



Additional Assessment Materials
Summer 2021

Pearson Edexcel GCE in AS Biology

Practical Skills and Maths – Paper 2

(Public release version)

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- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.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

1

Antibiotics are widely used to treat infections.

Some antibiotics are bactericidal.

- (c) Describe how you would use aseptic techniques to transfer bacterial cells growing on an agar plate to a tube containing a sterile broth.

(5)

Sterilise the inoculating loop, by heating it in the Bunsen burner flame. This kills any unwanted bacteria that are present on the loop, that could be harmful. Replace the lid of the petri dish as soon as possible and secure with tape. The lid stops additional unwanted bacteria in the air contaminating the plate. Do not fully seal the lid, as this will stop oxygen reaching the bacterium, and this may encourage harmful anaerobic bacteria to grow.

Clean the desk with disinfectant, this kills all unwanted bacteria and so decreases the chance of the agar plate becoming contaminated. Work near a Bunsen flame.

2

Insects such as locusts do not breathe through the mouth.

The gas exchange system of a locust includes air sacs, tracheae and tracheoles.

(b) A student investigated the effect of different gases on the breathing rate of a locust.

The student blew exhaled air over a locust in a syringe and recorded its breathing rate.

The locust was immediately given pure oxygen and the breathing rate was recorded.

The table shows the results of this investigation.

Treatment	Breathing rate / breaths min ⁻¹
Exhaled air	56
Pure oxygen	3

The student concluded that carbon dioxide increased the breathing rate of the locust.

Comment on how the limitations of this method affect the validity of this conclusion.

(5)

The experiment should be repeated to see if results are consistent. Only one carbon dioxide concentration was tested. The locust needs time to recover because it may still be affected by exhaled air which could affect its breathing rate. You need a control experiment with atmospheric air to compare results. Exhaled air contains oxygen and moisture, which could affect breathing rate.

3

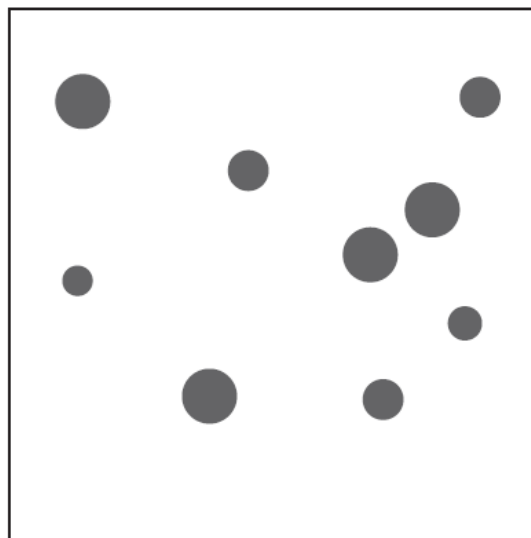
The drawing shows a plant called white clover, *Trifolium repens*.



A student used a 50 cm × 50 cm quadrat to compare the abundance of white clover in a trampled area of grassland and an untrampled area of grassland.

Each area measured 90 m × 45 m.

The diagram shows the distribution of white clover plants in one quadrat from the area of trampled grassland. Each circle represents one clover plant.



- (a) (i) Use the results from this quadrat to calculate the total number of white clover plants present in the area of trampled grassland.

(2)

$$\begin{aligned}50 \times 50 &= 2500 \text{ cm}^2 \\90 \times 45 &= 4050 \text{ m}^2 \\4050 \times 4 &= 16200 \\16200 \times 9 &= 145800\end{aligned}$$

Answer 145800

- (ii) The student used the same method to calculate the total number of white clover plants in the area of untrampled grassland.

The student decided that the calculated values were not accurate.

Explain how you would modify the method to obtain more accurate results.

(3)

Use several quadrats so a larger area is sampled. Place these quadrats at random. Then achieve a consistent measure of the mean.

- (b) The student investigated the effect of one abiotic factor on the abundance of white clover plants.

- (i) Name one abiotic factor, other than soil water content, that could affect the abundance of white clover plants in these areas.

(1)

Temperature

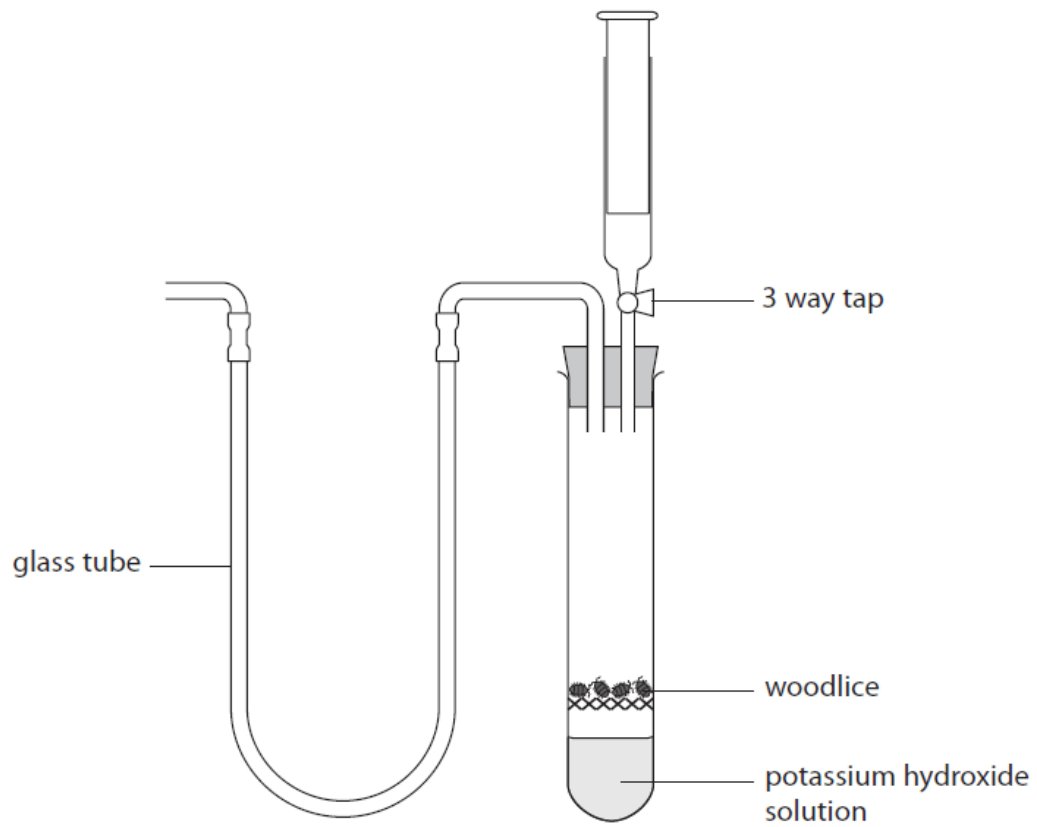
- (ii) Describe how you would measure the abiotic factor named in (b)(i).

(2)

Thermometer - measure in the same place at certain time intervals.

4

The diagram shows some apparatus that can be used to measure the rate of respiration in small animals such as woodlice.



Discuss how you would modify this apparatus and use it to find out if fluoride ions have a significant effect on the rate of anaerobic respiration in yeast.

(9)

- Woodlice are removed as they can affect volume of O_2 and CO_2 and it is not being investigated.
- Remove the potassium hydroxide since the volume of CO_2 produced from anaerobic respiration will be the measure of rate of respiration.
- Add solution to absorb oxygen from test tube.
- Use a straight glass tube instead of a bended U-shape and place ruler next to it to measure the distance moved by coloured liquid. Ensure every tube is airsealed.
- Add yeast and fluoride ions and leave for a known period of time.
- After time, measure how far the coloured liquid has moved (distance moved).
- Find volume of CO_2 and do volume divided by time to find the rate.
- Repeat each experiment 5 times and calculate mean rate of anaerobic respiration.
- Ensure temperature kept constant - water bath.
- Ensure pH kept same - use buffer solution.
- Use t test.

5*

(a) A student investigated the effect of ethanol on plant cell membranes.

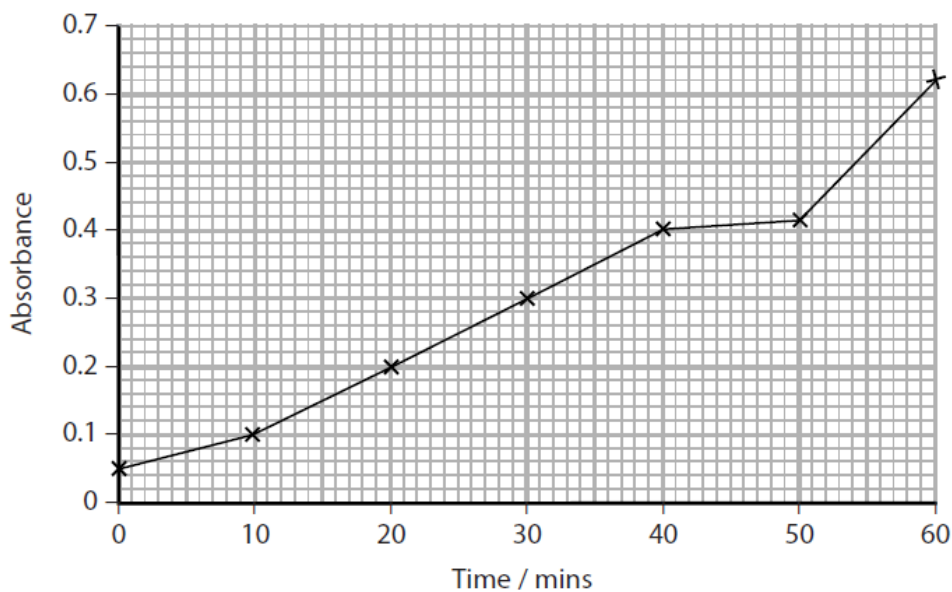
Step 1: The student cut leaf discs from leaves, using a cork borer.

Step 2: These leaf discs were then added to a boiling tube containing 10 cm³ of 40% ethanol solution. The pigments in the leaf discs dissolved in the ethanol, producing a green solution.

Step 3: The boiling tube was shaken and the amount of red light absorbed by this solution (absorbance) was measured at the start.

Step 4: The absorbance was measured every 10 minutes, for an hour.

The graph shows the results of this investigation.



(i) Explain why red light was used in this investigation.

Red is absorbed because of the presence of chlorophyll.

(2)

(ii) Explain the absorbance value at 0 minutes.

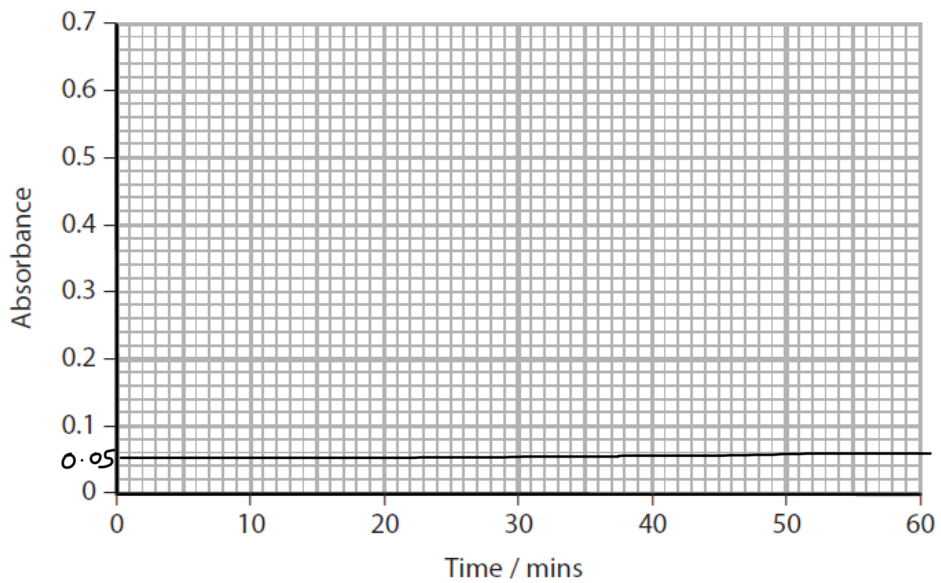
(2)

Chlorophyll was present because some cells are damaged.

(b) The student also carried out a control, using water instead of 40% ethanol.

Draw a line on the graph to show the results for this control.

(2)



(c) The student then investigated the effect of ethanol concentration on leaves from different plant species.

Justify the modifications to the procedure in part (a) that will be required to obtain valid data.

and same position on plant

Use leaves of the same age⁽⁵⁾ because age affects concentration of pigment.

Obtain leaf discs from the same part of the leaf because this affects concentration of pigment.

Use same size of leaf disc as this also affects concentration of pigment. Use same temperature because temperature affects the rate of diffusion.

Use same volume of ethanol so chlorophyll is diluted the same. Repeat each ethanol concentration to see if the results are consistent.

6*

Devise an experiment, which uses changes in mass, to compare the water potential of carrot tissue with the water potential of potato tissue.

(5)

- Use a range of at least 5 concentrations of sucrose solution.
- Use equal sizes of pieces of carrot and potato.
- Make sure the pieces of carrot and potato are submerged in the sucrose solutions for the same amount of time.
- Carrot and potato pieces ^{should be} weighed before and after and dried to get rid of excess water.
- Plot a graph of mass change against sucrose concentration and use to compare where line cuts x-axis for both carrot and potato (isotonic point)

TOTAL FOR TEST = 43 marks