



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- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.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

2 There are various ways to scan the brain.

- (a) (i) Brain tumours are dense masses of cells. The presence of brain tumours can be detected using several types of scanning method.

The table shows two types of scan. Place a tick [✓] in the box if the scan can identify the size and location of a large brain tumour or a cross [✗] in the box if the scan cannot identify the size and location of a large brain tumour.

(2)

Type of scan	Can be used to identify the tumour
CT	
MRI	

- (ii) Functional MRI (fMRI) measures brain activity by detecting changes in

(1)

- A blood flow
- B bone density
- C dopamine release
- D lactic acid production

- (iii) Which of the following types of scanner uses X-rays?

(1)

- A CT
- B fMRI
- C MRI
- D PET

(b) Describe how positron emission tomography (PET) scans can be used to investigate brain structure.

(2)

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(Total for Question 2 = 6 marks)

(b) Phytochrome is found in two different forms known as P_R (or P_{660}) and P_{FR} (or P_{730}).

(i) Which row correctly describes the effects of sunlight on phytochrome?

(1)

	Change in form of phytochrome	Speed of change
<input type="checkbox"/> A	P_{FR} to P_R	slow
<input type="checkbox"/> B	P_{FR} to P_R	rapid
<input type="checkbox"/> C	P_R to P_{FR}	slow
<input type="checkbox"/> D	P_R to P_{FR}	rapid

(ii) Phytochrome can be described as

(1)

- A** a form of opsin
- B** a photosensitive pigment
- C** an isomer of retinal
- D** a type of cytochrome

(iii) Give one example of a growth response of a plant that is affected by phytochrome.

(1)

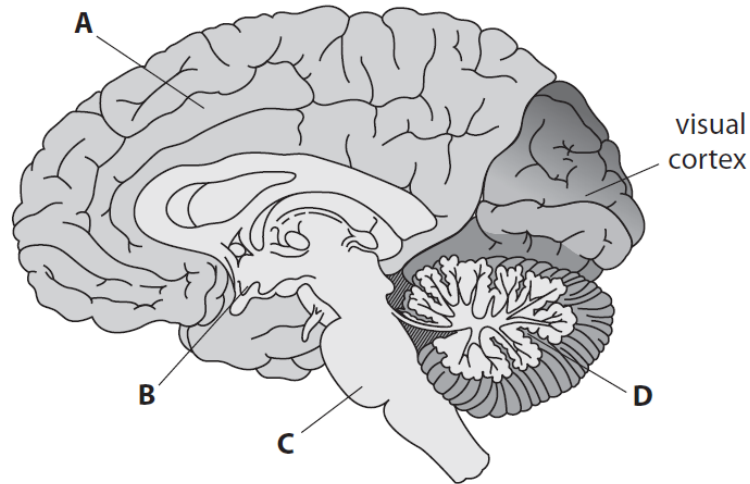
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(Total for Question 3 = 7 marks)

- 4 Visual development requires exposure of the visual cortex to environmental signals during a critical period.

The diagram shows parts of the brain, including the visual cortex.



(a) The visual cortex processes information received from the retina.

- (i) The non-protein part of the light-absorbing pigment in the rod cells of the retina is called

(1)

- A IAA
- B opsin
- C retinal
- D rhodopsin

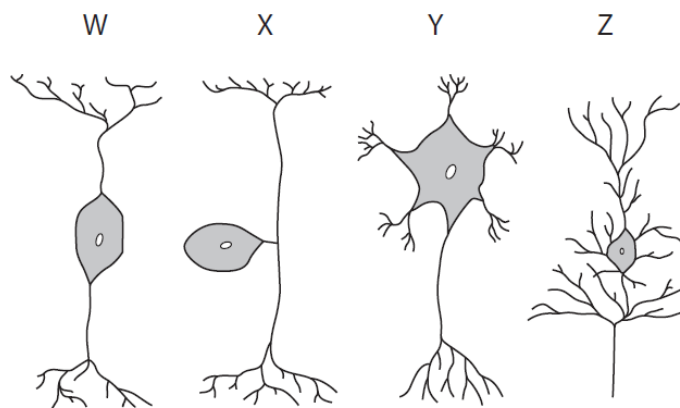
- (ii) The part of the brain involved in interpreting the information processed in the visual cortex is

(1)

- A
- B
- C
- D

8 People with Guillain-Barré syndrome (GBS) suffer from a rapid onset of muscle weakness. It is thought that GBS is caused by damage to the peripheral nervous system.

(a) The diagram shows some typical neurones.



(i) Which of these is a sensory neurone?

(1)

A W

B X

C Y

D Z

(ii) The axons of some neurones are surrounded by a myelin sheath.

The main component of myelin is a glycolipid.

Glycolipids are formed from lipids attached to a chain of

(1)

A amino acids which are joined by glycosidic links

B amino acids which are joined by peptide bonds

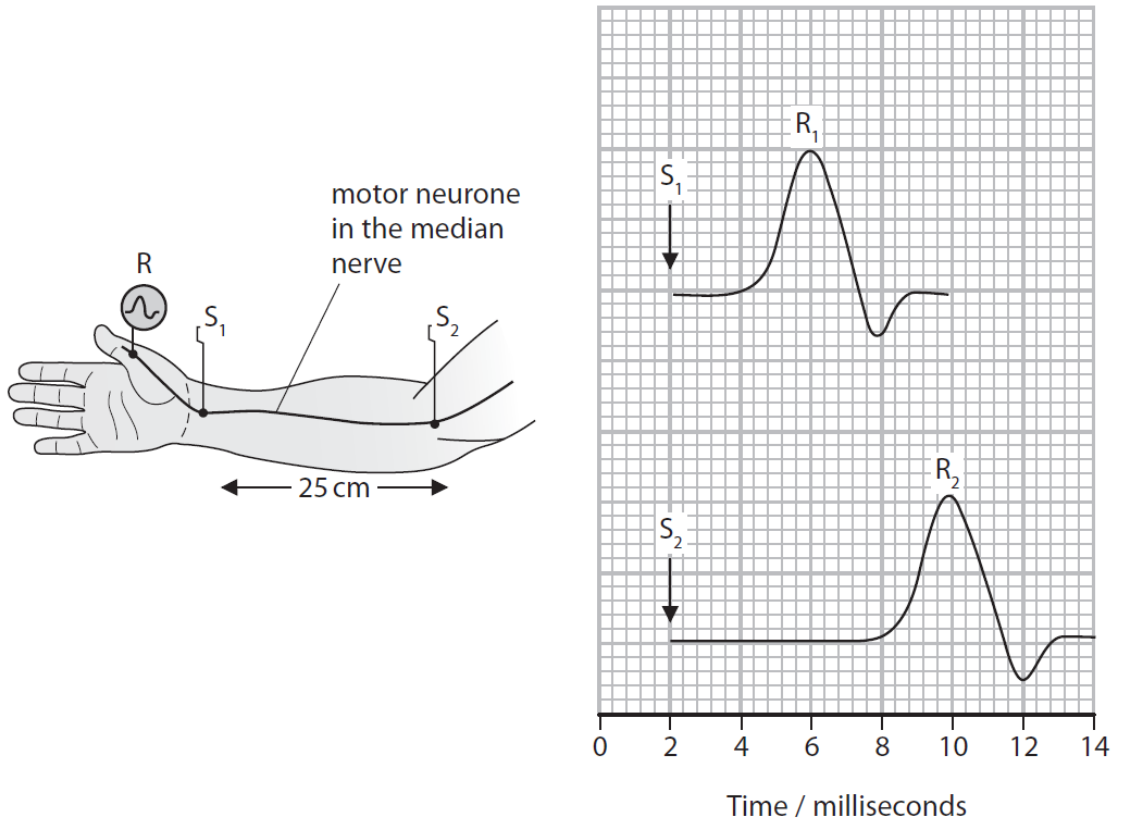
C sugar molecules which are joined by ester bonds

D sugar molecules which are joined by glycosidic links

(b) The speed of conduction along a motor neurone can be calculated.

The time taken for a stimulus (S) to produce a response (R) further along the neurone is recorded.

Using two stimuli, a known distance apart, allows the speed of conduction to be calculated.



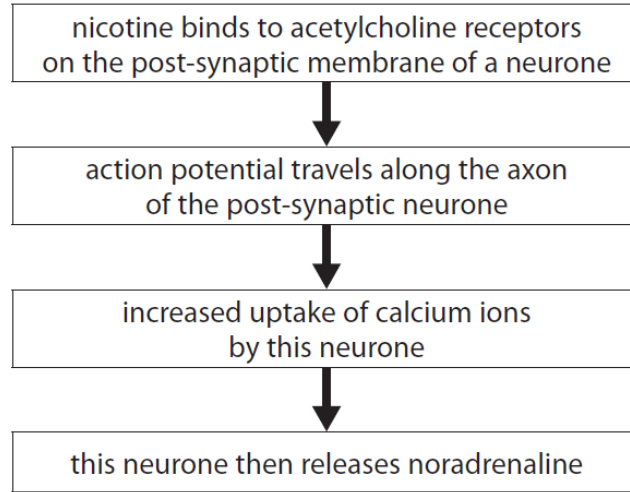
Calculate the speed of conduction for the neurone shown.

(2)

..... cm s^{-1}

9 Nicotine is a drug found in the smoke of cigarettes.

(a) The flow diagram shows how the presence of nicotine can cause the release of noradrenaline.



(i) Explain how nicotine causes an action potential in the post-synaptic neurone that releases noradrenaline.

(3)

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(ii) State how an increase in calcium ion uptake by the neurone leads to the release of noradrenaline.

(1)

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(b) The effect of inhaling nicotine on the circulatory system of rats was investigated.

In this investigation, three variables were considered:

- the concentration of nicotine in blood plasma
- the diameter of the lumen of one artery
- blood pressure

Two groups of rats were treated as shown in the table.

Group	Number of rats in group	Nicotine dose / mg
A	6	1.0
B	6	0.1

(i) The concentration of nicotine in the blood plasma of the group A rats was recorded at different times and the means calculated.

The means are shown in the table along with the range of data for each mean.

Time of sampling / minutes	Mean concentration of nicotine in blood plasma / ng cm^{-3}
0 (immediately after inhalation)	35.0 ± 9.3
30 (after inhalation)	24.1 ± 5.6

Determine the maximum rate of decrease in the concentration of nicotine in the blood plasma per minute after being given the nicotine.

(2)

Answer..... $\text{ng cm}^{-3} \text{ min}^{-1}$

(Total for Question 9 = 6 marks)

9 Changes in diet are affecting the health of people in the UK.

(a) The table shows mean data for adult males in the UK in 1967 and 50 years later in 2017.

Year	Mean mass / kg	Mean height / cm	Mean BMI
1967	73	172	24.7
2017	84	178	

The National Health Service (NHS) states that BMI can be used to assess the weight category of an adult male. The table shows these categories.

Category	BMI range
Underweight	≤ 18.4
Healthy weight	18.5 – 24.9
Overweight	25.0 – 29.9
Obese	≥ 30.0

The mean BMI for adult males in 1967 indicates that they were in the healthy weight category.

Use the BMI formula to determine the mean weight category for adult males in 2017.

$$\text{BMI} = \frac{\text{mass in kilograms}}{(\text{height in metres})^2}$$

(2)

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(b) The effect of being shown a cheeseburger on saliva production in a child was studied.

The mass of saliva produced by this child was measured.

The child was then shown a cheeseburger and the new mass of saliva produced was measured. The change in the mass of saliva produced was recorded.

This was repeated with the child being shown a cheeseburger on eight occasions, at five minute intervals.

The results in the table show the change in mass of saliva produced compared with the mass of saliva produced before the child being shown a cheeseburger.

Occasion	Change in mass of saliva produced / g
1	+ 0.30
2	+ 0.18
3	+ 0.05
4	+ 0.02
5	+ 0.02
6	- 0.08
7	- 0.18
8	- 0.19

(i) Describe the effect on saliva production shown by these results.

(2)

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(ii) Name the type of learning behaviour shown by the child as they were repeatedly shown a cheeseburger.

(1)

(iii) Explain what happens at the synapse to cause a decrease in saliva production when the child was shown a cheeseburger on more than six occasions.

(4)

(c) When the child was shown the cheeseburger, information would have been sent from the eye to the brain.

Describe the role of sodium ions in the functioning of a mammalian rod cell.

(3)

(Total for Question 9 = 12 marks)

TOTAL FOR TEST = 50 MARKS