Pearson Edexcel

Additional Assessment Materials Summer 2021

Pearson Edexcel GCSE in Biology (1BI0) Higher

Resource Set Topic 6: Plant structures

Questions

(Public release version)

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Additional Assessment Materials, Summer 2021

General guidance to Additional Assessment Materials for use in 2021

Context

- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an **optional** part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

Purpose

- The purpose of this resource to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

3 A student compared the number of stomata on the upper and lower surfaces of a leaf.

She completed a leaf peel as shown in Figure 5.

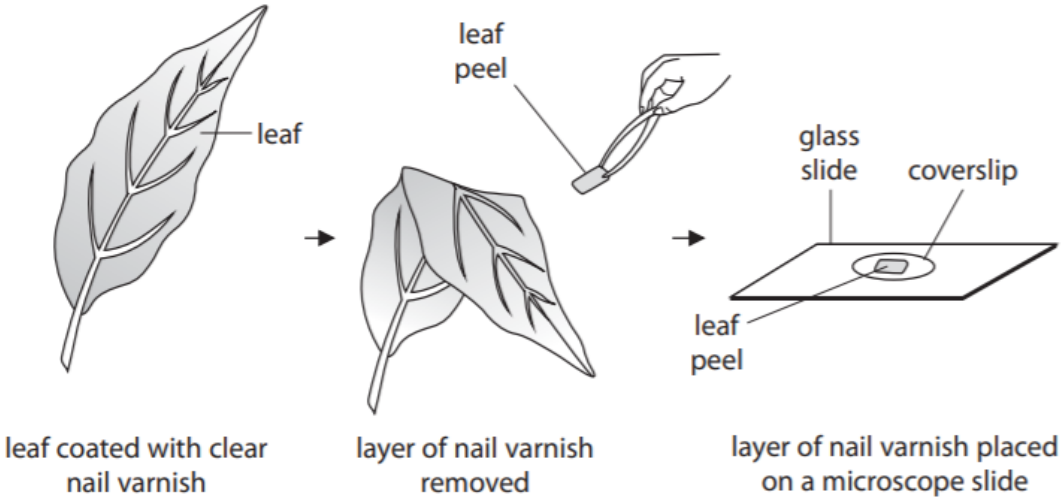


Figure 5

The layer of nail varnish shows an impression of the cells on the surface of the leaf.

(a) (i) State why a coverslip is placed on top of the leaf peel.

(1)

to protect the specimen

(ii) Explain why the leaf peel rather than the whole leaf was viewed with a microscope.

(2)

the leaf peel is thinner and will allow light to pass through, so the cells can be seen. (stomata can be identified easier)

(b) The student drew a biological diagram of the leaf peel taken from the underside of the leaf.

Figure 6 shows this diagram.

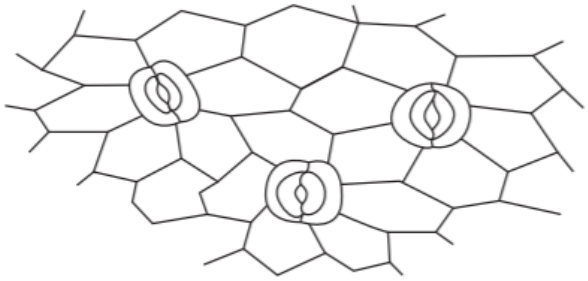


Figure 6

(i) State the number of stomata visible on Figure 6.

(1)

3

(ii) The student observed that the stomata were open.

Describe how stomata open.

(3)

water move into guard cells through osmosis so the guard cells become turgid and change shape.(swell)

(iii) The leaf peel from the upper surface of this leaf showed no stomata.

Explain why it is an advantage to the plant to have this distribution of stomata in the upper and lower surfaces of the leaf.

(2)

There is no stomata in the upper surface so that water loss can be reduced. Stomata on the lower surface allows gas exchange as CO_2 is needed for photo synthesis and oxygen is released.

7 (b) Figure 15 shows the results of this investigation.

seedling in test tube	length at the start in mm	length after 7 days in mm
1	4	11
2	6	17
3	5	26

Figure 15

(i) Explain why there are differences in the change in the lengths of the seedlings.

(2)

The increase in length is the largest in the test tube with the highest concentration of nitrate ions. Nitrate ions are needed for the growth of plants as they are used to make amino acids, which are used in protein synthesis.

(ii) Explain how nitrate ions were absorbed by the seedling in test tube 3.

(3)

Nitrate ions move across the partially permeable membrane into root hair cells by diffusion, travelling down the concentration gradient.

8 (a) Figure 16 shows the effect of light intensity and temperature on the rate of photosynthesis.

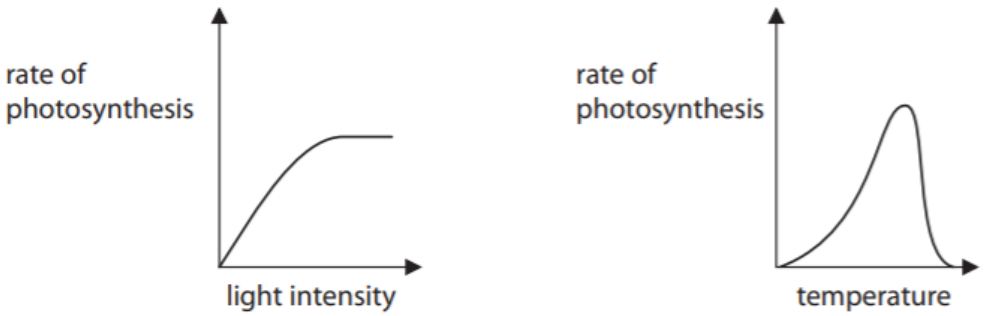


Figure 16

(i) Describe the effect of light intensity on the rate of photosynthesis.

(2)

Initially, rate of photosynthesis increases with light intensity, but it plateaus off when light intensity becomes a limiting factor.

(ii) Explain the effect of temperature on the rate of photosynthesis.

(2)

Initially, the rate of photosynthesis increases with temperature, until the optimal temperature for the enzymes involved is reached. As temperature continues to increase, enzymes become denatured so rate of photosynthesis falls.

(b) A student measured the rate of photosynthesis using algal balls in a laboratory. The tube of algal balls was kept at a temperature of 25 °C and was moved to different distances from a light source.

The results of this investigation showed that the rate of photosynthesis is

(1)

- ☐ **A** directly proportional to the distance from a light source
- ☐ **B** inversely proportional to light intensity
- ☐ **C** directly proportional to temperature
- ☒ **D** inversely proportional to the distance from a light source

*(c) Explain how substances are moved through a plant by transpiration and translocation.

(6)

As water evaporate from the leaf, water is pulled upwards from the roots to the leaf through capillary action. Water moves through the xylem vessel, which is made up of dead cells and walls are lignified to withstand the pressure. The water flows in one direction only.

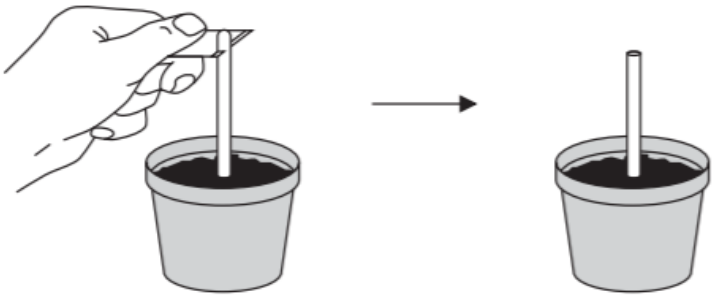
In translocation, sucrose moves from the source to the sink through the phloem sieve tube. The movement of sucrose is bidirectional.

10 (a) Figure 18 shows an investigation into the growth of plant shoots.

Experiment 1:

The tip of a shoot was removed from the plant.

There was no growth in the shoot after 3 days.



Experiment 2:

The tip of a shoot was cut off and then placed back onto the shoot.

The shoot had grown 6 mm after 3 days.

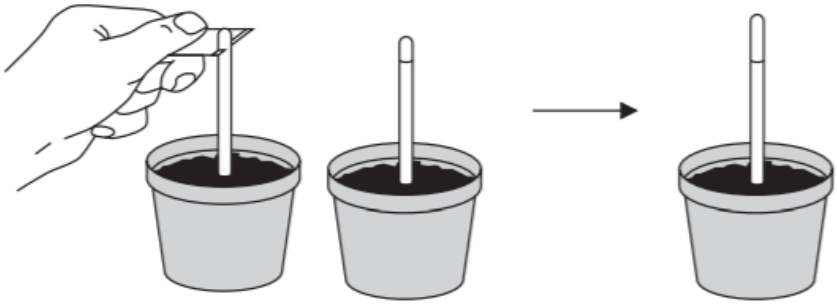


Figure 18

(i) Give **one** variable that must have been controlled for the plant shoot to grow vertically, as shown in experiment 2.

(1)

the direction of light

(ii) State **one** conclusion that could be made based on these two experiments.

(1)

The tip is responsible for the growth of the shoot.

(iii) Which plant hormone causes growth in the plant shoot?

(1)

- [x] **A** auxin
- [ ] **B** ethene
- [ ] **C** gibberellin
- [ ] **D** chlorophyll

(iv) Explain **one** way that this investigation could be improved.

(2)

Use a shoot without cutting off the tip as a control to compare the results.

*(b) Marram grass is a plant that grows on exposed areas of sand dunes.

Figure 19 shows marram grass growing and a cross section through a leaf of marram grass.

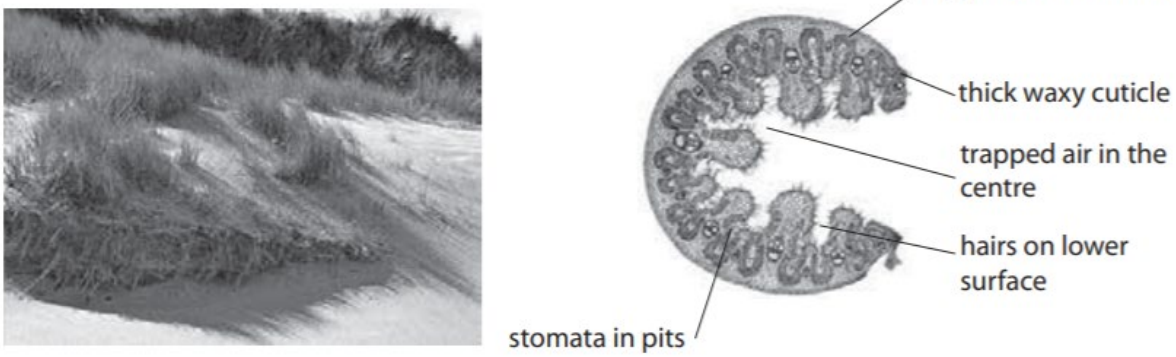


Figure 19

Explain how marram grass is adapted to survive in the hot, windy and dry conditions of a sand dune.

(6)

Marram grass has thin leaves with small surface area to reduce water loss to the environment. The plant is flexible so it does not break in the wind. The leaf is curved to trap a layer of moist air and stomata in pits have moist air arround them, so water loss is reduced. The thick waxy cuticle helps to prevent water loss via evaporation. The hairs on lower surface reduce the air flow so there is less water loss.

The good root structure prevents the marram grass from being uprooted in the windy conditions.

1 (a) Figure 1 shows a cross section of a leaf.

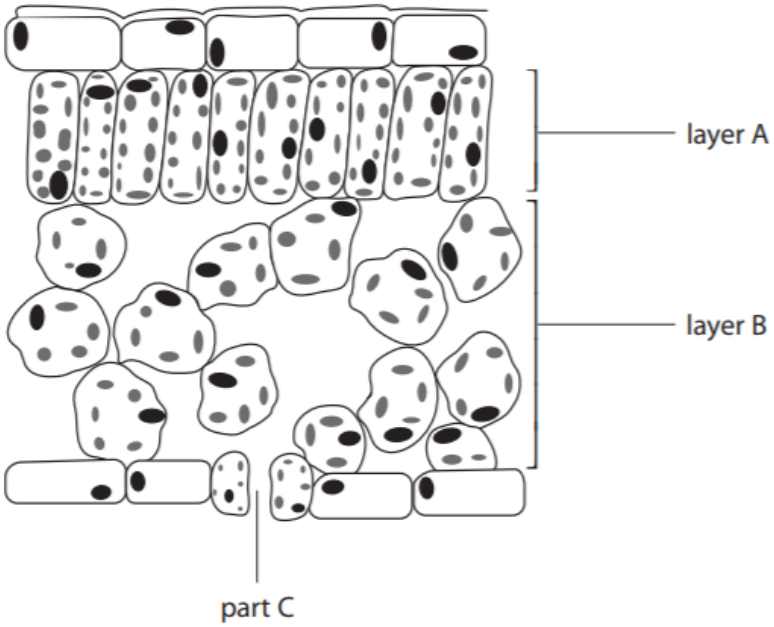


Figure 1

(i) What is the name of layer A?

(1)

- ☐ **A** spongy mesophyll
- ☒ **B** palisade mesophyll
- ☐ **C** upper epidermis
- ☐ **D** waxy cuticle

(ii) Explain the function of the spaces between the cells in layer B.

(2)

The spaces in layer B gas to diffuse to the cells as CO_2 is needed for photosynthesis and oxygen is diffused out.

Spongy mesophyll layer is packed loosely with cells for efficient gas exchange - allow gases to move in and out of the cells.

(iii) Explain the function of part C in Figure 1.

(2)

Part C allows gas exchange as CO_2 is taken in for photosynthesis and oxygen is released.

(b) Xerophytes are plants adapted to live in very dry conditions.

State **two** differences between the leaf structure of a xerophyte and the leaf structure shown in Figure 1.

(2)

1 xerophytes will have a thicker waxy cuticle

2 the stomata in xerophytes are found in pits

5 (a) (i) Water enters a plant through root hair cells.

Root hair cells have

(1)

- ☐ **A** a small surface area and thin cell walls
- ☐ **B** a small surface area and thick cell walls
- ☒ **C** a large surface area and thin cell walls
- ☐ **D** a large surface area and thick cell walls

(ii) Explain how water in the root is transported to the leaves of the plant.

(2)

Transpiration at the leaves draw water up by capillary action. As water molecules are cohesive they will form a continuous column. water molecules travel via the xylem vessel.

(b) How is sucrose transported from the leaves to other parts of the plant?

(1)

- ☒ **A** by osmosis through the phloem
- ☒ **B** by osmosis through the xylem
- ☒ **C** by translocation through the phloem
- ☒ **D** by translocation through the xylem

(c) Figure 7 shows the average size of stomata in a leaf during one day.

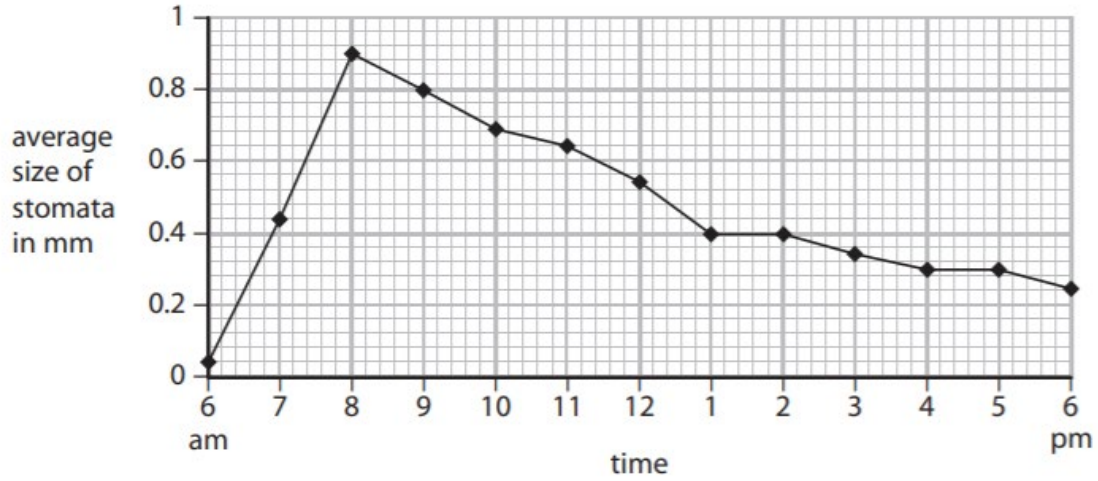


Figure 7

(i) Name the cells that change the size of stomata.

(1)

guard cells

(ii) Describe the trend shown in Figure 7.

(2)

From 6am to 8am, the size of stomata increases significantly and peaks at 8am. From 8am to 6pm, the average size of stomata gradually decrease.

(iii) The temperature increased from 8 am to 1 pm.

Explain why this affected the size of the stomata.

(2)

The size of stomata decreased to reduce water loss due to evaporation.

Because as the temperature increases the rate of evaporation increases.

2 Figure 2 shows the leaves and flowers of water lily plants (*Nymphaea odorata*) on a lake.

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Figure 2

(a) Water lilies have stomata on the upper surface of the leaves.

Explain why water lilies have no stomata on the lower surface of the leaves.

(2)

The lower surface of the leaves are on the water, so gases cannot diffuse through the stomata if they are on the lower surface.

(water would go through stomata and fill up inside the leaves prevent gas diffusion)

(ii) Glucose is made by photosynthesis.

Glucose is converted to another sugar to be transported in the plant.

What is the name of this sugar?

(1)

- ☐ **A** glycerol
- ☐ **B** ribose
- ☒ **C** sucrose
- ☐ **D** starch

(iii) Describe how this sugar is transported from the leaves to the flowers of the water lily.

(2)

Sucrose is transported by translocation through the phloem sieve tube.

7 (a) A gardener decided to kill the dandelion plants growing in his lawn.

The gardener set up a trial to see which concentration of weed killer would kill the most dandelions and be most economical.

He counted the number of dandelion plants in six 1 m^2 areas of the lawn.

He made six different concentrations of weed killer solution.

He applied the solutions to each of the six different areas.

After two weeks, he counted the number of dandelion plants in each area.

The results are shown in Figure 12.

concentration of weed killer solution (%)	number of dandelion plants in 1 m^2	
	before applying weed killer	two weeks after applying weed killer
0	9	9
20	9	9
40	7	5
60	8	2
80	8	0

Figure 12

(i) Give **one** variable the gardener should control when completing this trial.

(1)

amount of fertilisers given

(ii) State and explain the conclusions the gardener can make based on his trial.

(3)

At 20% concentration of weed killer solution it is ineffective after 2 weeks as no daffodils are killed. As the concentration of weed killer solution increases, more daffodils are killed after 2 weeks.

(b) Some weed killers contain plant hormones.

Explain how plant hormones work as weed killers.

(3)

The plant hormones cause weed to grow too quickly and die. As weed have broader leaves, more plant hormones from the weedkillers are absorbed, so the weed killer is selective for the weed.

(c) Explain how phototropism is controlled in plant shoots.

(3)

Auxin is a plant hormone which promotes growth, and is found to be concentrated on the side which is shaded away from the light source in plant shoots. The shaded side will grow more and become elongated, so the plant shoot will bend towards the light.

Auxin is produced from the tip of the stem.

TOTAL = 67 MARKS