



Additional Assessment Materials
Summer 2021

Pearson Edexcel GCE (Biology A)

Resource Set Topic 8: Grey Matter

Question Paper

(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- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.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 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 Genome sequencing and genetic modification (GM) can be used to develop proteins as personalised medicines.

(a) (i) Which of the following correctly describes the genome of an adult male?

(1)

- A** all of his alleles plus all of his genes
- B** all of his exons minus all of his introns
- C** all of his introns minus all of his exons
- D** all of his introns plus all of his exons

(ii) Which row correctly identifies all the types of organism that can be both genetically modified and be a source of a gene to be used in GM?

(1)

	Animal	Bacterium	Plant
<input type="checkbox"/> A	no	no	yes
<input type="checkbox"/> B	no	yes	yes
<input type="checkbox"/> C	yes	yes	no
<input type="checkbox"/> D	yes	yes	yes

(b) Genetically modified organisms (GMOs) can synthesise personalised proteins for use as medicines.

Describe the role of enzymes involved in the synthesis of personalised proteins in GMOs.

(3)

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(Total for Question 1 = 5 marks)

1 Serotonin is found in the brain and is important in health and wellbeing.

An imbalance of serotonin can lead to problems such as depression. An individual with symptoms of depression may have low serotonin levels in the brain.

(a) Describe how low serotonin levels in an individual can affect the transmission of impulses in their brain.

(2)

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(b) The use of drugs such as MDMA (ecstasy) can cause an imbalance of chemicals in the brain.

(i) Describe how the use of MDMA could affect the transmission of impulses in the brain.

(2)

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(ii) Individuals who use MDMA may develop the symptoms of depression.

Explain how the use of MDMA could result in the development of these symptoms.

(2)

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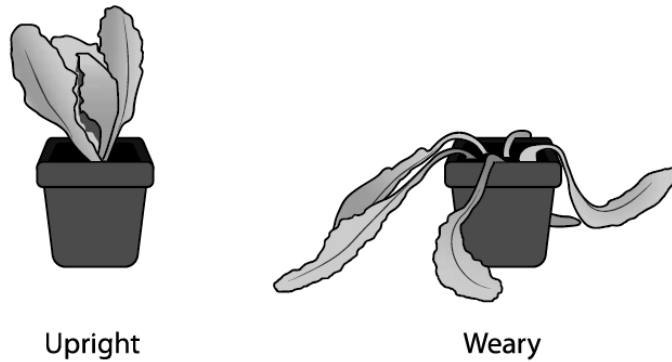
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(Total for Question 1 = 6 marks)

5 Lettuce plants usually grow upright. This is the 'upright' phenotype.

In one variety of lettuce the stem of the lettuce grows along the ground. This is the 'weary' phenotype.

These two phenotypes are shown in the diagram.



(a) Inheritance of the weary phenotype has been investigated.

Scientists crossed weary lettuce plants with upright lettuce plants. The F_1 generation produced from this cross were all upright.

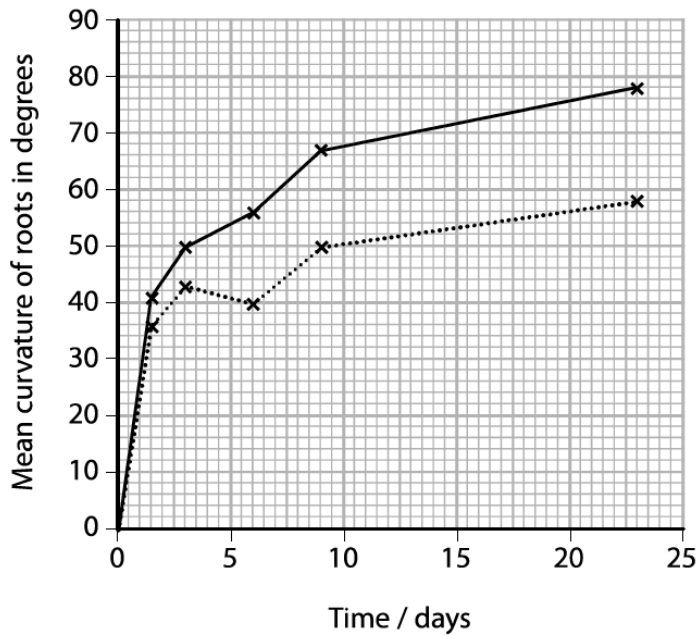
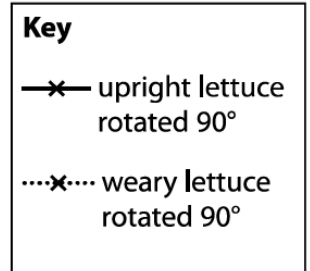
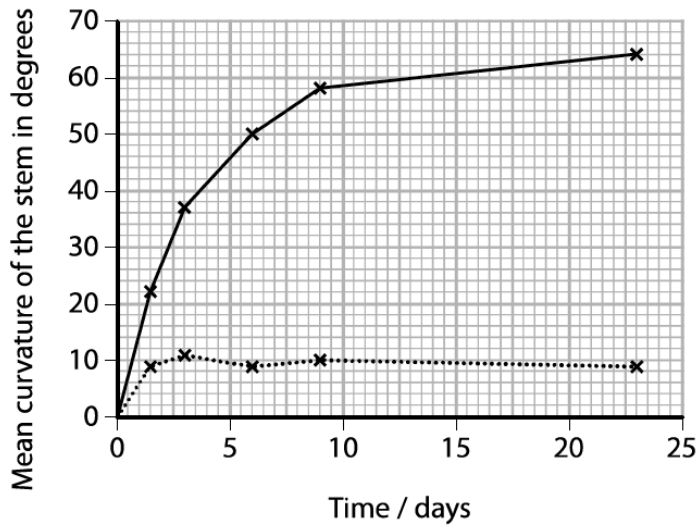
In the second cross, two of the F_1 lettuce plants were crossed with each other to produce the F_2 generation.

The phenotypes of the F_2 generation and the results of a statistical test are shown in the table.

Number of offspring with weary phenotype	Number of offspring with upright phenotype	Chi-squared (χ^2)
159	414	2.31

Degrees of freedom	Probability		
	0.01	0.05	0.1
1	2.71	3.84	6.64
2	4.61	5.99	9.21
3	6.25	7.82	11.35
4	7.78	9.49	13.28

(ii) The mean curvatures of the stems and the roots are shown in the graphs.



Calculate the difference in the mean rate of curvature of the stems and roots of the weary lettuce plants over 23 days.

(2)

Answer

(iii) Explain why the stems of weary lettuce do not respond to gravity.

(2)

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(Total for Question 5 = 10 marks)

(c) Studies were carried out to investigate the withdrawal response in earthworms.

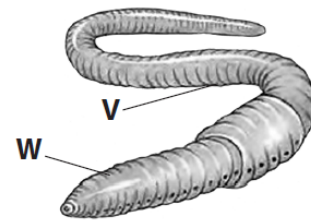
The duration of the withdrawal response is the length of time that the muscles remain contracted. If the stimulus is repeated, the withdrawal response is either reduced in duration or lost.

In one study, an earthworm was touched 20 times in one minute at point **V** as shown in the diagram. The shortening of the earthworm's body was measured after 20 stimuli.

The effect of touching point **W** in the same way was recorded and also the effect of alternating touches between points **V** and **W**.

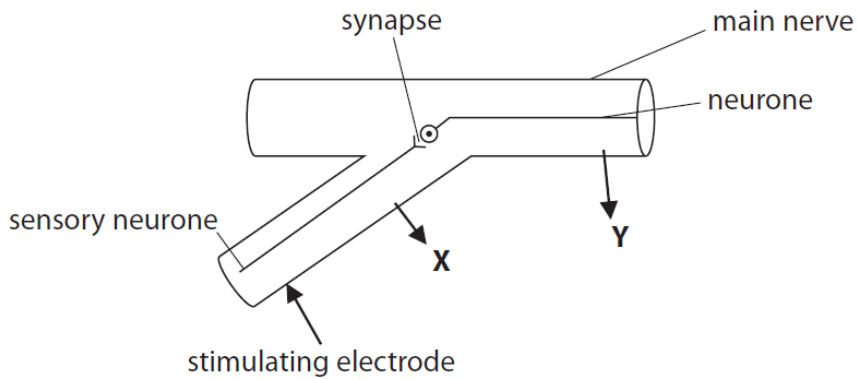
The results of this study are shown in the table.

Nature of stimulus	Change in body length after 20 stimuli / mm
All stimuli at point V	0
Stimuli alternating between points V and W	17
All stimuli at point W	0



In another study, sensory neurones of an earthworm were stimulated by an electrode six times.

Nerve impulses were recorded at positions **X** and **Y** as shown in the diagram.



Nerve impulses recorded at **X** and **Y** are shown in the diagram below. The presence of a line indicates that an impulse was detected. **S** shows the stimulus.

