

ST ANDREW'S SECONDARY SCHOOL**Secondary 4 Biology (6093)****Chapters 17: Reproduction in Plants**

Name: _____ () **Class:** _____ **Date:** _____

12. REPRODUCTION IN PLANTS**Content**

- Asexual Reproduction
- Sexual Reproduction in Plants

Learning Outcomes**Candidates should be able to:**

- (a) define *asexual reproduction* as the process resulting in the production of genetically identical offspring from one parent
- (b) define *sexual reproduction* as the process involving the fusion of nuclei to form a zygote and the production of genetically dissimilar offspring
- (c) 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
- (d) state the functions of the sepals, petals, anthers and carpels
- (e) 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
- (f) outline the process of pollination and distinguish between self-pollination and cross-pollination
- (g) compare, using fresh specimens, an insect-pollinated and a wind-pollinated flower
- (h) describe the growth of the pollen tube and its entry into the ovule followed by fertilisation (production of endosperm and details of development are not required)

Use the knowledge gained in this section in new situations or to solve related problems.

17.1 Reproduction

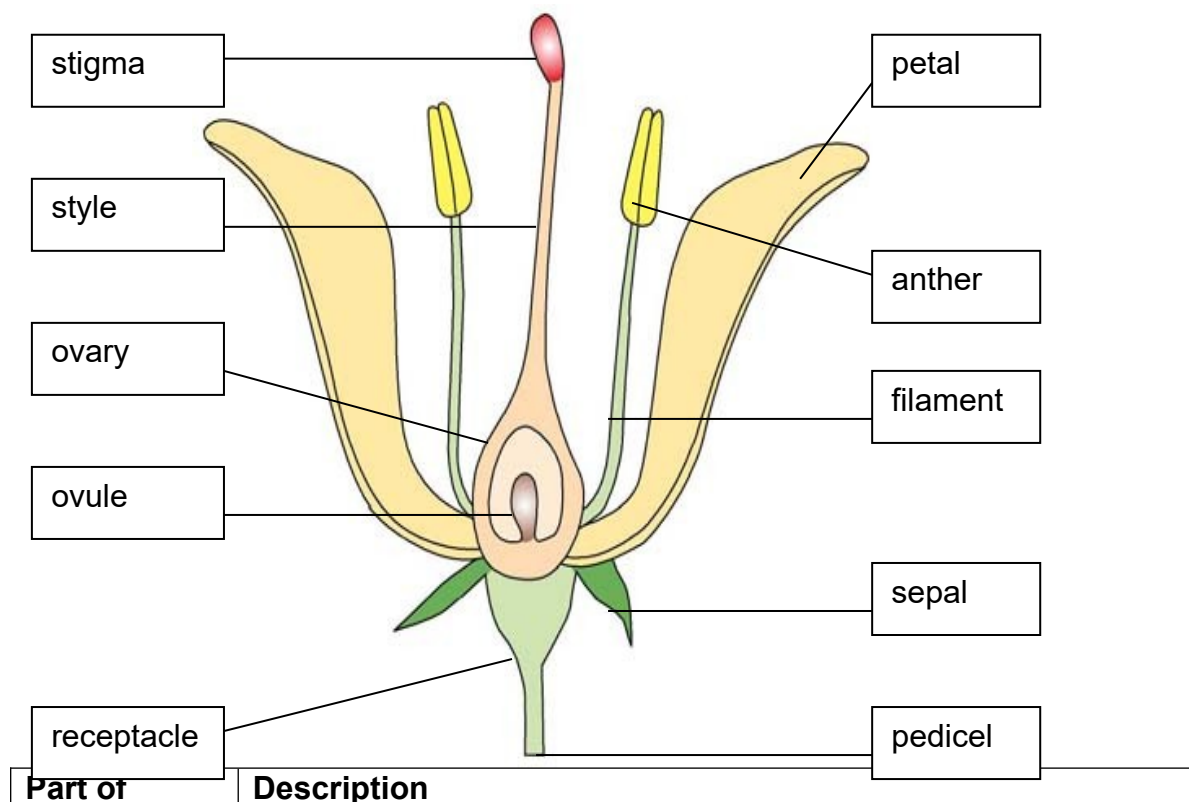
Reproduction is the process of producing of new organisms.

Asexual reproduction produces genetically identical offspring from one parent by mitosis.

Sexual reproduction involves the fusion of gametes to form a zygote producing genetically dissimilar offspring (since gametes are obtained through the process of meiosis), typically involving two parents.

	Sexual	Asexual
No. of parents involved	Typically involving <u>2</u> parent(s)*	<u>1</u> parent involved
Offspring genetics	Offspring are genetically <u>dissimilar</u> from parents	Offspring are genetically <u>identical</u> to parents
No. of offspring produced	<u>Less</u> offspring produced in a given time	<u>More</u> offspring produced in a given time
Adapting to environmental changes	Species <u>more</u> likely to be able to adapt to changes in the environment	Species <u>less</u> likely to be able to adapt to changes in the environment

17.2 Parts of a Flower



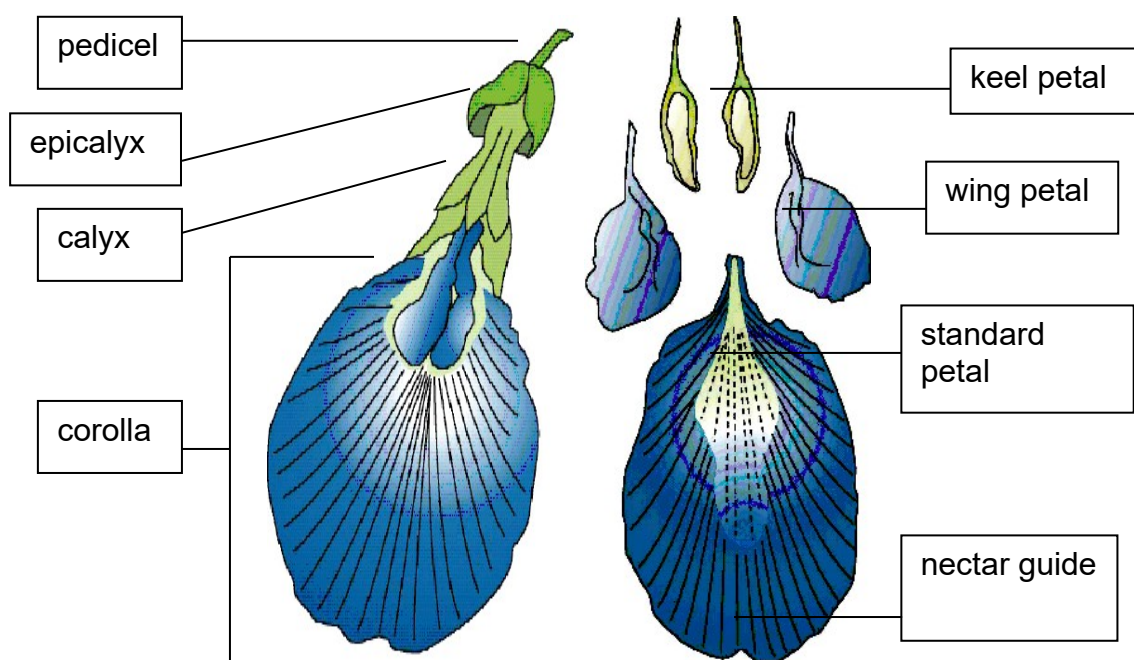
flower	
<u>Sepal</u>	A modified leaf that enclose and protect the other parts of the flower in the bud stage. All the sepals together make up the <u>calyx</u>.
<u>Petal</u>	A modified leaf that forms the most obvious part of the flower. All the petals together make up the <u>corolla</u>. In insect-pollinated flowers, attract insects for pollination and provide platform for insects to land.
<u>Pedicel</u>	The flower stalk.
<u>Receptacle</u>	The enlarged end of the flower stalk.
<u>Stamen</u>	The male part of the flower. It consists of: <u>Anther</u> - produces pollen grain. <u>Filament</u> - holds anther in a suitable position to disperse pollen grains. Pollen grains can be found in pollen sacs contained in the anther. Pollen grains are <u>haploid</u> as they are produced by <u>meiosis</u>. The nucleus in the pollen grain is the male <u>gamete</u>.
<u>Carpel</u>	The female part of the flower. It consists of: <u>Stigma</u> that receives pollen grains and secrete a sugary fluid to stimulate germination of pollen grains <u>Style</u> that holds stigma at a suitable position to trap pollen grains. <u>Ovary</u> that will develop into a fruit after fertilisation. It produces and protects one or more <u>ovules</u>. The ovule develops into a <u>seed</u> after fertilization. It produces the haploid female gamete or <u>ovum</u> by meiosis.

17.3 Pollination

1. Pollination is the transfer of pollen grains from the anther to the stigma.
2. Self-pollination involves the transfer of pollen grains from the anther to the stigma of the same flower or a different flower on the same plant.
 - a. Advantages of self-pollination includes:
 - i. Only one parent plant is required.
 - ii. Beneficial qualities are passed down from parents to offspring.
 - iii. Not dependent on external factors for pollination.
 - iv. More likely to take place since stigma is closer to anther.
 - v. Less pollen and energy is wasted.
 - b. Disadvantages of self-pollination includes:
 - i. Less varieties of offspring produced.
 - ii. The probability of harmful recessive alleles being expressed in the offspring is higher as compared with cross-pollination.
 - iii. Species may become weaker, smaller and less resistant to changes in the environment.
 - c. Features favouring self-pollination
 - i. Bisexual flowers with anthers and stigma maturing at the same time
 - ii. Stigma situated directly below the anthers
3. Cross-pollination involves the transfer of pollen grains to the stigma of a flower from another plant of the same species.
 - a. Advantages of cross-pollination includes:
 - i. Offspring can inherit beneficial qualities from both parents.
 - ii. Greater genetic variation in the offspring.
 - iii. Produces seeds that are capable of surviving longer before germination takes place.
 - b. Disadvantages of cross-pollination includes:
 - i. Two different plants from the same species are needed.
 - ii. Dependent on external factors for pollination.
 - iii. Less likely to occur as compared to self-pollination.
 - iv. More energy and pollen are wasted.
 - c. Features favouring cross-pollination

- i. Plants bear either male or female flowers, making self-fertilisation impossible.
- ii. Plants bear both male and female parts/flowers but anthers and stigma mature at different times and stigmas of plants are situated a distance away from the anthers.

4. Clitoria is an insect pollinated flower.



- a. The calyx is made up of five green sepals.
- b. The calyx is enclosed by the epicalyx made up of two leaves.
- c. The corolla is made up of five brightly coloured petals.
- d. The standard petal has nectar guide to help guide insects to where the nectar is located.
- e. The standard petal encloses two deep blue wing petals.
- f. The wing petals enclose the keel petals.
- g. Keel petals enclose and protect the reproductive organs of the flower.
- h. The androecium of the flower consists of ten stamens with long filaments. Nectars are collected at the bottom of the stamen trough. Only insects with proboscis (long tubular mouth) can reach the nectar.
- i. The pistil or carpel is made up of a stigma, a long style and an ovary containing a row of ovules.

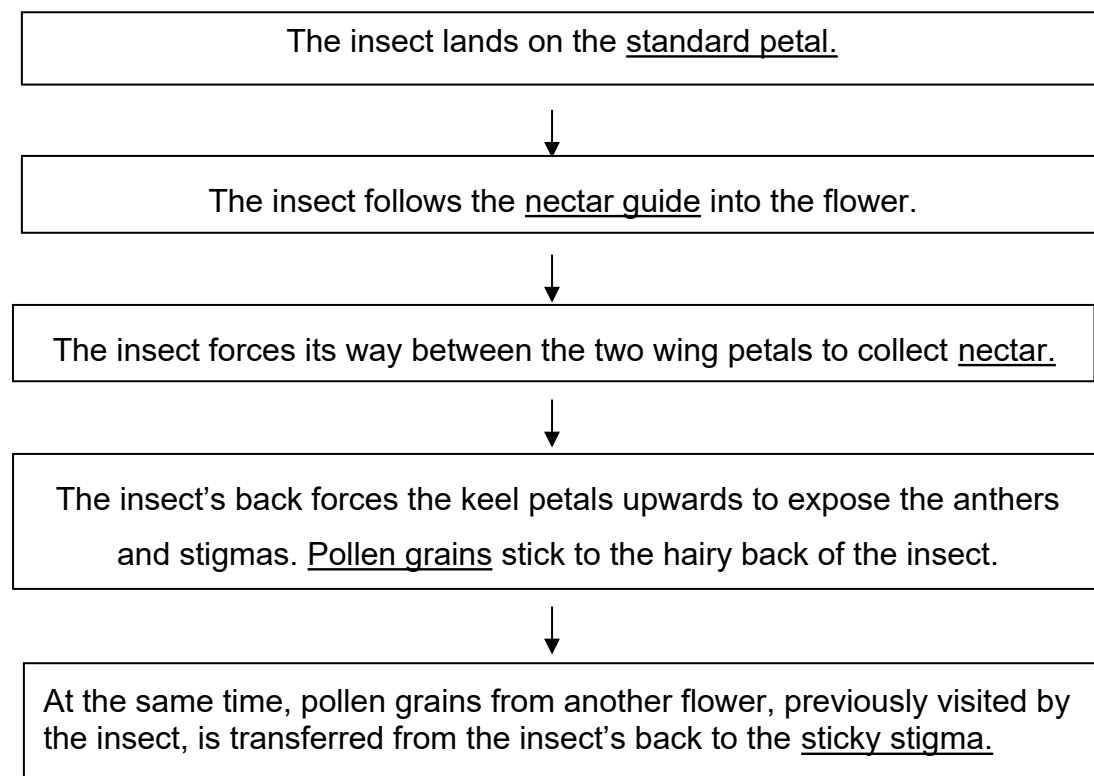
State two visible features which indicate that the *Clitoria* is pollinated by insects.

1. Brightly coloured petals to attract insects.
2. Nectar guide is present to guide insects to collect nectar.

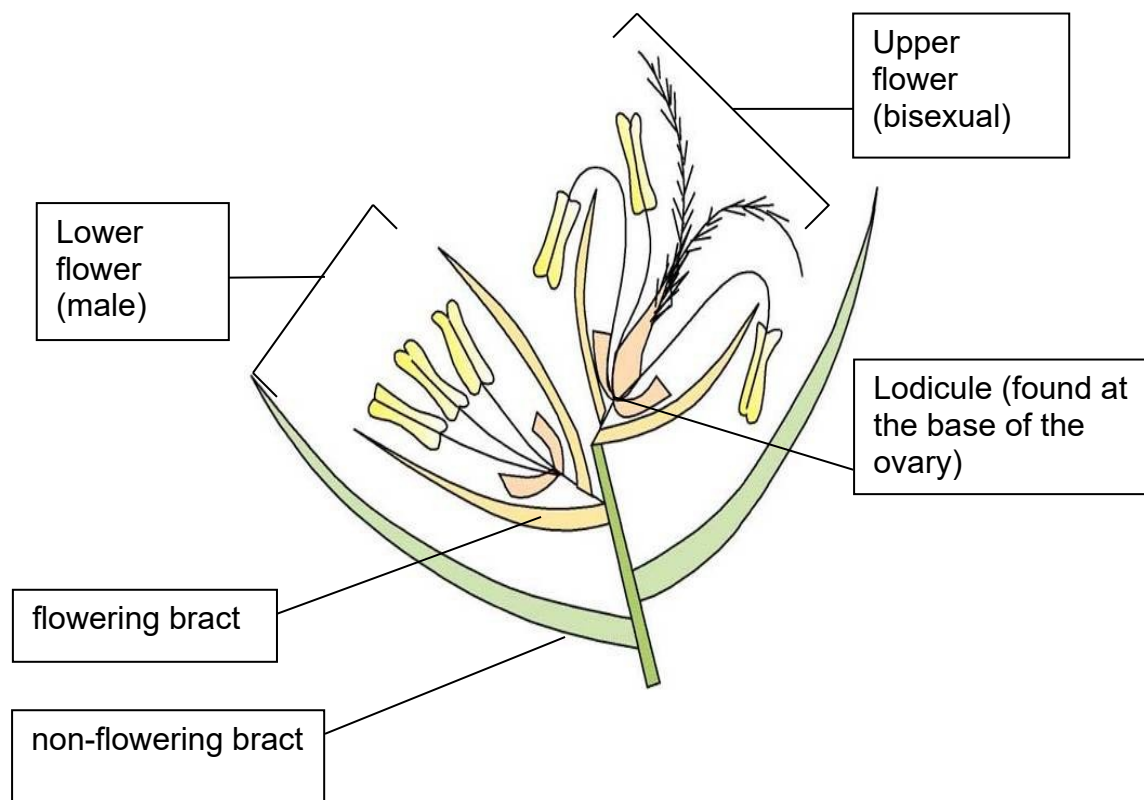
Suggest a feature of the pollen produced by this flower.

Pollen grains have rougher surfaces to latch on to hairy backs of insects.

5. Events taking place in the pollination of *Clitoria*.



6. *Ischaemum muticum* is a wind-pollinated flower.



- Ischaemum muticum* has flowers that come in pairs.
- Upper bisexual flower consists of an ovary with two long feathery stigmas, three stamens and two lodicules.
- Lower male flower contains only three stamens with long filaments and two lodicules.
- Each pair of flowers together with a short stalk forms the spikelet.

State two visible features which indicate that the *Ischaemum muticum* is pollinated by the wind.

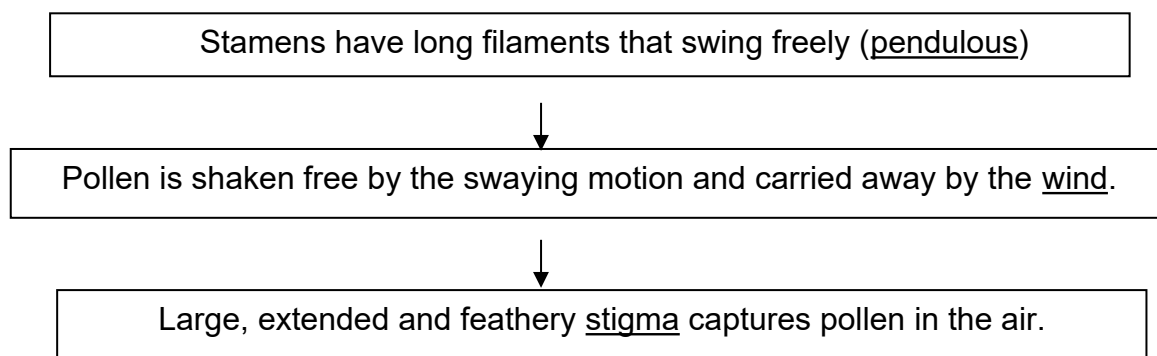
1. Large feathery stigmas that protrude out of flower.

2. Long pendulous filaments with protruding anthers.

Suggest two features of the pollen produced by this flower.

1. Abundant

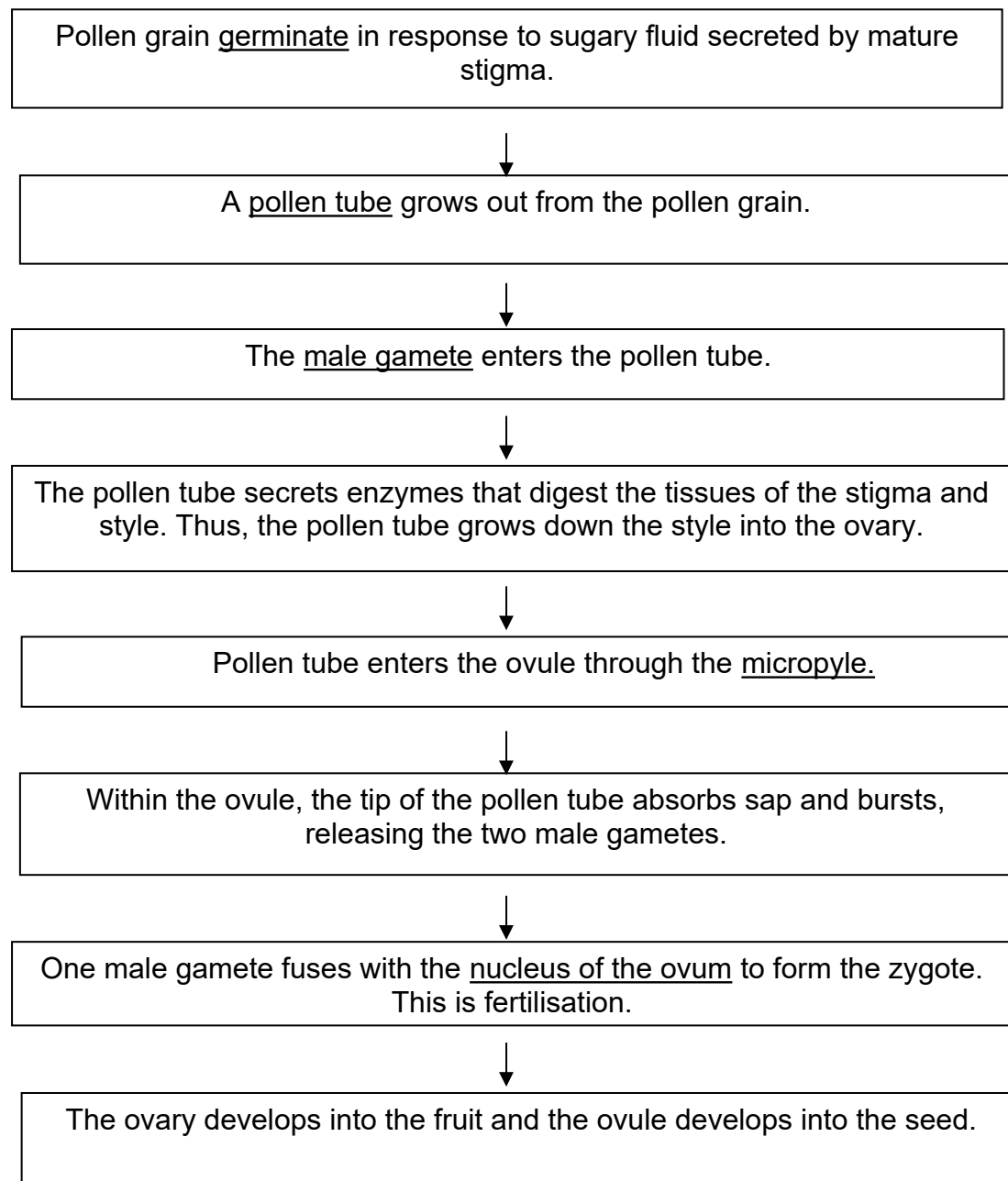
2. Tiny and light

7. Events taking place in the pollination of *Ischaemum muticum*.

8. Differences between and insect pollinated and a wind pollinated flower.

Feature	Insect-pollinated flowers	Wind-pollinated flowers
Petals	<u>large</u> and brightly-colored petals to attract insects.	Small, <u>dull-colored</u> without <u>petals</u>
Nectar	Nectar is present.	Nectar is <u>absent</u> .
Scent	<u>Fragrant</u> and sweet-smelling	Scent is absent.
Stigmas	Small, <u>compact</u> and do not protrude out of flowers.	Large, <u>feathery</u> and protrude out of flowers.
Stamens	Not <u>pendulous</u> and do not protrude out of flowers.	Long and pendulous filaments with <u>protruding anthers</u> .
Pollen	Fairly abundant. Pollen grains are larger with <u>rough</u> surfaces.	More abundant. Pollen grains are <u>tiny and light</u> with smooth surfaces.
Nectar guides	Nectar guides are <u>present</u> .	Nectar guides are absent.

17.4 Fertilisation in Plants



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