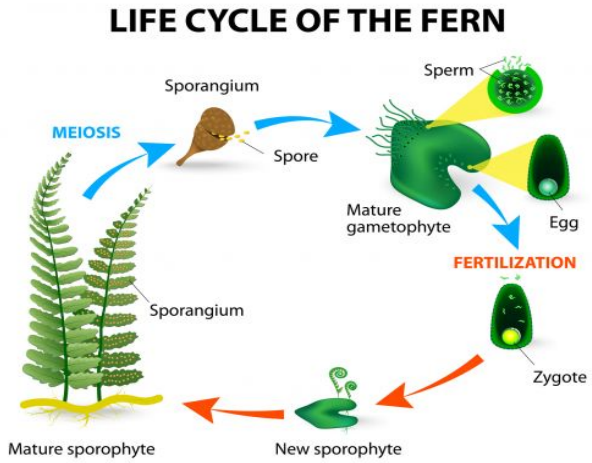
Plant reproduction

Lesson 1-Methods of reproduction in plants



Plants can reproduce in a number of different

1. Vegetative propagation

(**asexual** reproduction from a plant cutting)

2. **Spore** formations (e.g. moulds, ferns)

3. **Self-pollination**

4. **Sexual reproduction** in flowering plants involves the transfer of pollen (male gamete) to an ova (female gamete). This involves three distinct phases – pollination, fertilization and seed dispersal

<u>Sexual reproduction key terms.</u>

Pollination:

- The transfer of pollen grains from an anther (male plant structure) to a stigma (female plant structure)
- Many plants possess both male and female structures (monoecious) and can potentially self-pollinate

- From an evolutionary perspective, cross-pollination is preferable as it improves genetic diversity

Fertilisation:

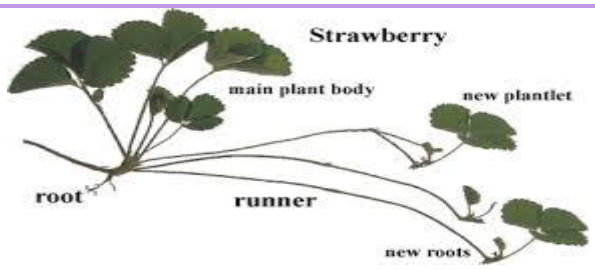
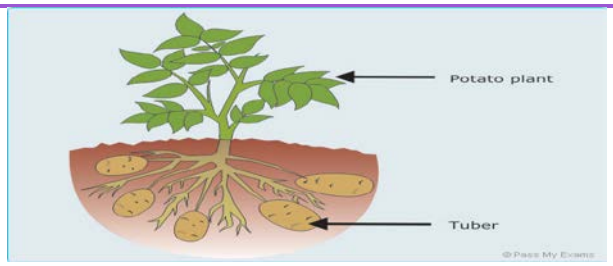
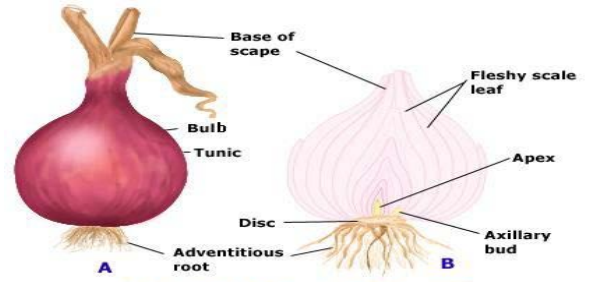
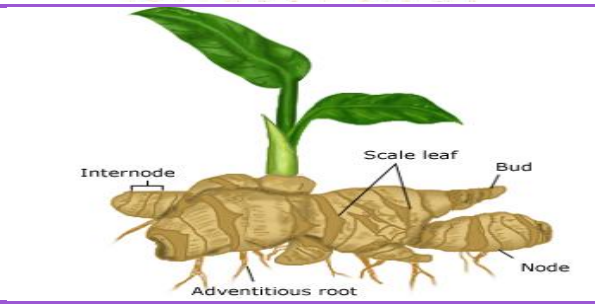
- *Fusion* of a male gamete nuclei with a female gamete nuclei to form *a zygote*
- In plants, the male gamete is stored in the pollen grain and the female gamete is found in the ovule

Seed dispersal:

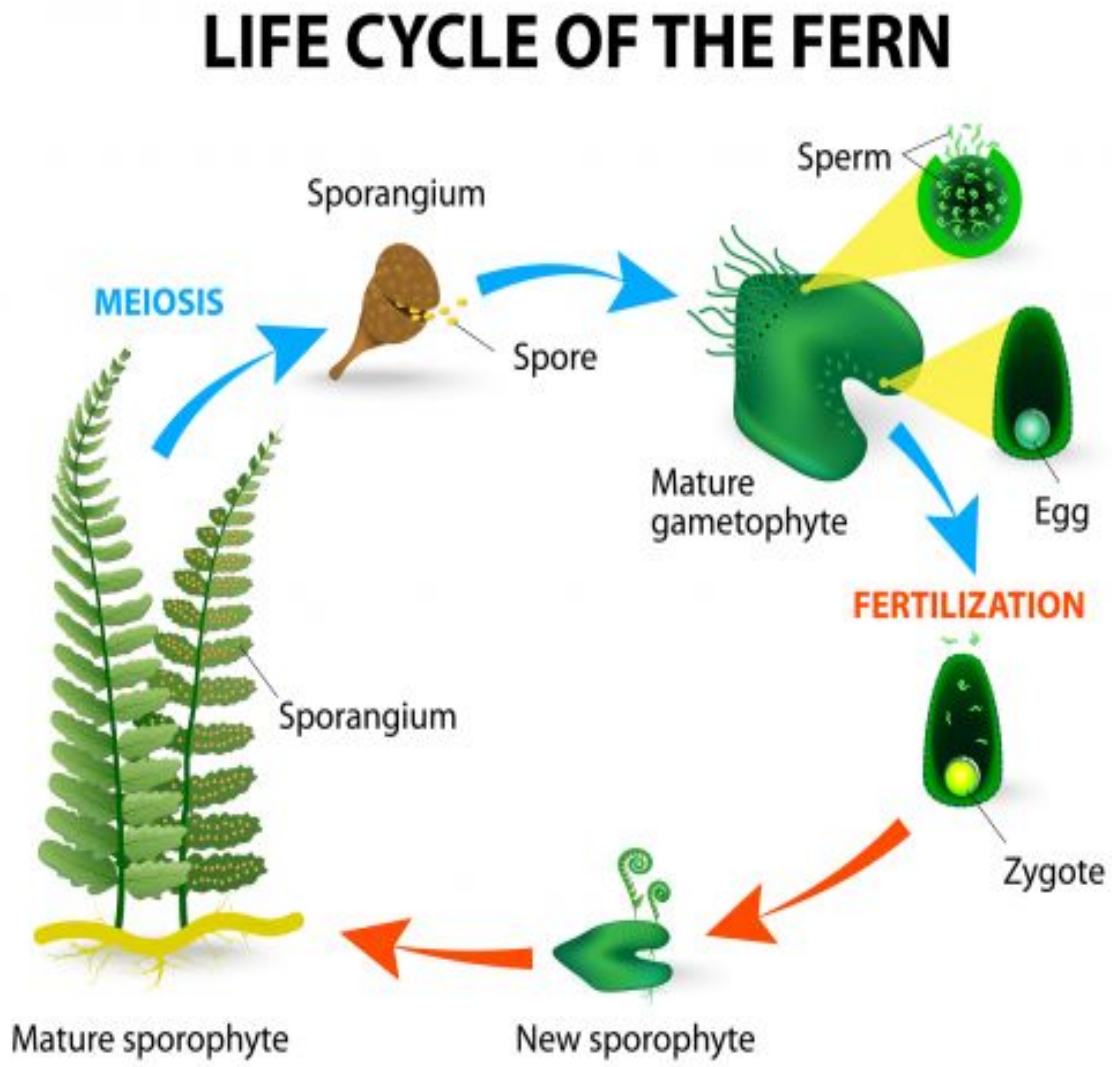
- *Fertilisation* of gametes results in the formation *of a seed,* which moves away from the parental plant
- This seed dispersal reduces competition for resources between the germinating seed and the parental plant
- There are a variety of seed dispersal mechanisms, including wind, water, fruits and animals
- Seed structure will vary depending on the mechanism of dispersal employed by the plant

1. Asexual reproduction

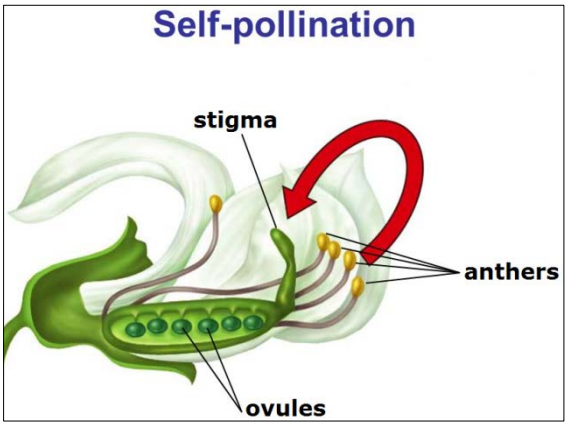
In plants, asexual reproduction can occur by different methods, as shown in the table below.

Asexual reproduction method	Plants that show this	Structure invovled	Diagram
Runner	Many grasses, strawberries, ivy, violets	Stems run along the ground surface. They send down roots at intervals.	
Stem tuber	Patato, yam	Sweelings called tubers are attached to the stem underground and full of stored food	
Bulbs	Onions, tulips, daffodils	Undeground “leaves” are full of stored food	
Underground stem	Bamboo, bracken, ginger	Stems run along underground and send up leaves at intervals	
Root suckers	Some eucalpts	Roots sen dup stems where they come near the surface.	

2. Spore formation

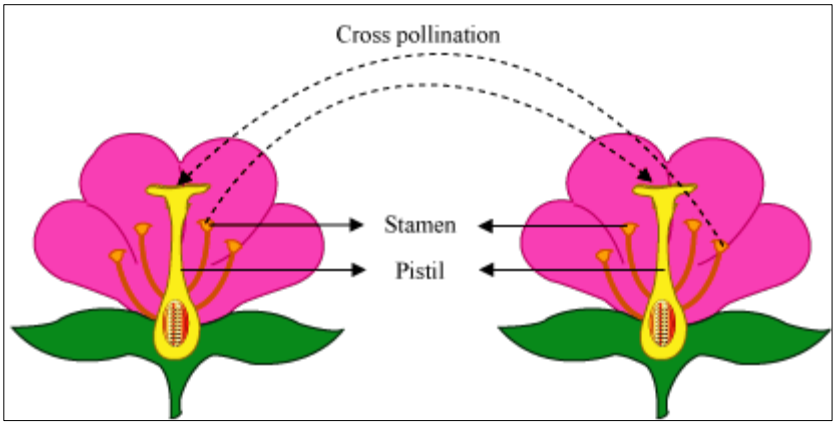


3. **Self-pollination** is the transfer of pollen from the anther to the stigma of the same flower. In some flowers, the stigma and anther are arranged so that self-pollination cannot occur.



4. Sexual Reproduction

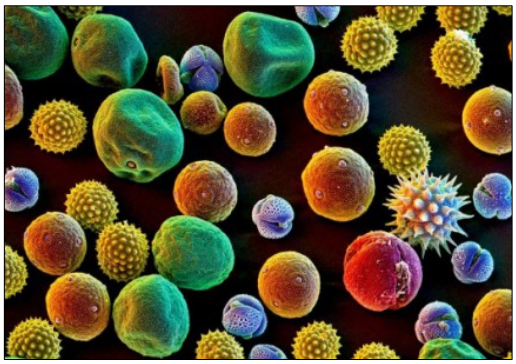
Cross-pollination is the transfer of pollen from the anther to the stigma of **another flower**. In cross-pollination **wind, insects or birds** transfer pollen from one flower to another as shown to the right.



In some plant species, there are separate male and female flowers either:

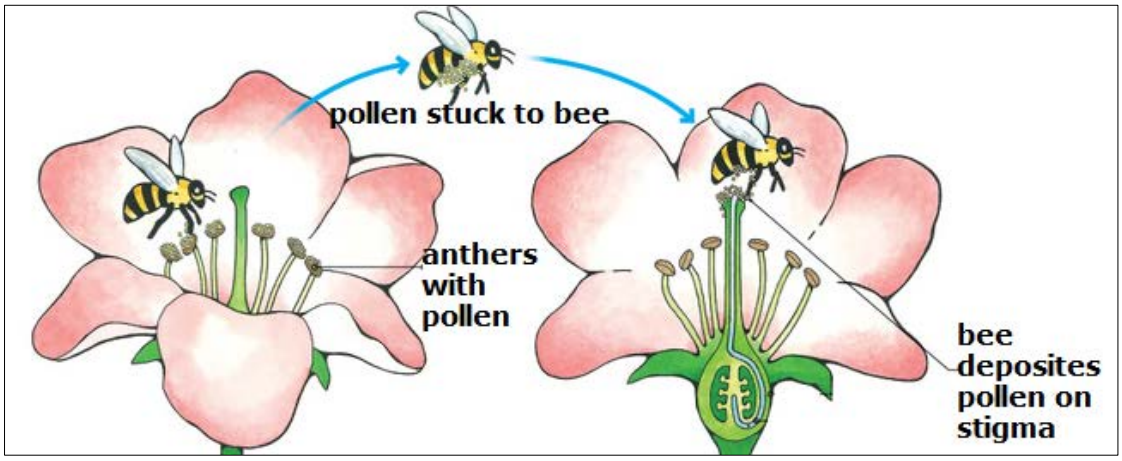
- on different parts of the **same plant** or
- on **separate plants**.

Pollen grains are very small and light. Each kind of plant has pollen grains that look different from those of any other plant. Some have spikes that help them attach to surfaces. Pollen easily floats along with the wind and can also be transported on the bodies of insects and birds.



Electron microscope image of some pollen varieties

The main insects involved in pollination are bees.



Cross pollination by bees

Go to the send in pages and complete exercise 1.2 and 1.3

Activity: Pollination summary

Fill in the missing words to complete the summary.

The transfer of pollen from the anther to the stigma is called _____ .

There are two types of pollination: _____ and _____ .

Self-pollination is when the pollen from the anther falls on the stigma of the _____ flower. Cross-pollination is when the pollen from the anther falls on the stigma of _____ flower.

Three ways pollen may be transferred from one flower to another are:

- _____
- _____
- _____

Check and mark your answers in the suggested answer pages.

https://www.youtube.com/watch?v=L-kuvnCMZEk

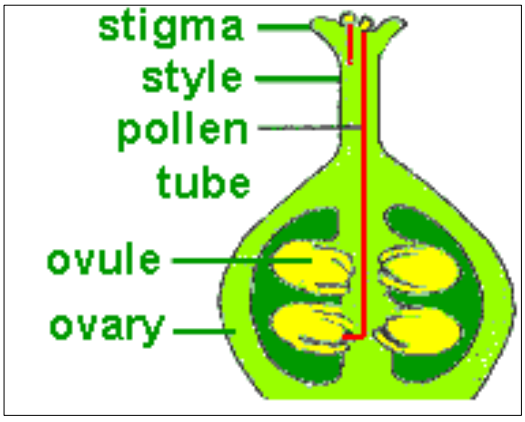
Lesson 2

After pollination

When the pollen grain lands on the stigma, it is held there on a sticky surface. While it is on the stigma it gets food and grows a long extension called a pollen tube that goes down the style into the ovary.

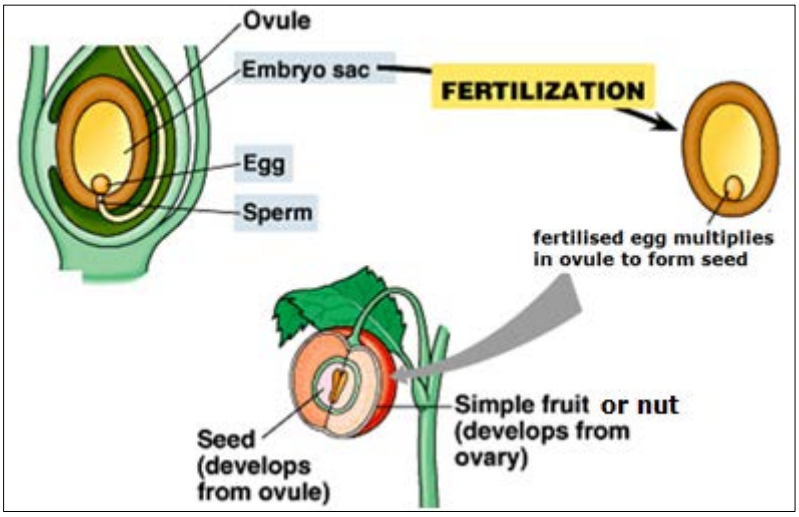
The pollen tube then enters an ovule in the ovary, as shown in Figure 5.

The sperm cell travels down through the pollen tube and enters the ovule where it joins with the female egg cell.

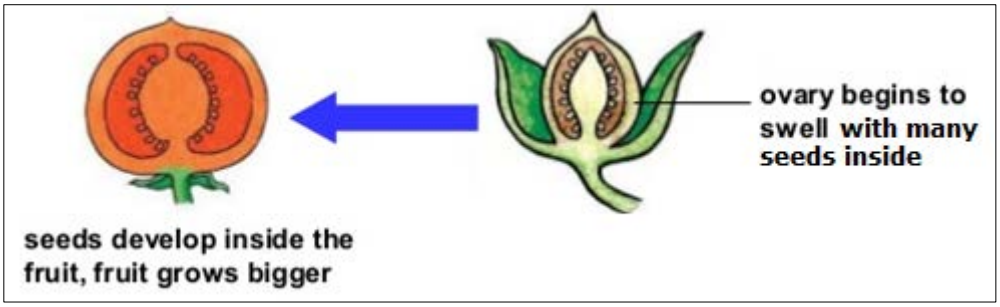


The joining of the sperm and egg cell is called **fertilisation**. This forms the first cell of a new plant.

The cell multiplies in the ovule to form a **seed**.
The ovary swells to protect the developing seed. The swollen ovary forms a **fruit or nut**, as shown in Figure 6.



In some plants many ovules are found in one ovary. In these plants many fertilised eggs can form many seeds in one swollen ovary fruit.



As a seed grows, a store of food is added to it.

The stored food in a seed later allows its **cells to multiply to form small leaf and root** structures. This process is called **germination**.
Not all seeds that fall onto the ground will germinate. Seeds will only germinate if conditions are suitable.

Activity: Seeds

1. Describe the function of the structure called a “pollen tube”.

_____

2. Explain why seeds need to contain a store of food.

_____

_____

Check and mark your answers

Summary of Lesson 2

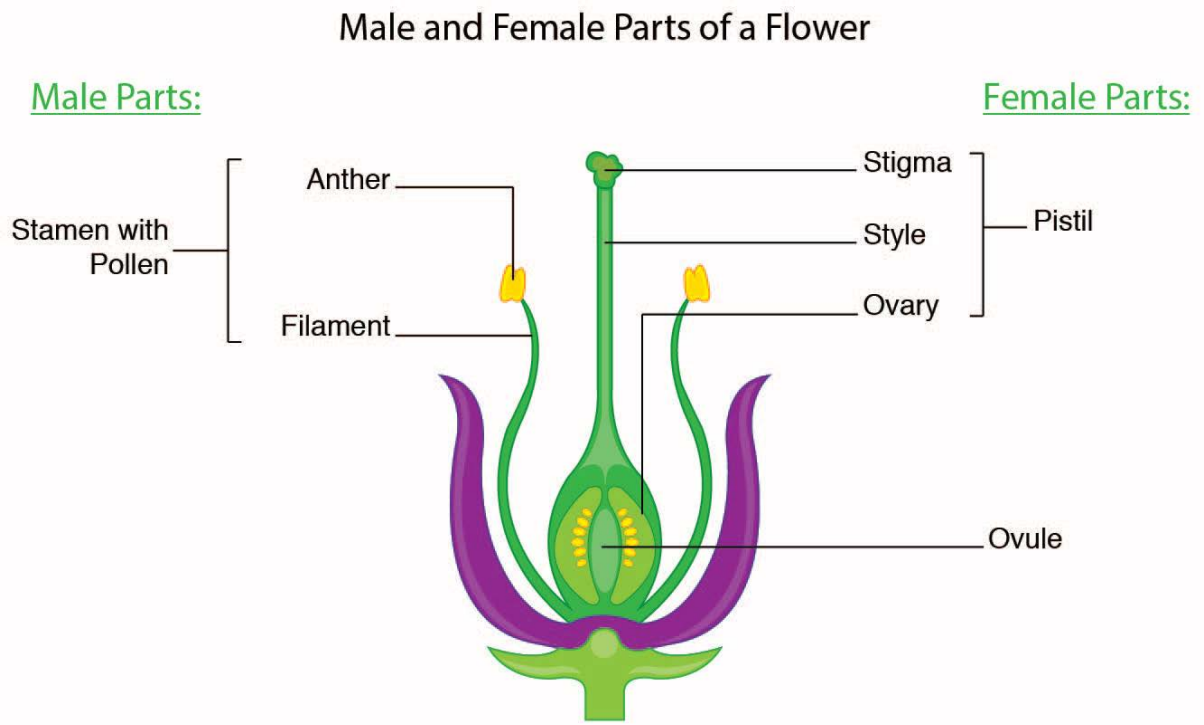
- Pollination is the transfer of pollen from an anther to a stigma of a flower.
- Fertilisation is the joining of a sperm cell with an egg cell to form the first cell of a new organism.
- In a flower the first cell multiplies to form a seed in an ovule inside an ovary.
- The ovary around the seed grows into a fruit or nut.
- Seeds, fruits and nuts contain stored food.
- Germination is the multiplication of seed cells to produce small leaves and roots.

Complete the Send-in exercises for Lesson 1

Lesson 3 -What's in a flower?

Have you ever wondered why it is that many plants have flowers?
You probably know plants have flowers so that they can **reproduce**.
When a flower matures, it **contains seeds** that will eventually grow into new plants we call this **germination.**

A generalised flower cross-section (cut down the middle)



The following activity will help you to identify the main parts of a flower and their functions. Use the interactive website below to fill up the blank spaces in the table.

http://www.harcourtschool.com/activity/science_up_close/515/deploy/interface.swf

Play this really fun game which challenges you to identify the different parts of a flower and their functions. The link in underneath the table.

Part of flower	Function
Sepal	
Stamen	
Anther	
Stigma	
Style	
Ovary	
Petal	

http://www.sciencekids.co.nz/gamesactivities/detectivescience/plantparts.html

Lesson 4

Practical - Flower Structure

Aim: To compare the structure of different flowers

Equipment: selection of flowers, blades and forceps, hand lens or stereomicroscope

Method:

1. Carefully observe the structure of each flower
2. Use a stereo microscope or hand lens to study them
3. Dissect the flowers carefully using the forceps and blade

1. Construct a quick sketch of the basic shape of the flowers. Do not draw in fine detail. Write the name of the plant species on your diagram.

2. Identify all the flower parts and label these on your diagram

3. On your diagram, write down the general features of the flower, such as its size and colour.

Practical - Germination

Definition: Germination is the process by which a plant grows from a seed or similar structure.

Aim: To determine what effects the germination of seeds

Hypothesis: Write a hypothesis in the space provided below (after reading the materials needed and method):

_____

_____

_____

Materials: 1ml of cool boiled vegetable oil, 10ml of cool boiled water 5 test tubes, 25 wheat seeds, cotton wool, labels and a pen, thermometer, lamp, access to a dark cupboard and fridge, camera/mobile phone camera

Method:

The test tubes will have the following conditions:

Test-tube	Conditions
A	Light, moisture, oxygen, warmth
B	Dark, moisture, oxygen, warmth
C	Dark, no moisture, oxygen, warmth
D	Dark, moisture, no oxygen, warmth
E	Dark, moisture, oxygen, cold

1. Label the test tubes with your name and the correct letter A to E

2. Put a centimeter of cotton wool in the bottom of the test tubes A to E as shown in the diagram below

3. Add about 1ml of tap water to the test tubes A, B and E.

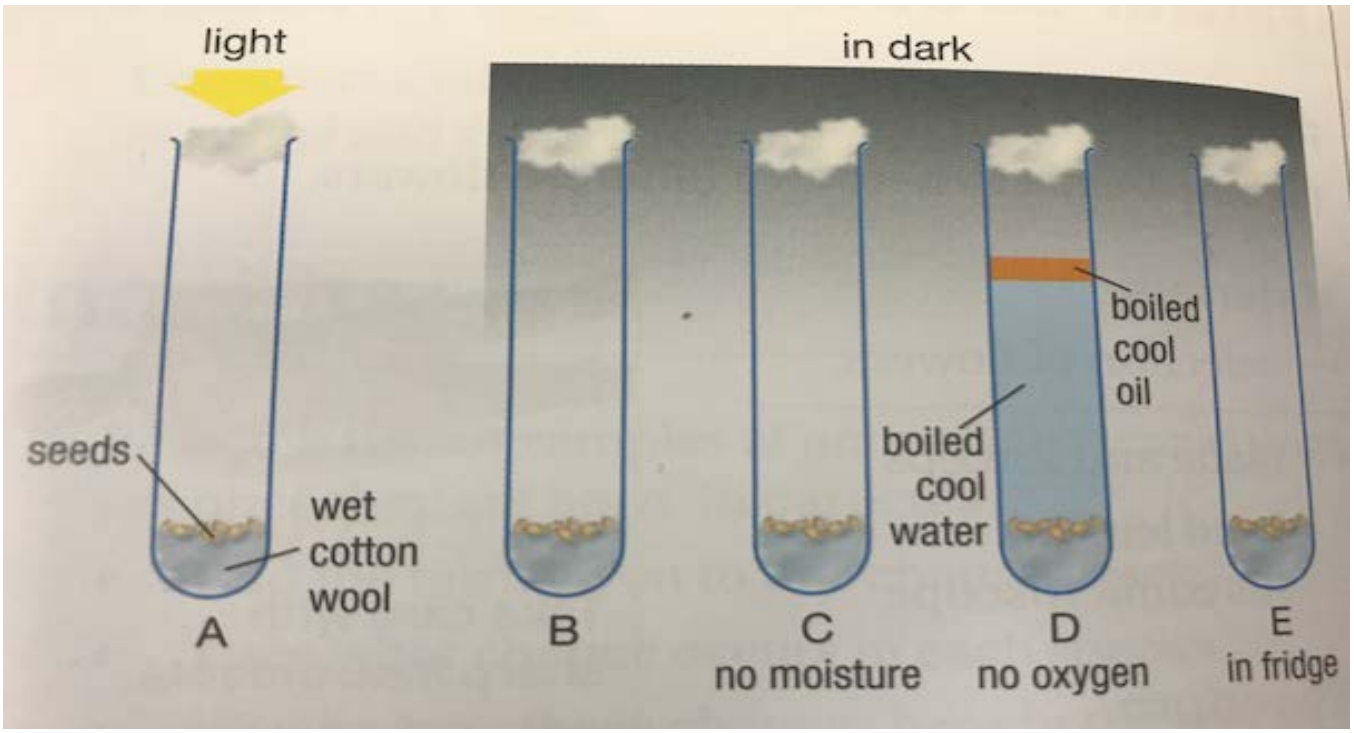
4. Add five seeds to each of the test tubes A- E

5. Add about 10ml of boiled (but cooled) water to test-tube D. Add the boiled (but cooled) oil to this test-tube.

6. Put a loose cotton wool plug in the mouth of each test-tube.

7. Place test-tube A somewhere sunny. Place test tubes B, C and D in a dark cupboard. Place test tube E in a fridge.

8. Observe or photograph the experiment each day for 5 days. Record the results in the table below. Write down your observations for each test tube each day.



Lesson 5

Practical- Asexual Reproduction

Aim: To observe examples of asexual reproduction

Materials: Selection of onion, patato, clove of garlic, leaf of geranium, stem of bamboo or braken (any of the above that you can get your hands on), soil, glass jars, toothpicks, ice-cream container or container of any kind, stereo microscope, mobile phone camera/camera, small plate

Hypothesis: (After reading the procedure for this experiment, write a hypothesis for this experiment)

_____

_____

_____

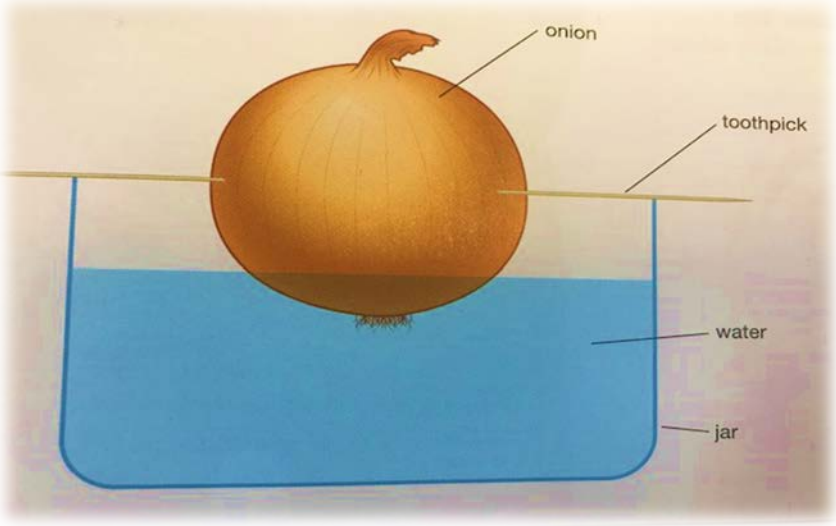
Procedure

1. Take an onion, a piece of garlic and a patato. Stick some toothpicks in them so that they can be supported on top of a jar of water and just touch the water at the bottom. The diagram below shows how to do this using an onion. Fill each jar with water.

2. Place a leaf from a tree of life or a geranium on some soil in an ice cream container. Place the small plate over the top of the leaf to keep it pressed against the soil. Water the soil.

3. Cut a piece of geranium stem about 10cm long. Strip the leaves off. Stick it in soil, leaving a few centimeters above the soil and then water it.

4. If you have some bamboo stem or bracken stem, break about 10cm off it ad cover it in soil, watering it well.



Results:

1. Place each plant sample in a cupboard and check it regularly.
2. Record your observations, perhaps using a camera to record changes.

Send-in exercises *Plants* Part 3

Lesson 1 Pollination and germination

Exercise 1.1

1.Name the two main types of reproduction

1._____

2._____

2. (a) List three different ways that plants reproduce asexually

_____

_____

(b) For each way, name one plant that reproduces that way.

_____

_____

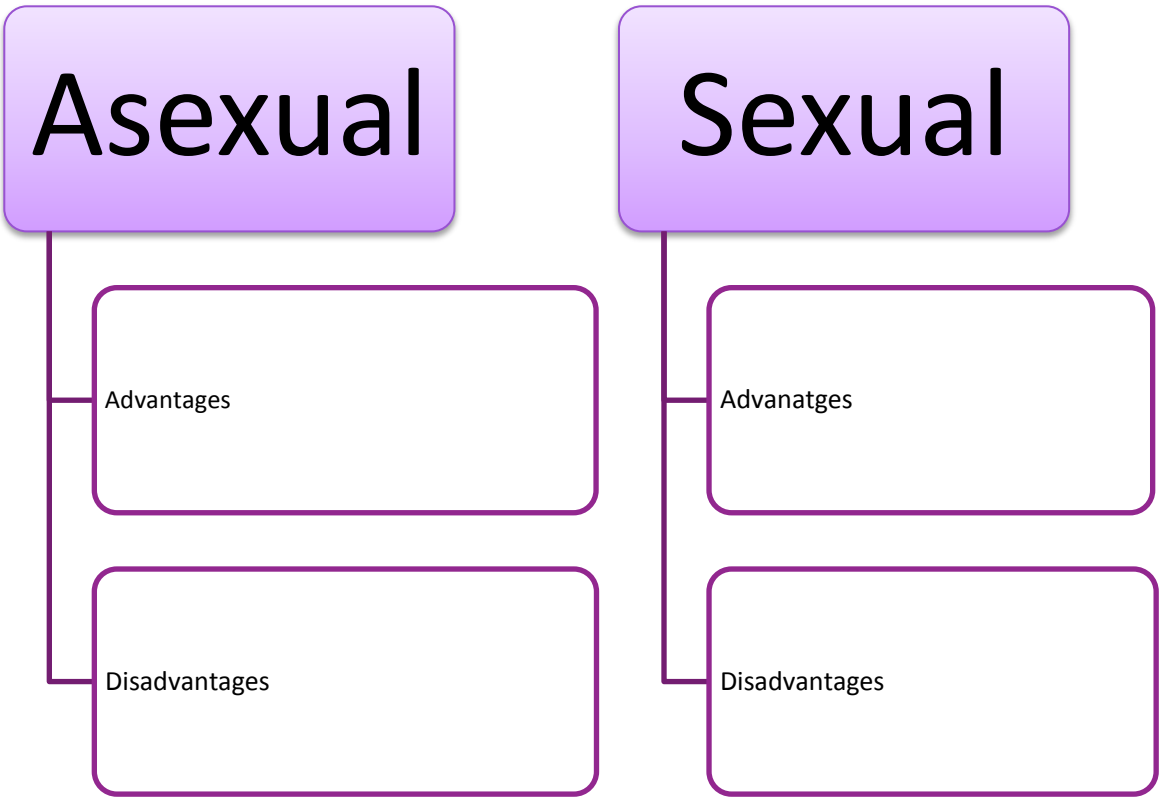
Exercise 1.2

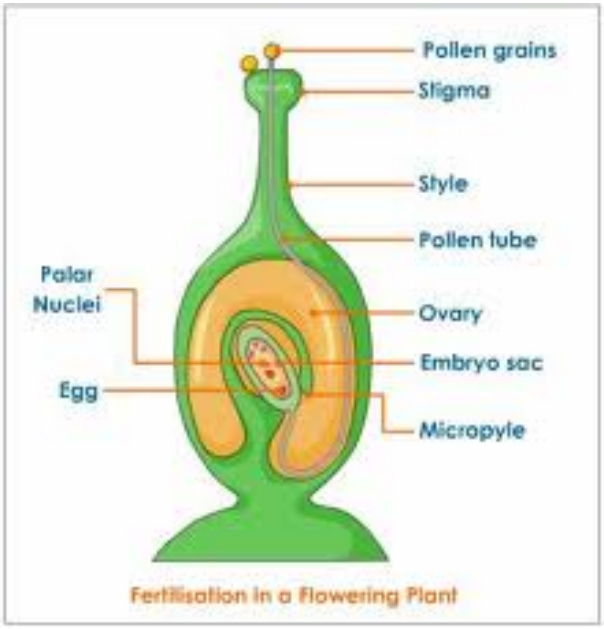
You probably eat a lot of plants in your everyday diet. List six different foods that you eat that come from plants. Identify the part of the plant you eat and name the plant structure. An example has been done for you.

Food	Plant structure
1. Strawberries	**Runners**
2.	
3.	
4.	
5.	
6.	

Exercise 1.2

Compare the **two** advantages and two disadvantages of sexual and asexual reproduction in plants in the space provided below.





Fertilisation in a Flowering Plant

Exercise 2.1

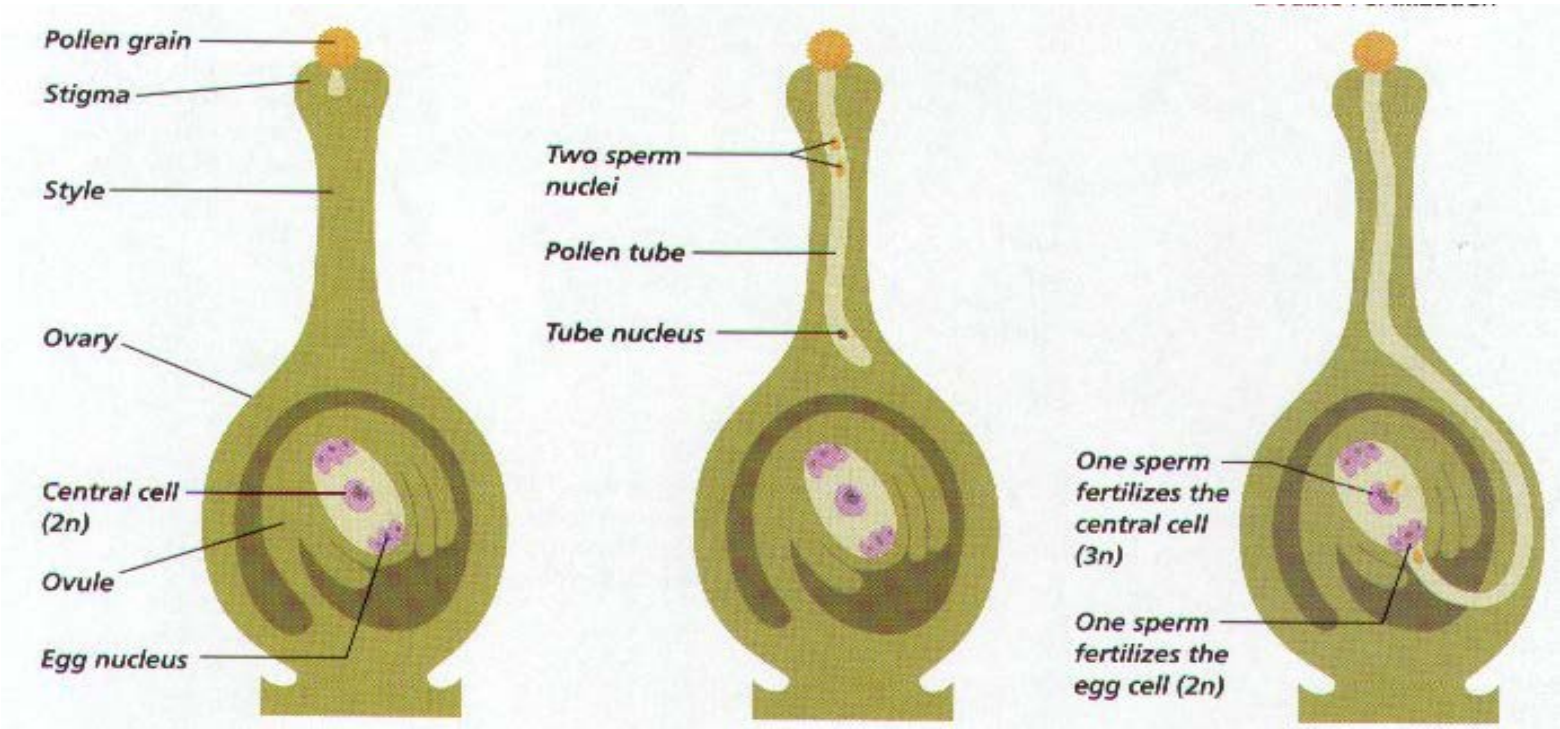
In each pollen grain is a _____ _____ pollen nucleus. Inside each ovule is a _____ovule nucleus.

Once it is _____ _____, the ovule grows a _____ _____.

After fertilisation most parts of the _____, wither and die. The _____ gets bigger and forms the **fruit.**

Inside the fruit are the _____

Flower	Female	Seed	Male	Fertilised	Ovary	Seeds



1. 2. 3.

Exercise 2.2

Complete the following summary about seeds by filling in the missing words using words below.

fertilisation food fruit germination ovary roots seed seedling sperm stem tube

Seed summary

After pollen lands on a stigma, a _____ grows from the pollen down the style and enters an ovule in the _____.

A _____ cell moves from the pollen and joins an egg cell in the ovule to form the first cell of a new plant. This joining is called _____.

The first cell multiplies and forms a _____ with stored food. The ovary around the seed grows to become a _____ or nut.

When seeds receive water and warmth their cells multiply and grow to form small roots, stem and leaves producing a _____ or sprout. This process is called _____.

The _____ always grow down towards gravity, and the _____ grows up, away from gravity.

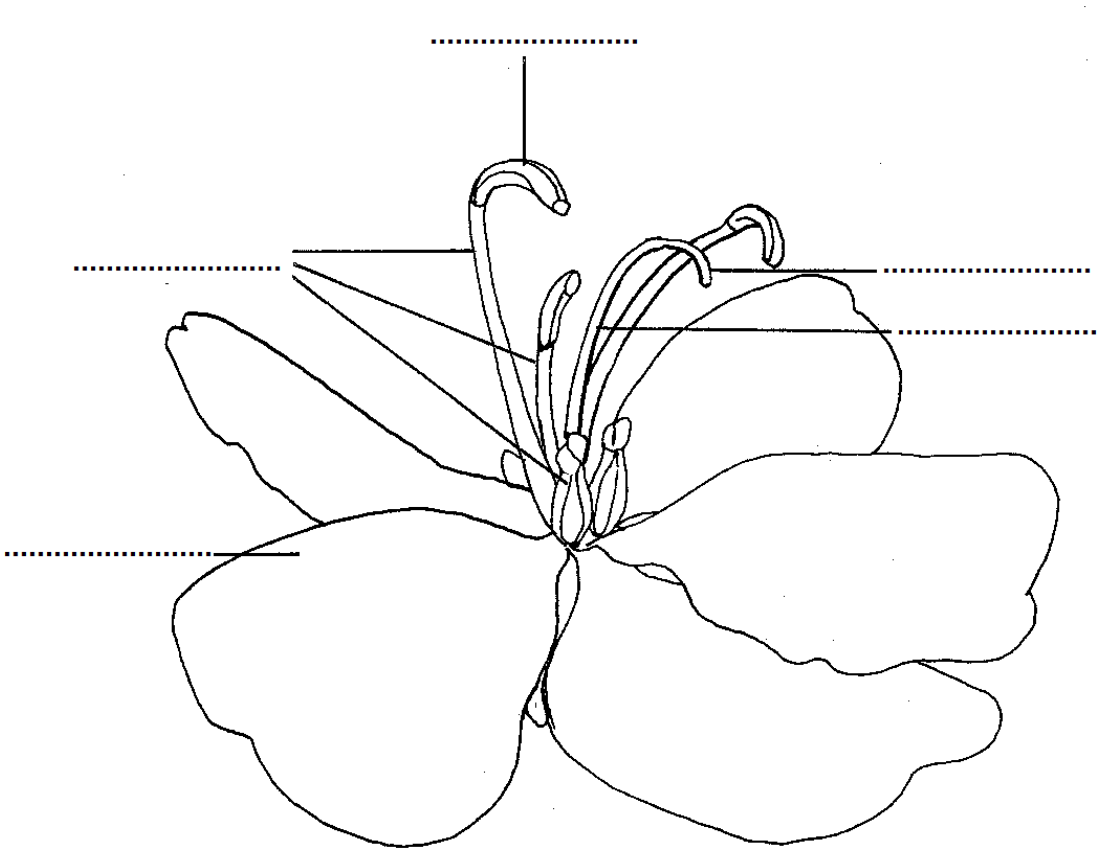
Fruits, nuts, seeds and seedlings contain substances that animals can use as _____.

Lesson 3 Structure of a flowering plant

Exercise 3.1

Look at the photo of the cassia flower, then label the diagram of the flower by writing a flower structure on the dotted lines.

Diagram of Cassia flower



Exercise 3.2

The figure below is a cross section through a typical flower. Complete the diagram by:

a) writing the name of the structures on the dotted lines.

b) indicating which are female parts and which are male parts

c) drawing in a pollen tube to show the delivery of a sperm cell to an egg cell in sexual reproduction of the flower

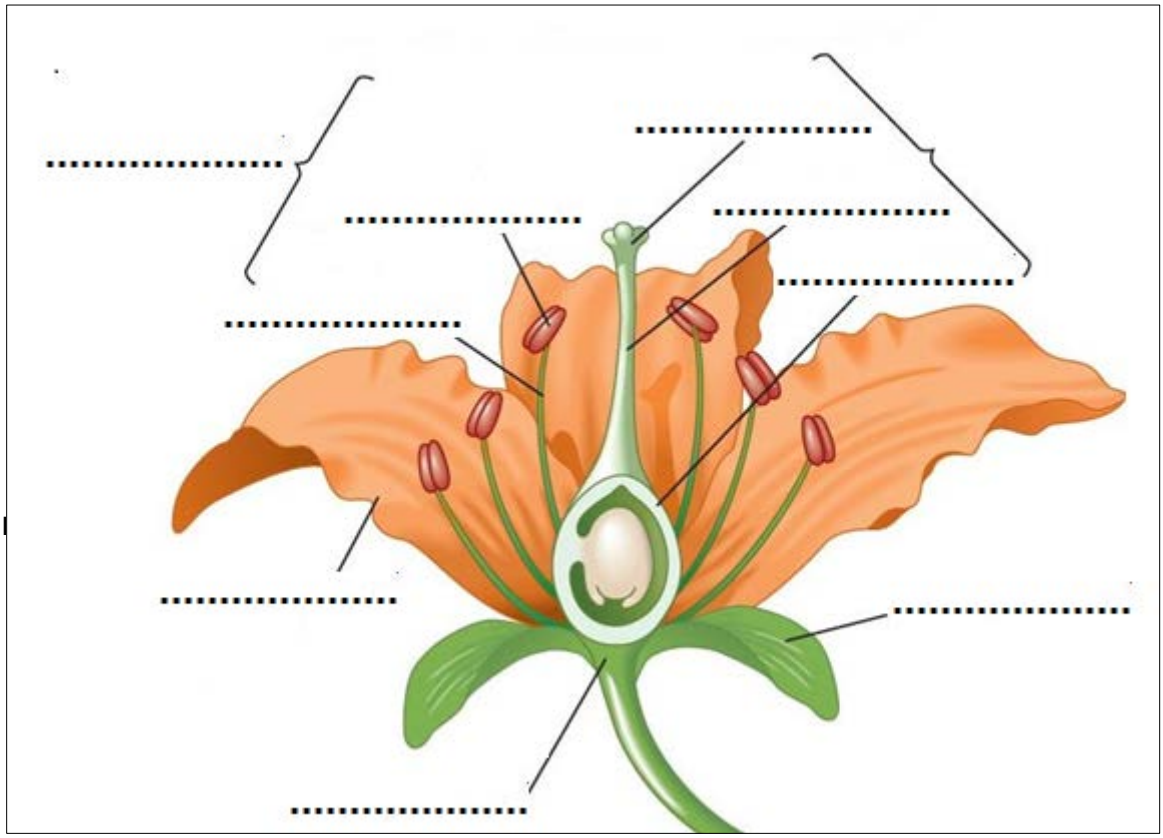


Figure 11 cross-section of a typical flower

Exercise 4.1

Flower structure practical

1. Construct a quick sketch of the basic shape of the flowers. Do not draw in fine detail. Write the name of the plant species on your diagram.

2. Identify all the flower parts and label these on your diagram

3. On your diagram, write down the general features of the flower, such as its size and colour.

Exercise 4.2

Germination results

Results:

Test Tube	A	B	C	D	E
Day 1					
Day 2					
Day 3					
Day 4					
Day 5					

Discussion:

Answer the following questions to write a discussion related to the experiment.

1. In this experiment, most of the variables have been controlled by setting the seeds up in the same test tube. What are some controlled variables in this experiment?

_____

_____

_____

2. What is the difference between each test tube?

_____

_____

3. What is the independent variable (what you change)?

_____

4. What is the dependent variable for this experiment (what you observe to record in the results)? _____

Conclusion:

_____

_____

_____

Exercise 5.1

Asexual reproduction practical

Results: (Observations / photos)

Conclusion:

_____

_____

_____