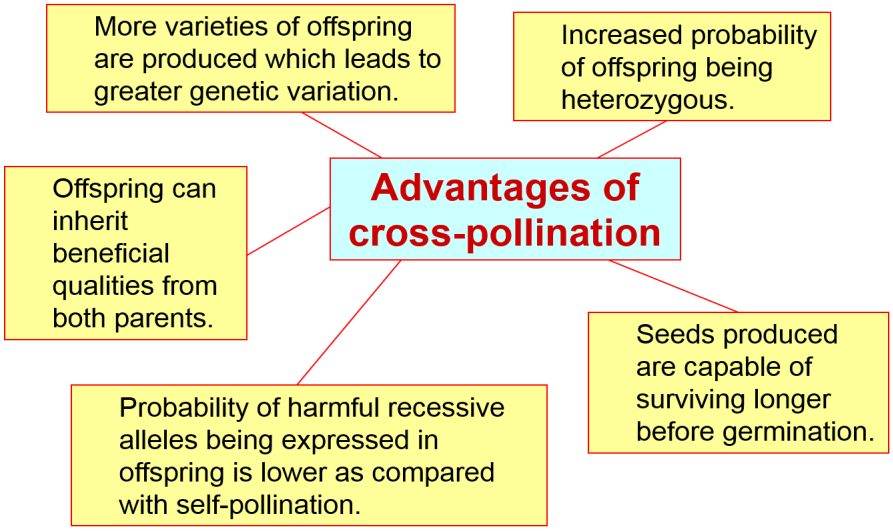


- **Disadvantages:**
  1. Offspring produced are genetically similar to parents causing fewer varieties of offspring, less adapted to changes in the environment.
  2. Probability of harmful recessive alleles being expressed in offspring is higher as compared with cross-pollination.
- **Ways to prevent self-pollination:**
  1. Stamen and pistil mature at different times
  2. Unisexual plant (plant producing either male or female flowers)
  3. Stigma of the flower is above the anther
  4. Stigma and anther are situated far apart from each other.

Cross-Pollination (C):

- The process of pollination whereby the pollen grains from the anther are transferred to the stigma of another flower on another plant of the same species.

- **Advantages**



- **Disadvantages:**
  1. Two different plants of the same species are required.
  2. Dependent on external factors for pollination.
  3. More energy and pollens are wasted.

Note: Self-pollination and cross-pollination both result in sexual reproduction.

LO: Compare, using fresh specimens, an insect-pollinated and a wind-pollinated flower

Insect pollination

- An insect lands on the petals.
- The insect follows the nectar guide into the flower.
- The insect brushes against the stigma.
- Pollen grains from another flower, which the insect had visited earlier are transferred from the insect's body and deposited onto the stigma.
- As the insect brushes the anther, pollen grains will stick to the insect's back, which will be used to pollinate another flower.

Wind pollination

- The pendulous filaments expose the anthers to the wind.

- When the wind blows, pollen grains are released and carried away by the wind.
- The pollen grains land on large and feathery stigma, which increases surface area to trap the pollen grains.

Feature	Characteristics	
	Insect-pollinated flowers	**Wind-pollinated flowers**
Petals	Flowers are usually large and conspicuous with brightly-coloured petals.	Flowers are usually small and dull-coloured, without petals.
Stigmas	Stigmas are usually small and compact.	Stigmas are large and feathery to provide a large surface area to trap pollen.
Stamens	Stamens are not pendulous.	Stamens have long pendulous filaments with protruding anthers.
Pollen	Pollen is fairly abundant and larger with rough surfaces.	Pollen is more abundant with smooth surfaces and are light and tiny.
Nectar guides	Nectar guides may be present on the petals to guide insects.	Nectar guides are absent.

LO: Describe the growth of the pollen tube and its entry into the ovule followed by fertilization (production of endosperm and details of development are not required)

Sequence of Fertilisation:

- After pollination, the pollen grains germinate in response to a sugary fluid secreted by the mature stigma
- A pollen tube grows out of each pollen grain
- The cytoplasm, the generative nucleus and the pollen tube nucleus of each pollen grain pass into the pollen tube
- The growth of pollen tube is controlled by the pollen tube nucleus, and as it grows, enzymes are secreted to digest the surrounding tissue of the stigma and the style, so as to allow the pollen tube to penetrate through the style as it grows

- The pollen tube enters the ovule through an opening called the micropyle
- Along the way, the generative nucleus divides to form two male gametes, and eventually the pollen tube nucleus disintegrates
- Within the ovule, the tip of the pollen tube absorbs sap and bursts to release the two male gametes
- The haploid nucleus of one male gamete fuses with the haploid nucleus of the ovum to form the diploid zygote, while the nucleus of the other male gamete fuses with the definitive nucleus to form the endosperm nucleus. This results in double fertilisation.
- The zygote then divides mitotically and develops into the embryo in the seed, while the endosperm nucleus divides to give rise to the food storage tissue called the endosperm.