Pearson Edexcel

Additional Assessment Materials Summer 2021

Pearson Edexcel GCSE in Biology (1BI0) Foundation

Resource Set Topic 6: Plant Structures and their Functions

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- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.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.

4.

(b) Figure 8 shows part of a root as seen using a light microscope.

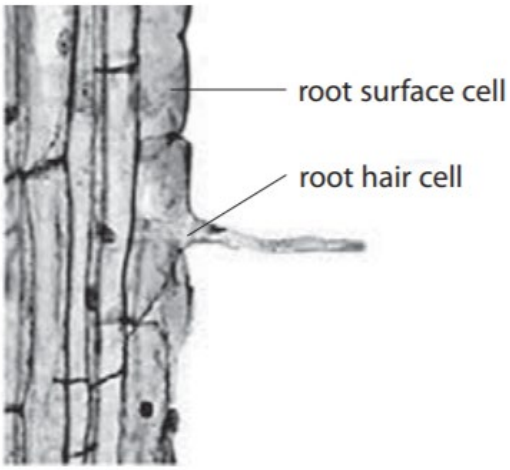

Figure 8

Figure 9 shows information about the two types of cell labelled in Figure 8.

type of cell	surface area in μm²	volume in μm³	surface area to volume ratio
root surface cell	5000	250000	1:50
root hair cell	36000	288000	?

Figure 9

(i) Calculate the surface area to volume ratio of the root hair cell.

(2)

36000 : 288000

1 : 8

1:8

(ii) Explain the benefit to the plant of having root hair cells.

(2)

- increase surface area
- able to absorb more minerals & nutrients
- for their growth

6 (a) Figure 12 shows a cross section through a leaf.

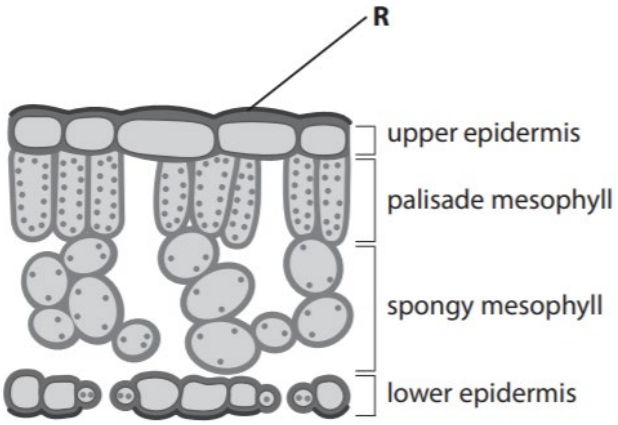

Figure 12

(i) What is the name of the part labelled **R** in Figure 12?

(1)

- ☐ **A** cell wall
- ☐ **B** cytoplasm
- ☐ **C** stomata
- ☒ **D** waxy cuticle

(ii) Figure 13 shows the mass of glucose produced in each layer of a leaf per hour.

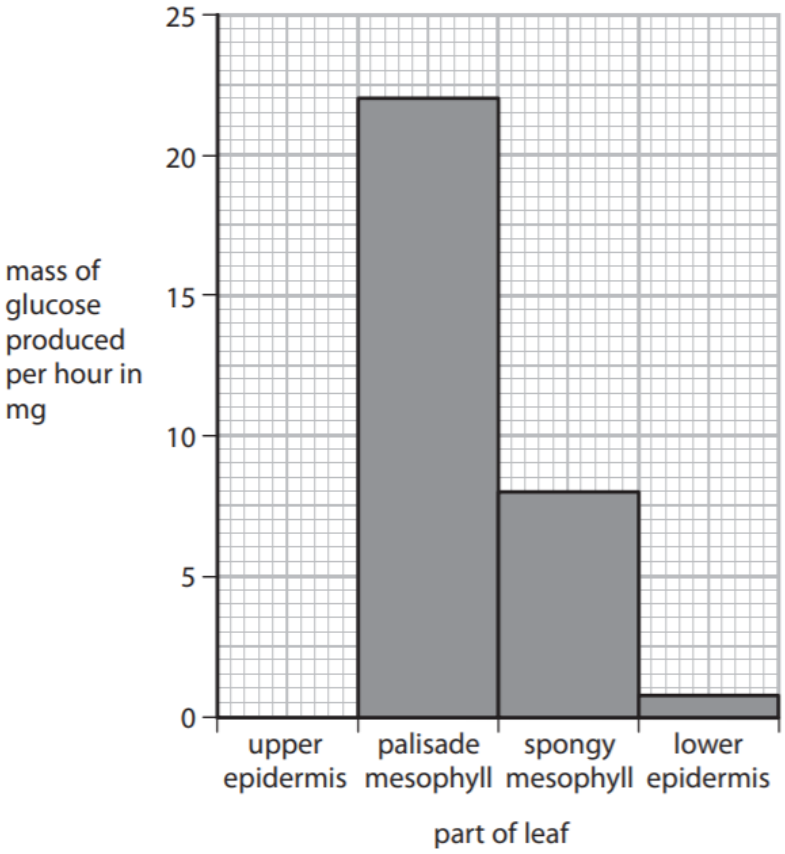

Figure 13

Describe the difference in the mass of glucose produced per hour in the palisade mesophyll and the mass of glucose produced in the spongy mesophyll shown in Figure 13.

(2)

more than a double of mass of glucose produced by spongy mesophyll is produced by palisade mesophyll (22mg - 8mg = 14mg)

(b) Figure 14 shows how light intensity changed during one day.

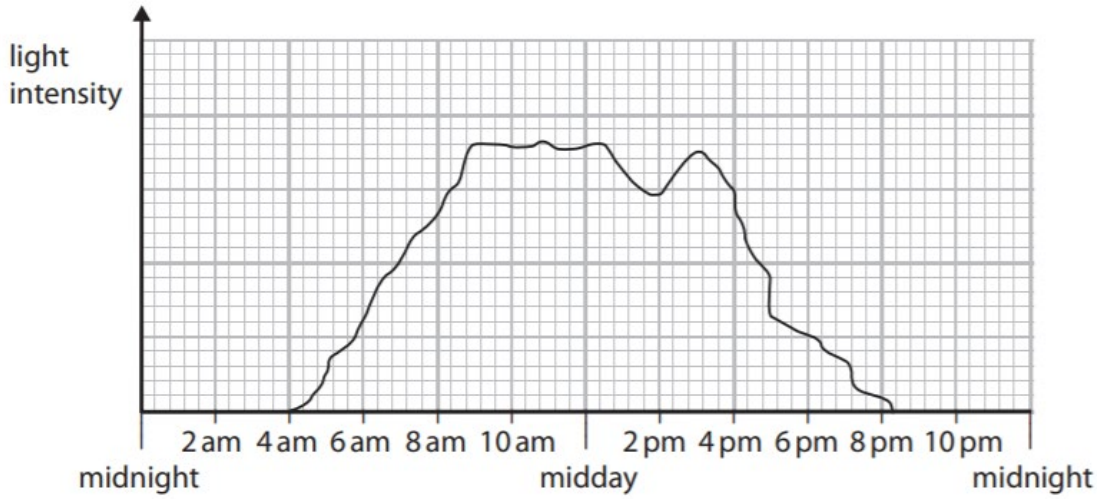

Figure 14

Use information in Figure 14 to explain why oxygen moved out of the leaf between 9 am and midday.

(2)

- light intensity remains at constant peak level (maximum)
- maximum rate of photosynthesis occurs so lots of oxygen made so move out of leaf by diffusion

(c) (i) Glucose is produced in a leaf.

Glucose is a

(1)

- ☐ **A** vitamin
- ☐ **B** protein
- ☐ **C** lipid
- ☒ **D** carbohydrate

(ii) Describe a test for glucose.

(2)

- add Benedict's solution
- warm solution
- colour change of blue to brick red precipitate

(d) Figure 15 shows an enzyme and three substrates found in plant cells.

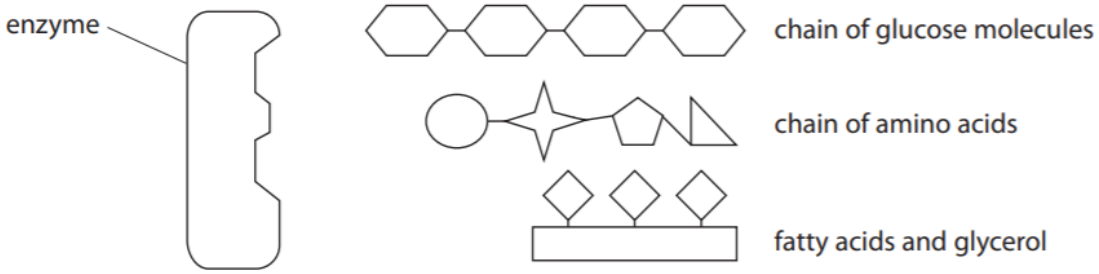

Figure 15

The enzyme will only break down one of these substrates.

State the name of this enzyme.

(1)

amylase

9 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 22.

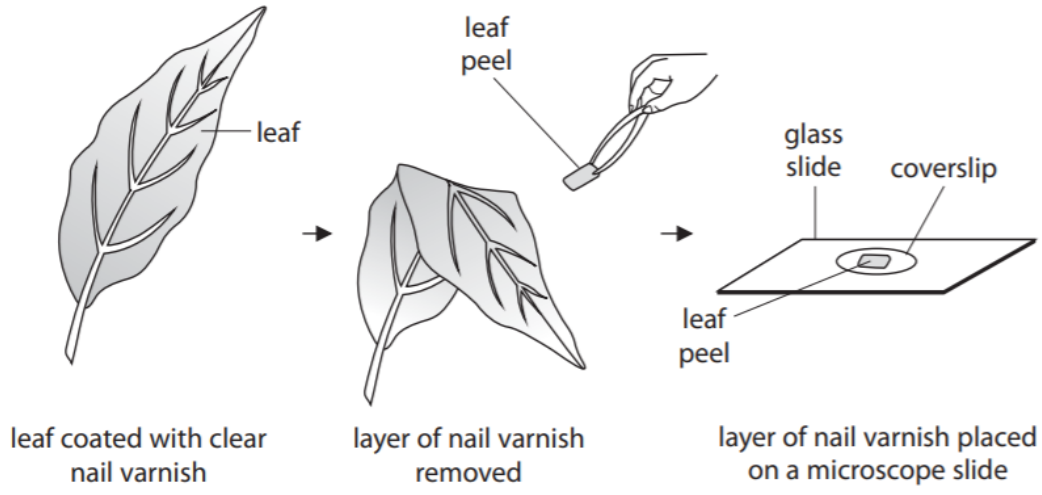

Figure 22

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)

(protect) to not damage lens when too close

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

(2)

- need to be one cell thick & transparent
- so light can penetrate through so cells can be observed

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

Figure 23 shows this diagram.

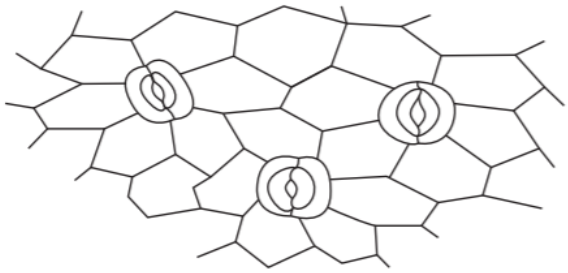

Figure 23

(i) State the number of stomata visible on Figure 23.

(1)

3

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

Describe how stomata open.

(3)

- active transport of K^+ ions into cells from surrounding makes water potential more negative so water passes by osmosis
- water molecules enter guard cells to be absorbed then expand, becoming turgid
- rigid inner wall resists expansion so becomes more curved, opening stomata

*(c) Figure 24 shows xylem and phloem.
Xylem and phloem are involved in the transport of substances through a plant.

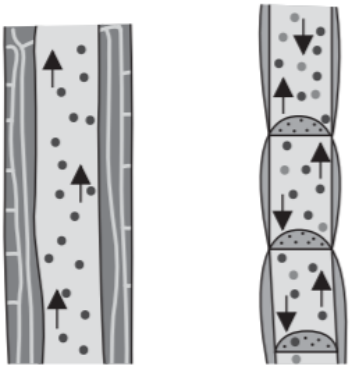

Figure 24

Use Figure 24 to help you describe how water and sucrose move through a plant.

(6)

XYLEM
- made of dead cells with lignin
- forming narrow hollow tubes
- carries water & mineral ions from roots up to leaves
- driven by transpiration where water evaporates from leaves
- cell to cell and out of xylem by osmosis

PHLOEM
- made from living cells & have sieve tubes
- carries sugars in water from leaves down to roots and up to buds / flowers
- movement by translocation
- cell to cell and into out of phloem by active transport

3 (a) Photosynthesis occurs in leaves.

(i) Which substance is needed for photosynthesis?

(1)

- [x] **A** carbon dioxide
- [ ] **B** glucose
- [ ] **C** oxygen
- [ ] **D** nitrogen

(ii) A leaf cell is 0.08 mm long.

Calculate the length of the image of this cell after it has been magnified 50 times using a microscope.

(2)

$M = \frac{I}{A}$

$50 = \frac{I}{0.08\,mm}$ $I = 4mm$ 4 ..... mm

Pine trees can live in dry soil.

(b) Use words from the box to complete the sentences.

(2)

thickness	water	light
area	chlorophyll	volume

The pine leaf has stomata in pits to reduce the loss of ..... water ..... .

The pine leaf is needle-shaped to reduce the surface ..... area ..... .

(c) Figure 5 shows young tomato plants growing in a glasshouse.

(Source: © adastra/Shutterstock)

Figure 5

The young tomato plants are growing towards the light.

Explain how a plant hormone causes these shoots to grow towards the light.

(2)

- auxin is produced by shoot tip and diffuse down the stem
- auxin laterally moves towards shadowed side
- auxin causes cell elongation
- higher auxin concentration on shadowed side so more cell elongation on that side so plant is able to bend towards light

3 (a) Figure 6 shows a root hair cell from a strawberry plant.

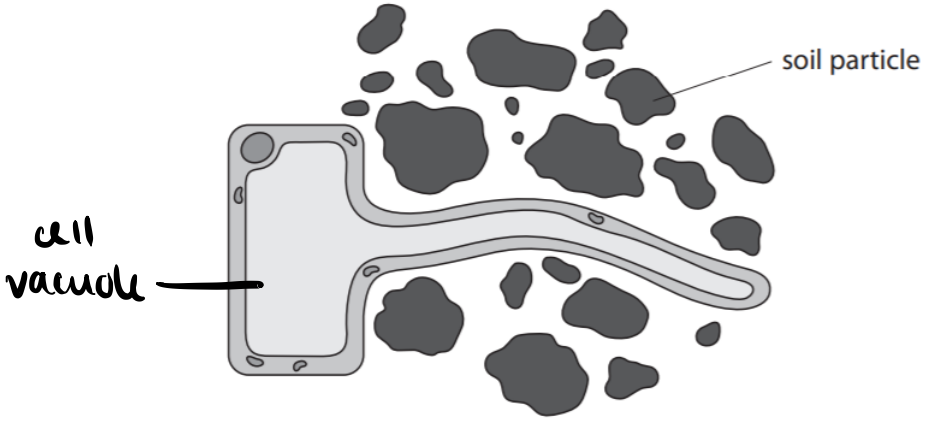

Figure 6

(i) Label the cell vacuole in Figure 6.

(1)

(ii) Explain how the structure of root hair cells increases water absorption from the soil.

(2)

- root hair cell has long extended/elongated part, increasing its surface area
- more cell membrane exposed to absorb water by osmosis

8 Figure 18 shows the leaves and flowers of water lily plants (*Nymphaea odorata*) on a lake.

Figure 18

(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)

- lower surface of leaves are always in contact with water
- gas cannot diffuse through via lower surface

(b) (i) The white petals of the water lily flowers cannot photosynthesise.

Which structure in leaf cells is the site of photosynthesis?

(1)

☒ **A** nucleus

☒ **B** vacuole

☒ **C** mitochondrion

☒ **D** chloroplast

(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

9 A slide of potato cells was viewed using a light microscope.

Figure 20 is a drawing of the slide showing starch grains in the potato cells.

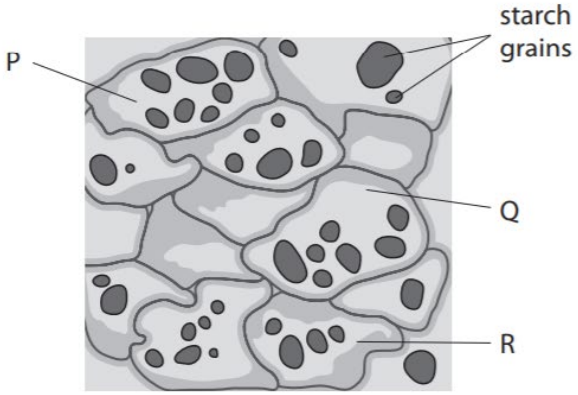

Figure 20

(a) (i) Calculate the mean number of starch grains in potato cells P, Q and R.

(1)

P: 7 Q: 7 R: 4

$\frac{7+7+4}{3} = \frac{18}{3} = 6$

6 starch grains

(ii) Which structures are found in plant cells but are **not** found in animal cells?

(1)

☒ **A** cell membrane, nucleus, chloroplast

☒ **B** cell wall, cell membrane, cytoplasm

☒ **C** nucleus, large vacuole, chloroplast

☒ **D** cell wall, chloroplast, large vacuole

(b) A scientist investigated how the length of starch grains in potatoes changed when the potatoes were stored in the dark.

Figure 21 shows a potato after being stored in the dark.

Figure 21

Three potatoes were used in the investigation.

The length of starch grains in potato 1 were measured at the start.

The length of starch grains were measured in potato 2 after 5 weeks in the dark.

The length of starch grains were measured in potato 3 after 10 weeks in the dark.

Figure 22 shows the results.

potato	time after placing in the dark in weeks	mean length of starch grains in μm
1	0	64
2	5	50
3	10	30

Figure 22

(i) Calculate the percentage difference in the mean length of starch grains in potato 2 at 5 weeks and in potato 3 at 10 weeks.

(2)

$$\frac{50-30}{\frac{50+30}{2}} \times 100 = 50\%$$

50 %

(ii) State **two** variables the scientist should have controlled to improve this investigation.

(2)

1 type of potatoes

2 mass / size of potatoes

(iii) The starch grains in the potatoes became smaller as the starch was converted into glucose.

State why the potatoes need glucose.

(1)

needed for aerobic respiration to release energy, for growth

*(c) Figure 23 shows a diagram of some equipment that can be used to investigate the rate of photosynthesis.

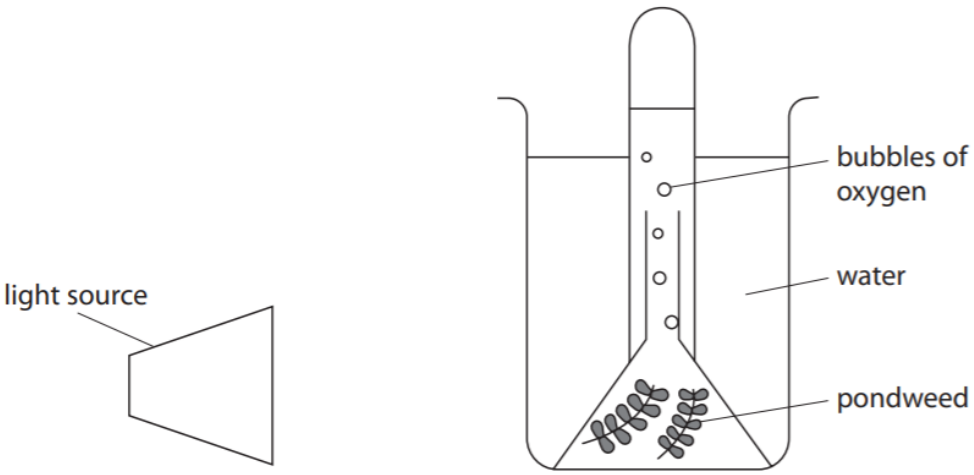

Figure 23

Devise a plan to investigate the effect of light intensity on the rate of photosynthesis.

Include variables you would need to control.

(6)

- controlled variables: type/age of plant and number of leaves, amount/volume of water, distance of light source to beaker due to temperature effect
- set up equipment as shown above (invert a test tube filled completely with water and put over filter funnel inverted with water plant inside)
- turn on light source and measure number of bubbles produced during 5 minutes
- repeat using higher intensities to compare rate

TOTAL = 55 MARKS