SUVA SANGAM COLLEGE

YEAR 11

BIOLOGY

Week 1: 05/7/21-09/07/21

Strand 1: Structure and life processes

Sub strand 1.5: structure, form and function in plants.

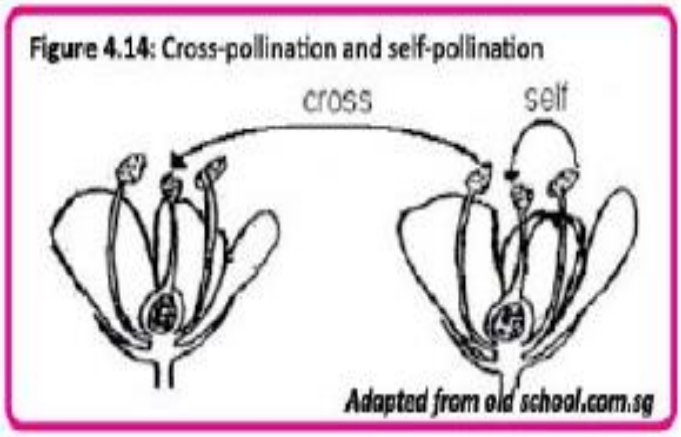
Achievement indicators; At the end of the class, students should be able to:

- Discuss the process of pollination and fertilization.
- Define double fertilization.

Pollination – is the transfer of pollen from an anther to the stigma.

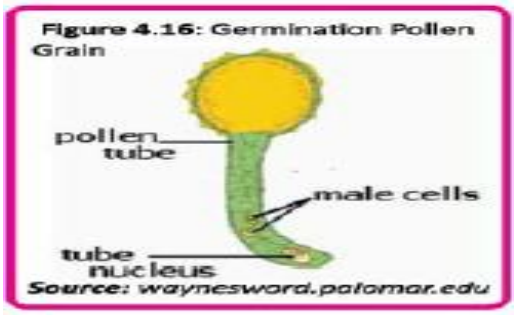
(Two type of pollination: cross pollination and self-pollination)

1. **Cross pollination**- transfer of pollen grains from the anther to the stigma of two different flowers.
2. **Self-pollination** – transfer of pollen grains from the anther to the stigma of the same flower.



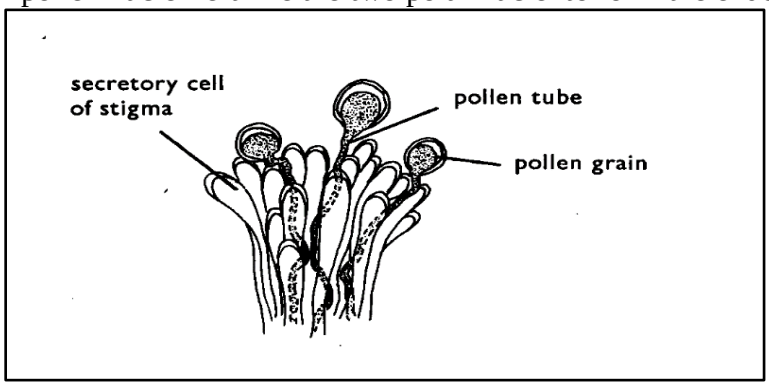
Fertilization

- Once a pollen grain has landed on the stigma of a flower, the sperm inside it must make its way to an ovule to join with the egg inside, fertilizing it.
- Sugars (nectar) on the stigma stimulate a tiny pollen tube to grow out of the pollen grain. This tube eats through the stigma, style and into the ovary. The ovules release chemicals to attract the tube.
- The sperm travels out of the pollen grain, down the pollen tube and into the ovule, where it fertilizes the egg.



Double Fertilization

- The male gamete is pollen grain which contains 2 pollen nuclei.
- Female gamete is the ovule which contains the egg cell and 2 polar nuclei.
- As the pollen lands onto the stigma, it grows a pollen tube which carries the 2 pollen nuclei to the ovule. This enters the ovule, one pollen nuclei fertilizes the egg cell to form zygote and other pollen nuclei fertilize the two polar nuclei to form the endosperm.



Exercise 1:

1. The male reproductive parts of a flower are the

A. anther and style. B. ovule and filament.
C. style and ovule. D. anther and filament.

2. State the difference between self-pollination and cross-pollination.

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_____
_____

3. Define **double fertilization** and state its advantage to the flowering plant.

_____
_____
_____

Week 2: 12/07/21 - 16/07/21

Strand 1: Structure and life processes

Sub strand 1.5: structure, form and function in plants.

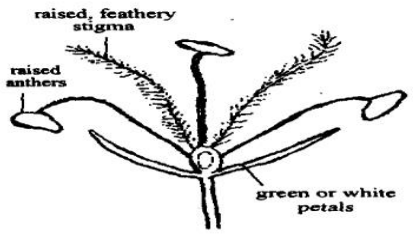
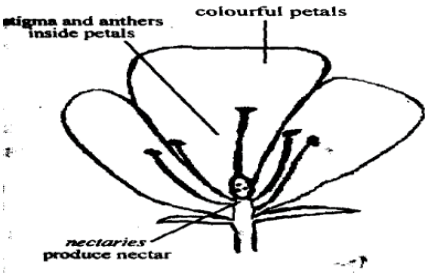
Achievement indicators; At the end of the class, students should be able to:

- Discuss the adaptation for wind /animal pollinated flower

Angiosperms – produce seeds in the flower; have anther and ovary in the same flower. Have double fertilization occurring inside ovules which produces an endosperm which is a food reserve. Pollen grains are transferred to the stigma in two ways:

I) By wind – wind pollination

II) By insects – insect pollination

Wind pollinated flower	**Insect pollinated flower**
Flowers are generally smaller and scentless with green or dull coloured petals	Flowers are generally large and scented with brightly coloured petals
Nectar present	Nectar present
Stamens and stigma usually hang out of the flower	Stamens and stigma usually hidden inside the petals
Filaments are long and pendulous	Filaments not pendulous
Stigma is larger with feathery branches for catching pollen grains. Not sticky	Stigma is sticky so that pollen grains that land on it cannot be easily shaken off.
Pollen grains are smaller, smoother and light, easily blown by wind	Pollen grains are large and heavy with rough surfaces for sticking to insects body
Large number of pollen grains produced	Small number of pollen grains produced
	

Production of seeds and fruits

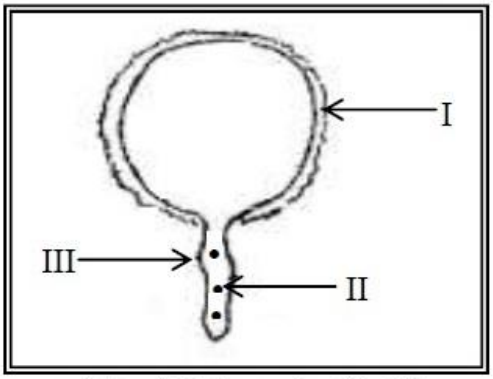
After fertilization, the fertilized egg grows into an embryo, the ovule changes into a seed and the ovary becomes the fruit.

Fruits

- Fruits develop from the ovaries of flowers.
- The ovary wall grows to become either a fleshy and juicy or a dry and have pericarp.
- Fleshy fruits are usually attractive and brightly coloured.
- They have large seeds e.g. mangoes or many small seeds e.g. dry fruits have a hard and dry pericarp, either split open when ripe or do not release their seeds by splitting.

Exercise 2:

1. The diagram below shows a germinating pollen grain.



Source: *http://biologyplantfertilizer.com*

i. Name the parts labelled I – III in the diagram above.

_____

_____

_____

ii. Is the pollen grain shown above from an insect or wind pollinated flower?

_____

2. What happens to the ovary and ovules after fertilization**?**

_____

_____

_____

Week 3: 19/07/21-23/07/21

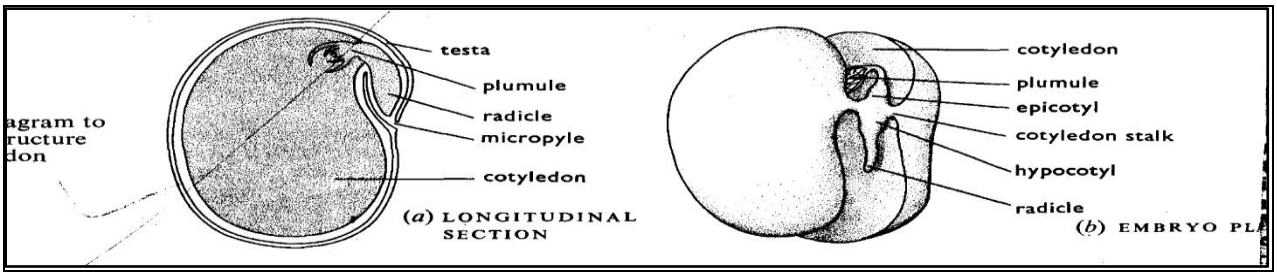
Strand 1: Structure and life processes

Sub strand 1.5: structure, form and function in plants.

Achievement indicators; At the end of the class, students should be able to;

- Identify the different parts of a seed and state its functions.
- Identify and discuss the various methods of seed dispersal in plants.
- List the conditions needed for seed germination.

Seed structure



Seed parts and their function

Part	**Function**
Seed coat	Protects the seed from dehydration
Endosperm	Provides food for the young new plant to use until it can make its own by photosynthesis
Embryo	"Baby" plant
Radicle	Seed root
Cotyledons	Seed leaves
Helium	Scare left by seed stalk
Micropyle	Small hole where water enters the seed
Plumule	"Baby shoot"

Seed dispersal

Dispersal of seeds is desirable for the following reasons:

1. To avoid overcrowding and competition for light and nutrients

2. To help colonize new and favourable habitats.

Methods of dispersal

1. **Wind dispersal**

- Some plants produce light seeds which are carried away by the wind.
- Those seeds generally have fruits that form wings or feather like structures so that they can "catch" the wind e.g. tulip, sycamore, grass etc.

2. **Water dispersal**

- Plants that grow near streams and oceans produce large hollow seeds that can float away to new area of land e.g. coconuts, mangroves. Ivi, etc/

3. **Animal dispersal**

Animals disperse seeds in two ways:

a) The seeds get stuck on the animal's body. Such seeds usually have hooks or spines.
b) The animals eat the fruits. Such fruits are usually fleshy and sweet. The seed passes unharmed through the digestive system and comes out in the faeces e.g. pawpaw, tomatoes, chilli etc.

4. **Pod explosion**

- Some plants enclose their seeds in pods that explode and scatter the seeds once they have matured and dried out e.g. balsam, beans, etc.

Seed germination

The **three** conditions for germination are:

i) Water – for swelling and bursting of seed, movement of food reserves.
ii) Oxygen – needed for respiration by growing seedling
iii) Warmth – for efficient functioning of enzymes.

Types of Germination

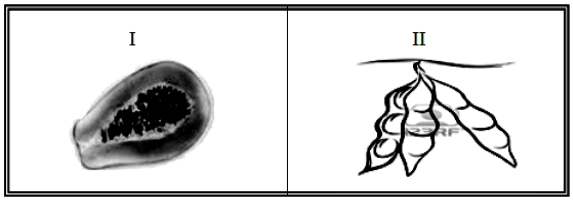
There are two types:

1. Epigeal germination – is where the seeds are carried above the ground during seedling growth. The cotyledon and the plumule then develop into a new shoot e.g. bean plants and peanuts.

2. Hypogeal germination – is where the seeds remain below the ground e.g. maize.

Exercise 3

1. The diagrams given below show the fruit and seeds of two different plants



i. Explain the dispersal mechanism used by each plant.

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ii. Explain the importance of dispersal mechanism in nature.

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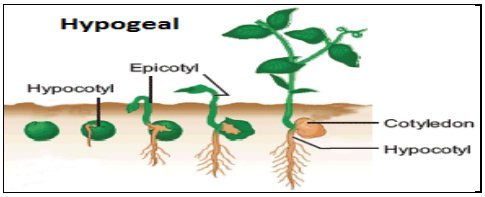
2. Use the diagram of a germinating bean seed to answer the questions that follow.



i. What is the **function** of the cotyledon?

_____

_____

ii. Before germination occurs, the embryo inside the seed is in a dormant state.
What does '**dormant state**' means?

_____

_____

iii. List **ONE** factor (other than water) needed for germination.

_____

_____

Week 4: 26/07/21-30/07/21

Strand 1: structure and life processes

Sub strand 1.5: structure, form and function in plants.

Achievement indicators; At the end of the class, students should be able to;

- Identify and explain the natural and artificial methods of vegetative reproduction.
- List the advantages and disadvantages of vegetative reproduction

Asexual and sexual reproduction

Asexual Reproduction

Asexual reproduction is so common in plants that there is a special name for it - Vegetative reproduction. Some methods of vegetative reproduction are;

1. Runners and suckers
- Some plants send out stems sideways which then sprout new plants.
- If the stems are above ground, they are called runners and if they are under the soil they are called suckers.
- The connection between the parent plant and the offsprings withers and dies once the offspring can support itself e.g. paragrass reproduces by runners and mint and bananas reproduce by suckers.

2. Rhizomes
- A rhizome is an underground stem that is swollen with food.
- New plants sometimes sprout off those stems e.g. ginger and turmeric.

3. Budding (stem tubers)
- In budding, one part of the plant buds off the main body of the parent plant.
- These buds grow its own roots and leave and then drops off becoming an independent plant. E.g. potatoes.

4. Corms: these are stems that are swollen with food found underground and are short, thick and starchy. Terminal buds of the corms may develop into a new plant e.g. taro.

5. Bulbs: these are buds found underground with thick, fleshy leaves that are stored with water and sugar e.g. onions.

Some methods of artificial propagation are:

1. Cuttings – a piece of the parent plant is cut and planted. Adventitious roots grow from the base of the cut stem into the soil while the shoot continues to grow and produce seeds e.g. sugarcane, cassava, bele, rose.

2. Layering – the stem of a plant is pinned down to the ground so that it will grow new roots. Once the plant is capable of supporting itself the connection is severed.

3. Grafting – short branches are cut off one tree and inserted into a closely related tree. The root, leaf and stem system of this related tree would support the branch. The bud or the shoot being grafted is called scion and the rooted portion is called the stock.

(For the diagrams of asexual and sexual reproduction refer to year 11 Biology text book pg. 45-46)

Advantages of vegetative reproduction

1. The offspring remains the same as the parents so the variety of species is maintained i.e. if a parent plant possesses some good qualities, it will be passed onto the daughter plant.

2. Since the food storage structure is underground, they cannot be easily damaged or eaten by other plants.

3. The new plant grows in the same place where the parent plant was growing so the conditions are suitable for the same plant.

4. There is no need to find a mate or partner.

5. The offspring's are supported by the parent plant.

Disadvantages

1. No variation among the individuals.

2. Species are liable to be wiped out if the environmental conditions change.

3. Overcrowding takes place.

Exercise 5:

1. **Many plants are capable of both sexual and asexual reproduction.**
   - **i.** definition of sexual and asexual reproduction;

     _____
     _____
     _____
   - **ii.** **List the four** methods of asexual reproduction with examples of local crops.

     _____
     _____
     _____
   - **iii.** **State two** advantages of asexual method of reproduction.

     _____
     _____
     _____
     _____

Week 5: 2/08/21-06/08/21

Strand 1: Structure and life processes

Sub strand 1.5: structure, form and function in plants.

Achievement indicators; At the end of the class, students should be able to;

- Define the term tropism.
- Explain the different growth response in a plant.
- Describe the role of auxin as a growth regulator.

Tropisms

- Is the response of a plant towards a stimulus.
- A tropism is the change in pattern of growth or movement in response to a factor in an organism's environment.
- When two plants grow towards a stimulus, it is called positive tropism.
- If a plant grows away from a stimulus it is called negative tropism.

1. **Phototropism** – is the growth response towards light. Plant shoots show positive phototropism while roots how negative phototropism.
2. **Hydrotropism** – is the growth response towards water or moisture. Roots show positive hydrotropism whereas shoots are negatively hydrotropic.
3. **Geotropism** – is the growth response of plants towards gravity. Roots are positively geotropic whereas shoots are negatively geotropic.
4. **Chemotropic** – is the growth response of plants towards chemicals. Roots and pollen tube show positive chemotropism.
5. **Thigmotropism** – growth response of plants towards touch. Tendrils are positively thigmotropic whereas leaves of sensitive grass (mimosa) show negative thigmotropism.

Control of tropism by auxins (hormones)

- Tropisms are at least partly controlled by a special group of plant hormones called auxins (IAA – indole acetic acid).
- This auxin influences the plant growth response by making cells grow longer.

Auxin control of phototropism

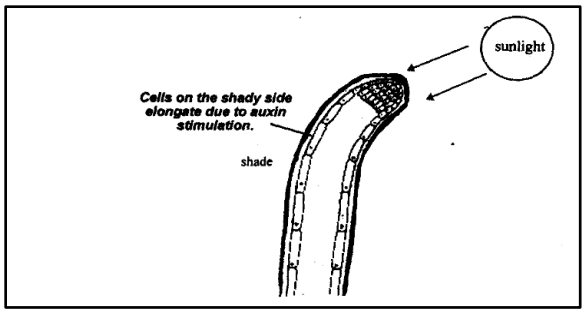
- Auxin is a hormone – produced at one part of the organism and tells other parts what to do.
- It is produced at the shoot tips and travels down the stem.
- When light shines on a plant from one direction, more auxin travels down the shady side compared to the illuminated side.
- Higher auxin concentration stimulates cell elongation.
- This makes the stem on the shady side to grow longer than the illuminated side therefore the stem curves towards the light.

Control of tropisms by Auxin

- Tropisms are at least partly controlled by a special group of plant hormones called auxins.
- The auxins influence a plant growth response by making cells grow longer. To see how auxin works, let's look at how they influence phototropism.

Auxins Control by Phototropism

- A shade stimulates stem cells to produce auxin.
- This makes the cells on the shady side grow longer.
- As the diagram below illustrates, this makes the stem curve towards the sunny side, because the stem cells getting sun do not elongate.



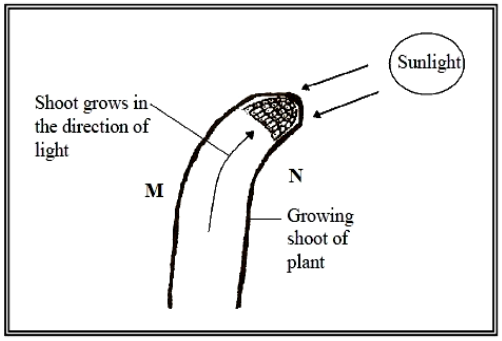
Note: Auxin – growth hormone

Exercise 5:

1. The response of a part of a plant growing away from light is called

A. positive phototropism.
B. negative phototropism.
C. positive thigmotropism.
D. negative Thigmotropism

2. Given below is a diagram of the upper part of a pot plant which is exposed to direct sunlight near a window.



i. Name the growth response shown in the diagram above.
_____

ii. Name the hormone that regulates this growth response.
_____

iii. Which of the sides labelled **M** or **N** of the plant will have the **highest** hormone concentration? _____

iv. Give **one** adaptive value of such a growth response to the plant.
_____