Unit 4 – Processing information

As you read information, identify and record *key points*, including diagrams, graphs, and statistics, by underlining, highlighting, or listing using bullet points. This is **processing data**. It shows you *understand* what you are reading.

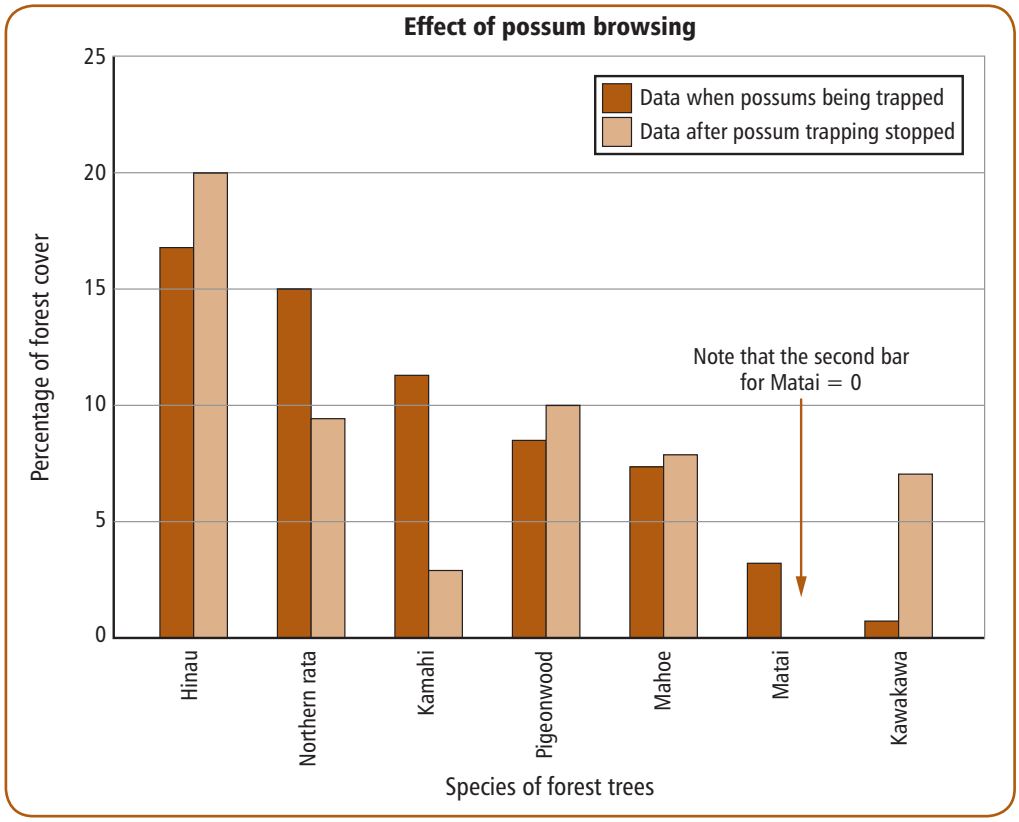
Turn these notes and data into paragraphs *using your own words*. The paragraphs *describe* the biological idea relating to the issue, and the differing viewpoints. Providing *reasons*, eg '*how*' and '*why*', for the ideas and opinions shows that you can *explain* the issue. By *linking* explanations and descriptions, you *integrate* ideas from different sources, so forming a *discussion*.

Content must be *accurate* and give *detail* rather than just general statements. The content must be at the level of Year 11 biology. For example, you must use correct biological terms and/or scientific terms.

Questions: Processing graphs

1. Graphs record data and show trends or patterns.

A study was carried out on the effects of possums browsing in the Orongorongo Valley, Wellington. The following graph shows the percentage of forest cover for different tree species. The first bar gives the percentage of the species in the forest when possums were being trapped. The second bar gives the percentage of the species after possum trapping had stopped for fifteen years.

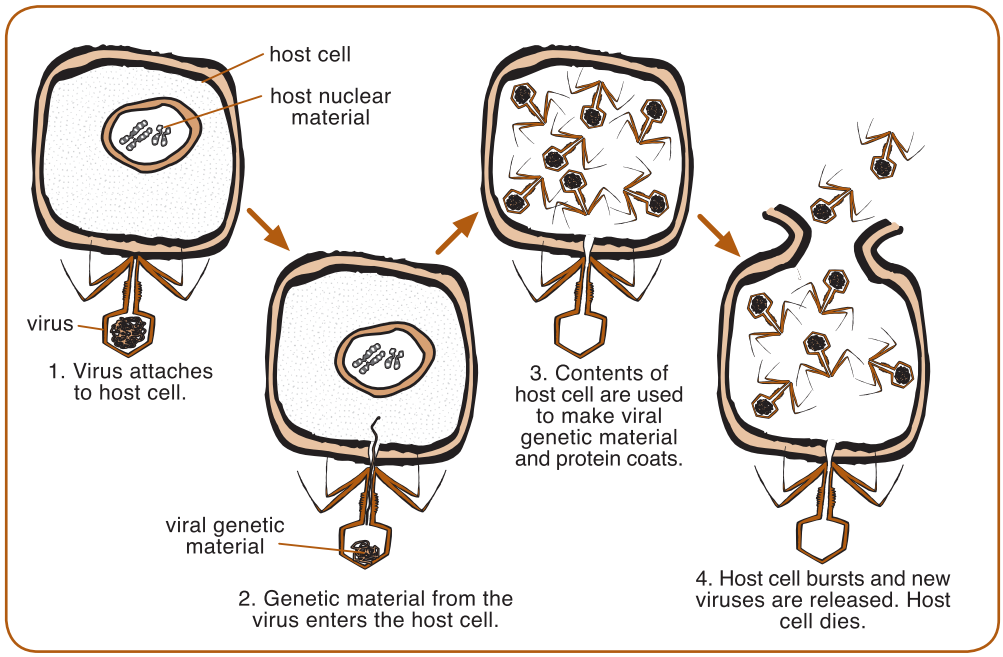


a. Use the graph to identify:

i. The three trees most favoured by possums for food.

Viral reproduction

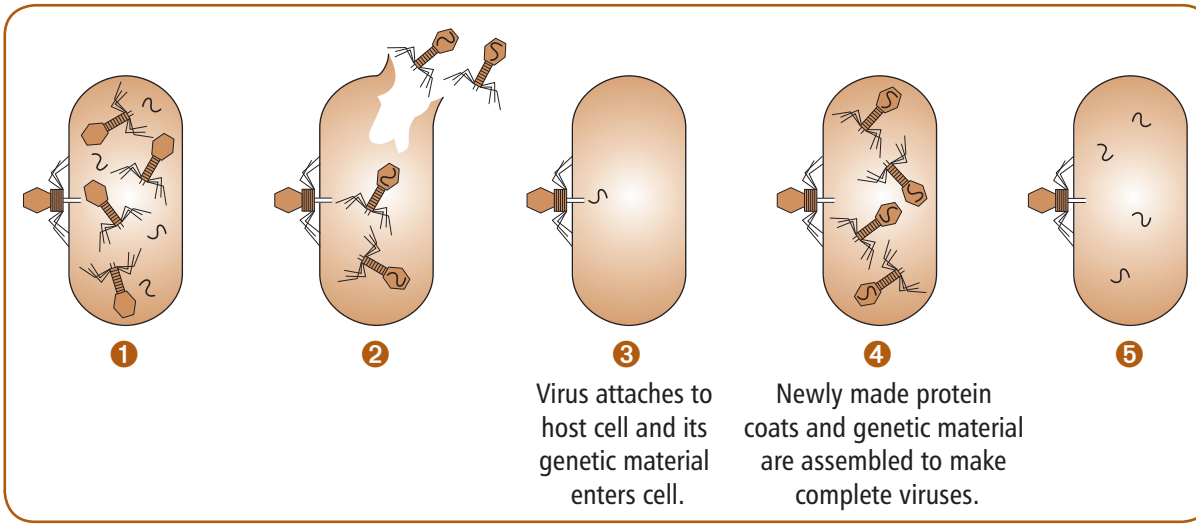
Viruses reproduce by invading **host cells**, using the contents of the host cell to reproduce their genetic material and make new protein coats.



Questions: Viral reproduction

The diagrams following show the events that occur when a virus invades a host cell, but:

- They are not in the correct order.
- Some of the descriptions about what is occurring at each stage are missing.



1. The *correct* sequence in which these events occur is: _____

2. Write the descriptions for stages 1, 2 and 5.

   a. Stage 1: _____

_____

The nitrogen cycle

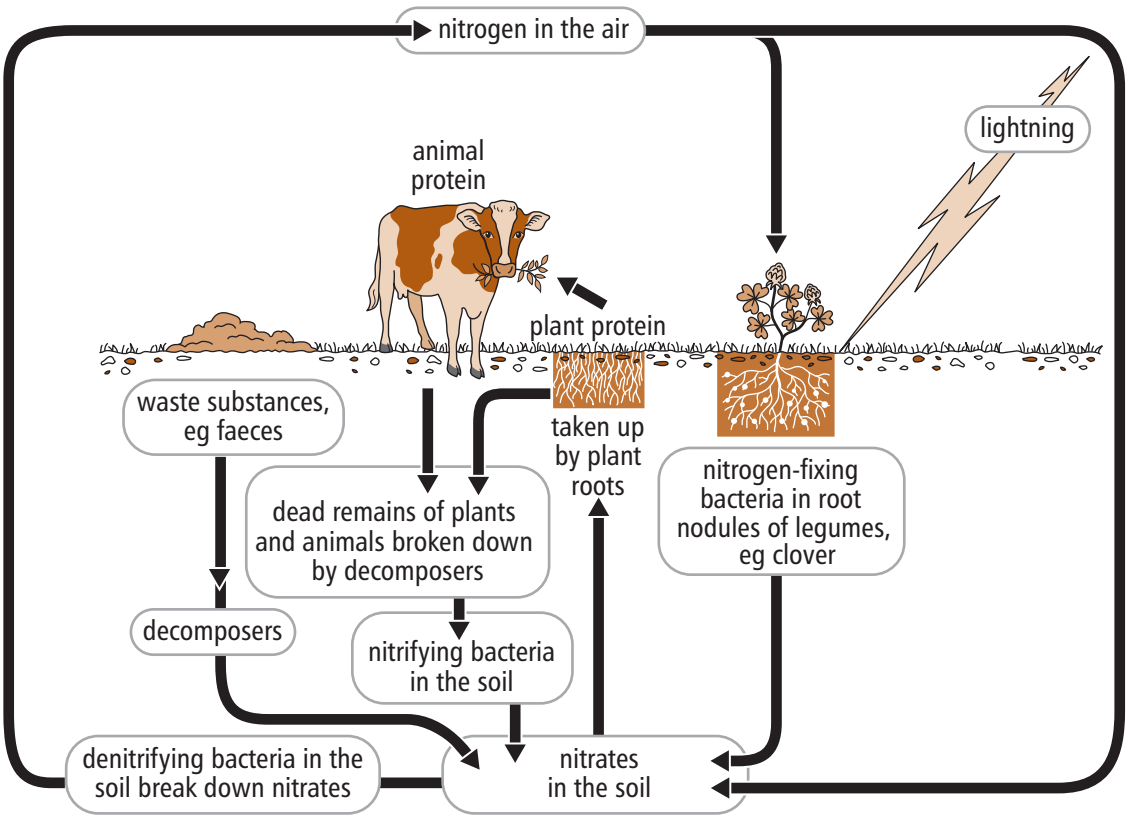
The **nitrogen cycle** involves different kinds of bacteria at various stages of the cycle.

Nitrogen is an important component of proteins, needed for growth in all living things.

Nitrogen is taken up by plants as **nitrates** from the soil and converted into proteins. Animals get their nitrogen from plant protein or other animal protein.

Plants cannot use nitrogen from the air – it *must* come from the soil in the form of nitrates. Nitrates dissolve in the water surrounding roots, so they can be taken up by plants and used to make proteins.

Questions: Nitrogen cycle



Use the diagram of the nitrogen cycle to complete the following. You will need a blue, green and red pen.

1. **a.** Circle the **nitrogen fixing** bacteria with the blue pen. Describe the role these bacteria play in the cycle.

   b. Circle the **nitrifying bacteria** with the green pen. Describe the role these bacteria play in the cycle.

   c. Circle the **denitrifying bacteria** with the red pen. Describe the role these bacteria play in the cycle.

2. All three types of bacteria respire aerobically, but the denitrifying bacteria can also respire anaerobically. **On your own paper**, discuss the effects on the nitrogen content of the soil *and* the growth of plants when soil becomes so wet that it has little or no oxygen in it.

BIOLOGY 1.4

Externally assessed
4 credits

Demonstrate understanding of biological ideas relating to the life cycle of flowering plants

SCIENCE 1.10

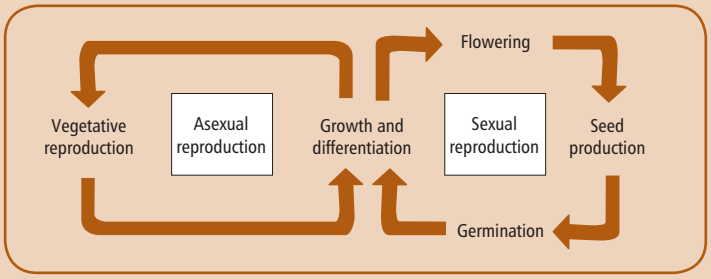
Internally assessed
4 credits

Investigate life processes and environmental factors that affect them

This chapter contains information about:

- The life processes related to the *life cycle* of *flowering plants* as outlined in AS 90928.
- The environmental factors that affect life processes of plants as outlined in AS 90949 (Science 1.10).

The life cycle of a plant refers to the processes that relate directly to the plant's growth, development and reproduction.



The life process of nutrition through photosynthesis is also studied in this chapter, because nutrition is:

- The life process on which all other life processes depend.
- One of the life processes that can be investigated for AS 90949.

Further material for Science 1.10, relating to the mammal as a consumer, is covered in AS 90929 (Biology 1.5).

Unit 1– Asexual reproduction of flowering plants

In asexual reproduction, only *one* parent plant is required. Offspring are *genetically identical* to the parent plant. Asexual or **vegetative** reproduction does *not* involve flowers; male and female gametes (ovules and pollen); fertilisation of the female gamete by the male gamete; production of seeds.

Many flowering plants that reproduce sexually through producing flowers *also* reproduce asexually.

Questions: Methods of asexual reproduction

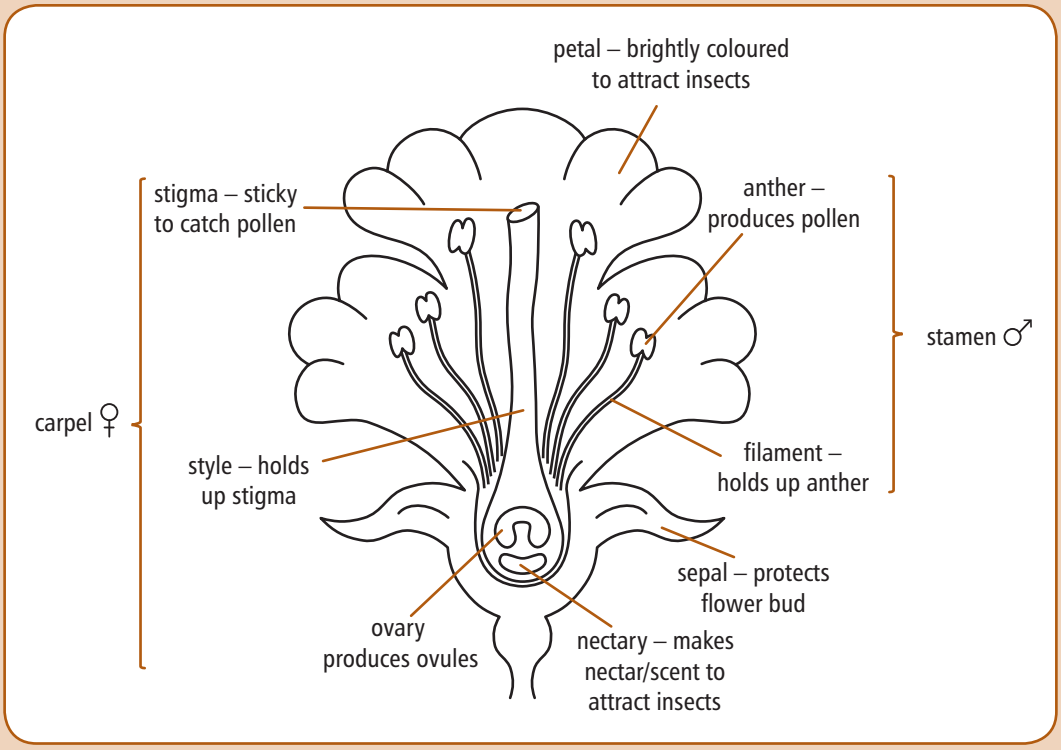
Use the two word lists to match the descriptions of asexual reproduction methods *and* the plant examples to the correct diagram in the table.

Flowers are the reproductive organs of flowering plants. Plants expend much energy producing flowers. Flowers have three main functions:

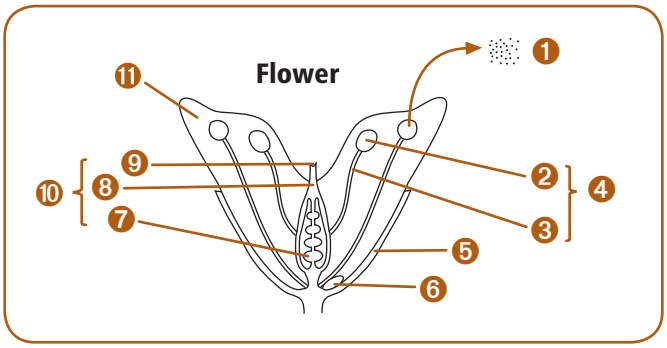
- They produce male and female gametes.
- Where **pollination** (transfer of pollen from the anther to the stigma) is done by insects or other animals, flowers attract **pollinators**.
- Flowers often help form fruits and disperse seeds.

All flowers contain the same structures, but these may look different depending on how the flower is pollinated.

The following diagram shows a typical insect-pollinated flower.



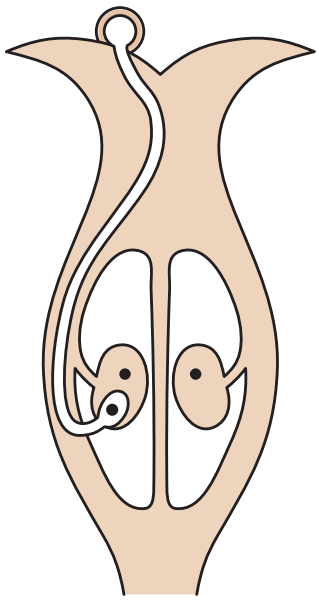
Questions: Flowers



1. a. Complete the table by naming the parts of the flower in the preceding diagram and describing the function of each part.

Questions: Fertilisation

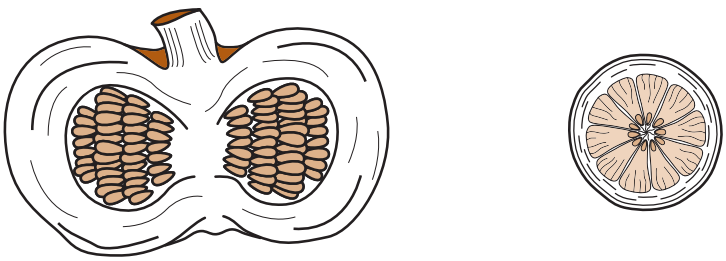
Using the underlined words in the preceding paragraph, label the following diagram, showing the process of fertilisation in flowering plants. You should be able to use all the words.



Unit 3 – Seeds and fruit

The fertilised egg is a **zygote**. The cells of the zygote divide many times to form an **embryo**, which will become the new plant. The ovule around the embryo becomes the **seed**. A tough protective coat, the **testa**, covers the seed. The ovary becomes the **fruit**. Petals and sepals usually die and fall off.

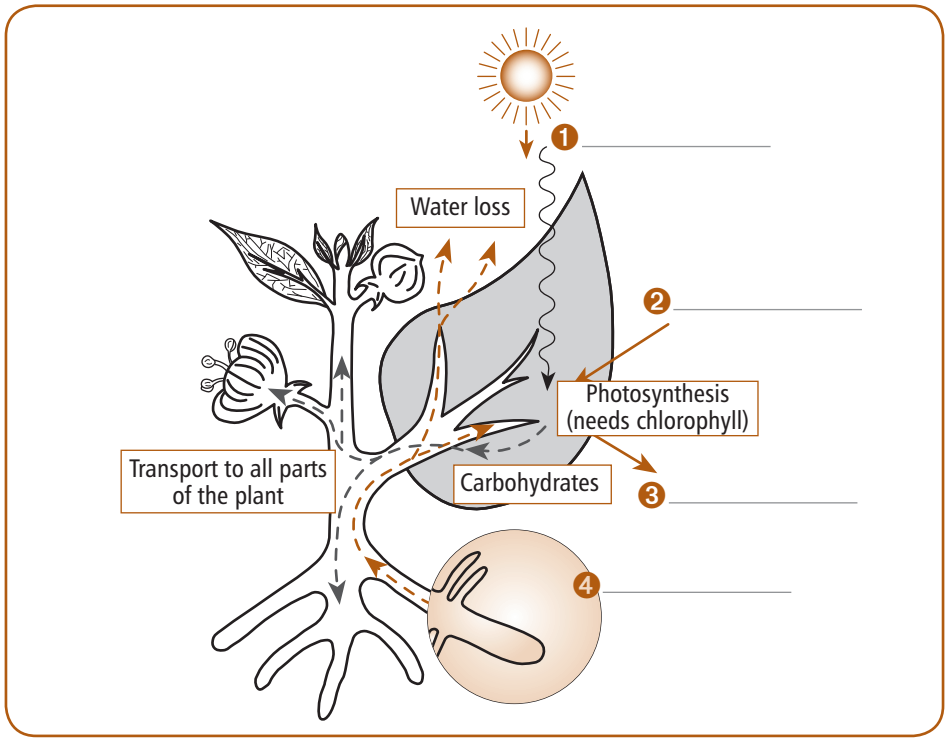
Questions: Seeds and fruit



1. Label 'seed', 'fruit', and 'testa' on the diagrams of both the pumpkin and the lemon.
2. Use your knowledge of the structure and development of fruit to explain why the pumpkin is biologically a *fruit*.

Questions: The process of photosynthesis

The diagram summarises photosynthesis. Complete the diagram by writing labels for 1 to 4.

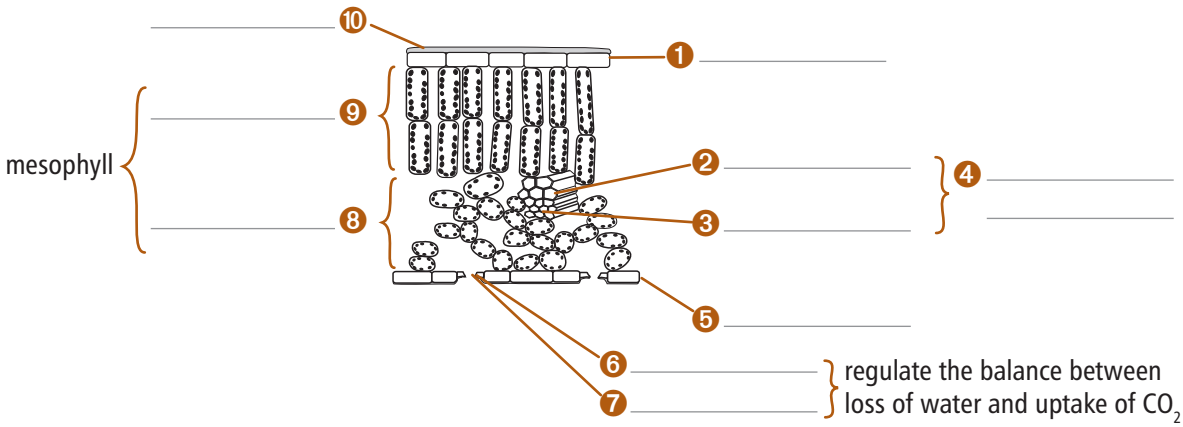


Leaf structure and function

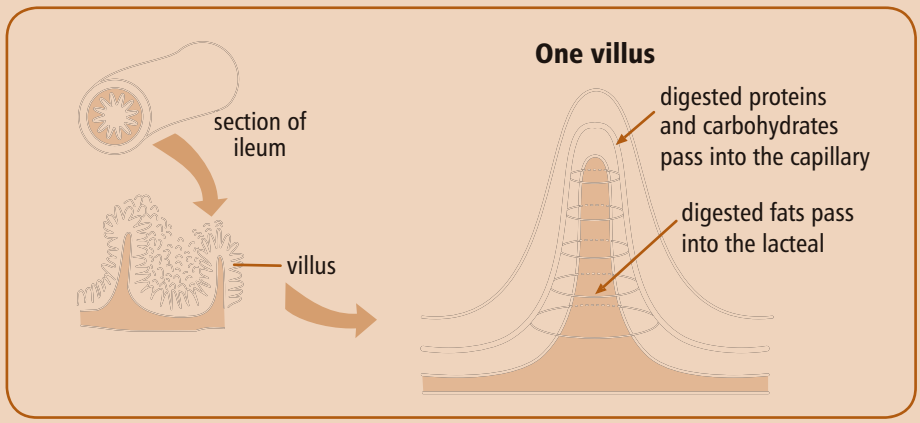
Leaves are well adapted in their structure and their arrangement on the plant to absorb the maximum amount of light for photosynthesis. More light means more photosynthesis (to an upper limit).

Questions: Leaf structure and function

1. Label the parts of the leaf and complete the following table. The information in the table will help you label the diagram.



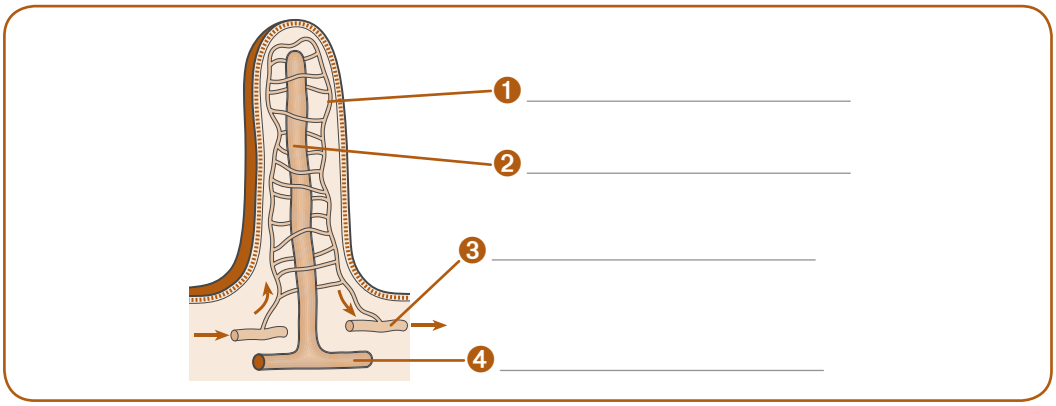
Leaf structure



- Digested *proteins* and *carbohydrates* are absorbed into the blood capillaries by a process called **active transport**, which requires energy. There are millions of capillaries, one for each villus. Each capillary has a very thin wall, ensuring that the many nutrients quickly reach the bloodstream. The capillaries join the **hepatic portal vein**, which takes nutrients to the liver for storage.
- Digested *fats* pass into the **lacteal**. Lacteals join into a **lymph vessel**, which eventually empties into the bloodstream.

Questions: Absorption

1. The following diagram represents a villus. Label the following parts: lacteal, blood capillary, hepatic portal vein, lymph vessel.

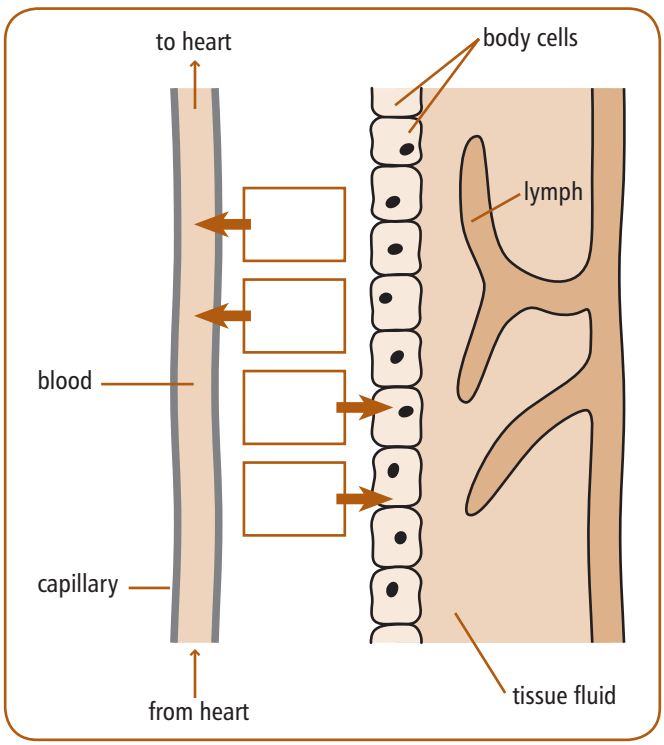


2. *Describe* the purpose of absorption.

3. Discuss how the villi and their structure increase the effectiveness of absorption in the small intestine. You may use a diagram in your answer.

Questions: Mammalian blood and blood vessels

1. **Using your own paper**, compare and contrast the three different types of blood vessel in mammals. Include information on:
   - Their structure – draw labelled diagrams of each type.
   - Their function.
   - How their structure is related to their function.
2. The following diagram shows part of a **capillary bed** – body cells surrounded by capillaries. The fluid surrounding the cells comes from the lymph vessel.



a. Complete the boxes on the diagram showing the correct direction of diffusion of the following substances:

O_2	**glucose**	**urea** (a waste product)	**CO_2**

b. Explain the importance of tissue fluid.

c. Explain how substances are able to leave the capillary or enter the body cells.

d. If this diagram represented cells of the small intestine, what label would the label 'to heart' need to be replaced with?

Answers Biology 1.3/Science 1.11 AS 90927 and AS 90950

Structure of micro-organisms (page 44)

1. a. ❶ Capsule
   ❷ Cell wall
   ❸ Flagellum
   ❹ Cell membrane
   ❺ Cytoplasm
   ❻ Nuclear material (DNA)

   b. ❶ Sporangium
   ❷ Spore
   ❸ Hyphae

   c. ❶ Protein coat
   ❷ Genetic material
   ❸ Head
   ❹ Tail

2. a. Hyphae.
   b. Genetic material / nuclear material (DNA).
   c. Flagellum.
   d. Cell wall / protein coat / capsule.
   e. Sporangium.
   f. Cell membrane.
   g. Spore.

Culturing bacteria and fungi (page 45)

1. a. Stage ❶ Inoculating loop sterilised before use.
   Stage ❷ Inoculating loop used to collect sample of micro-organisms.
   Stage ❸ Inoculating loop used to introduce microbes onto the agar.

   b. i. To sterilise the loop so you know that only those microbes present on the surface that the sample was obtained from will end up on the agar plate.
   ii. To reduce the chance of other microbes present in the surrounding air settling on the agar.
   iii. Microbes produce water as they respire/reproduce. They would die if left to sit in the water; inverting the plate means water drips onto the lid.
   iv. This is the optimum temperature for the microbes' life processes, including respiration that gives the energy required for reproduction.

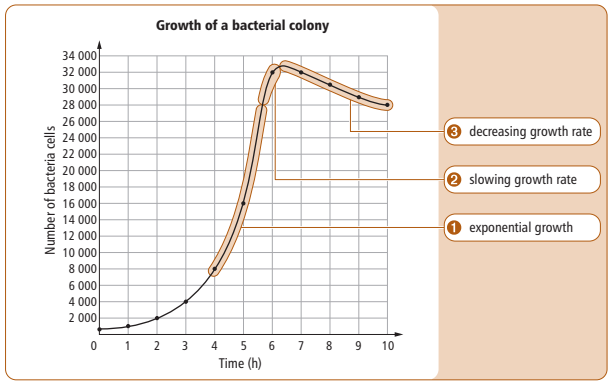
2. a. Bacterial colonies look slimy/greasy.
   b. Fungi look furry/fuzzy.

3. a. Bacteria and fungi.
   b. Viruses – these need living cells in which to reproduce, and there are no living cells in bread.

4. Nutrient media do not contain living cells, whilst a fertilised chicken egg contains living cells that are constantly dividing to produce an embryo. Viruses can reproduce only within living cells, because they need a cell's DNA or genetic material to make new viruses.

Bacterial reproduction (page 47)

1. and 2.



3. a. **Exponential growth phase**: Bacterial cells have unlimited food, space, oxygen, water; most survive, and therefore reproduction is at a very high rate. *Numbers increase exponentially*.
   b. **Slowing growth rate phase**: Some or all of the resources start to become limited and increasing numbers of bacteria do not survive to reproduce; reproductive rate slows down. *Numbers do not increase at as great a rate*.
   c. **Decreasing growth rate phase**: Some or all of the resources are limited and toxic waste products affect bacteria. Many bacteria do not survive to reproduce, so reproductive rate less than death rate. *Numbers decrease*.

4. The bacterial cells are destroyed by the high temperatures. This is important because some of the bacteria on the Petri dish may be pathogens. Also, some of the bacteria may have produced endospores as a result of the changing conditions on the Petri dish (running out of food, space or build up of toxins). Endospores are destroyed only by very high temperatures.

Fungal reproduction (page 48)

1. Sporangium – Produces spores.
2. Spores – Germinate and grow into a new fungus.
3. Hyphae – Feed/spread through substrate / develop sporangia on tips.
4. Substrate – Food source.

Viral reproduction (page 49)

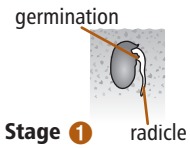
1. ❸, ❺, ❶, ❹, ❷.
2. Stage ❶: Viral genetic material instructs host cell to make new viral protein coats.
   Stage ❷: Dead host cell bursts to release new viruses.
   Stage ❺: Viral genetic material instructs host cell to make new viral genetic material.

Advantages and disadvantages of asexual reproduction (page 87)

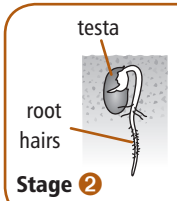
1. **a.** Asexual reproduction is less complex than sexual, because it does not produce flowers and gametes.
   b. Asexual reproduction does not involve the production of gametes. New plants grow directly from parts of the parent.
   c. Sexual reproduction results in genetically different offspring because gametes come from genetically different parents.
   d. The offspring of asexual reproduction remain close to the parent plant, because dispersal does not occur.
   e. Should conditions change, the offspring of sexual reproduction may not all die, because some may have adaptations that help them survive.
2. The two reasons are in *italics.*
   a. In a stable environment, a species will be well suited to the current conditions. Therefore, it is *not necessary to waste energy* reproducing sexually, *as significant genetic variation will not provide much advantage* to the species (provided conditions do not change).
   b. Colonising a new area is risky. Therefore, asexual reproduction is of benefit as *more energy can be put into successful growth* rather than producing gametes. Also, as there will probably only be *one or a few colonising* plants, there is a *very small chance that pollination and fertilisation* will occur.

Stages of germination (page 88)

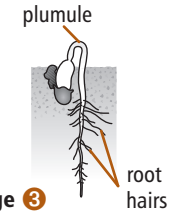
1. and 2.



Germination occurs as seed absorbs water, testa softens and splits, and radicle emerges.

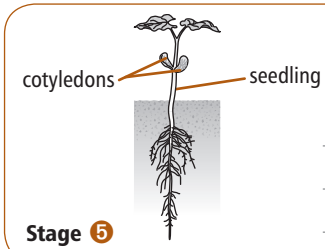


Root hairs grow on radicle. They absorb water and minerals from the soil.



Plumule emerges from testa and starts to grow above the soil.

First true leaves start to emerge from the cotyledons.



First true leaves now able to photosynthesise. Cotyledons no longer needed. This stage is a seedling.

Requirements for germination (page 89)

1. **a.** Oxygen, warmth, water.
   b. Seed raising mix, light.
2. **a.** The dry mass decreased for the first 9 days and then increased.
   b. **i.** Embryos were using up stored food supplies in the seeds for the processes of germination and seedling growth until the first true leaves developed.
   ii. Seedlings had their first true leaves and could photosynthesise, resulting in further growth.

Primary plant growth (page 91)

1. **a.** 1 flower 2 leaf 3 stem 4 root
   b. Circle(s) should be at growing tips – ie at the very tips of stems, branches and roots.

INDEX