



Additional Assessment Materials  
Summer 2021

Pearson Edexcel GCE in A Level Biology

Topic 9: Control Systems

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- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.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

Mammals produce urea as a nitrogenous waste product.

(a) Describe how urea is produced in mammals.

(2)

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(b) Bowman's capsule (renal capsule) in the kidney is involved in the excretion of urea in mammals.

Name the cluster of blood capillaries enclosed by Bowman's capsule.

(1)

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(c) The table shows the concentrations of molecules and ions in the blood plasma of the kidney, in the filtrate produced in Bowman's capsule and in the bladder.

Molecule or ion	Blood plasma of kidney (%)	Filtrate produced in Bowman's capsule (%)	Urine in the bladder (%)
Water	90 to 93	94 to 96	96
Protein	7 to 9	0.0	0.0
Glucose	0.10	0.10	0.0
Urea	0.03	0.03	2.0
Sodium	0.32	0.32	0.30 to 0.35
Chloride	0.37	0.37	0.60

(i) Name the process by which this filtrate is produced in Bowman's capsule.

(1)

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(ii) Analyse the data to explain the difference between the protein and the other molecules or ions in the filtrate in Bowman's capsule.

(3)

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(iii) Urea and chloride ions both become more concentrated as they pass from Bowman's capsule to the urine in the bladder.

Calculate how many more times urea becomes concentrated compared with chloride ions.

(3)

Answer .....

(iv) Analyse the data to explain the glucose concentration in the bladder.

(2)

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2

The retina contains rod cells and bipolar neurones.

Rod cells contain large numbers of mitochondria.

(a) Explain the role of mitochondria in the functioning of rod cells.

(2)

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(b) Rod cells release glutamate, an inhibitory neurotransmitter.

Describe how light causes a change in the release of glutamate from rod cells.

(4)

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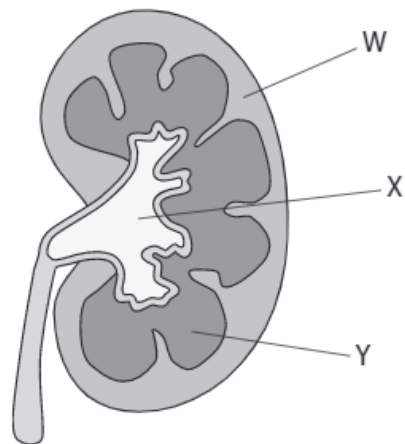
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3

The diagram shows a section through a mammalian kidney.



(a) Which row of the table names the parts of the kidney labelled in the diagram?

(1)

	W	X	Y
<input checked="" type="checkbox"/> A	cortex	medulla	pelvis
<input checked="" type="checkbox"/> B	cortex	pelvis	medulla
<input checked="" type="checkbox"/> C	medulla	pelvis	cortex
<input checked="" type="checkbox"/> D	medulla	cortex	pelvis

(b) The table shows information about substances found in the blood and in the filtrate in the renal (Bowman's) capsule.

Substance	Relative molecular mass	Ratio of concentration in the filtrate in the renal (Bowman's) capsule : concentration in blood
sodium ions	23	1.00
water	18	1.00
urea	60	1.00
glucose	180	1.00
myoglobin	17 000	0.75
plasma proteins	69 000	<0.01



Analyse the data to explain the ratios of these substances.

(3)

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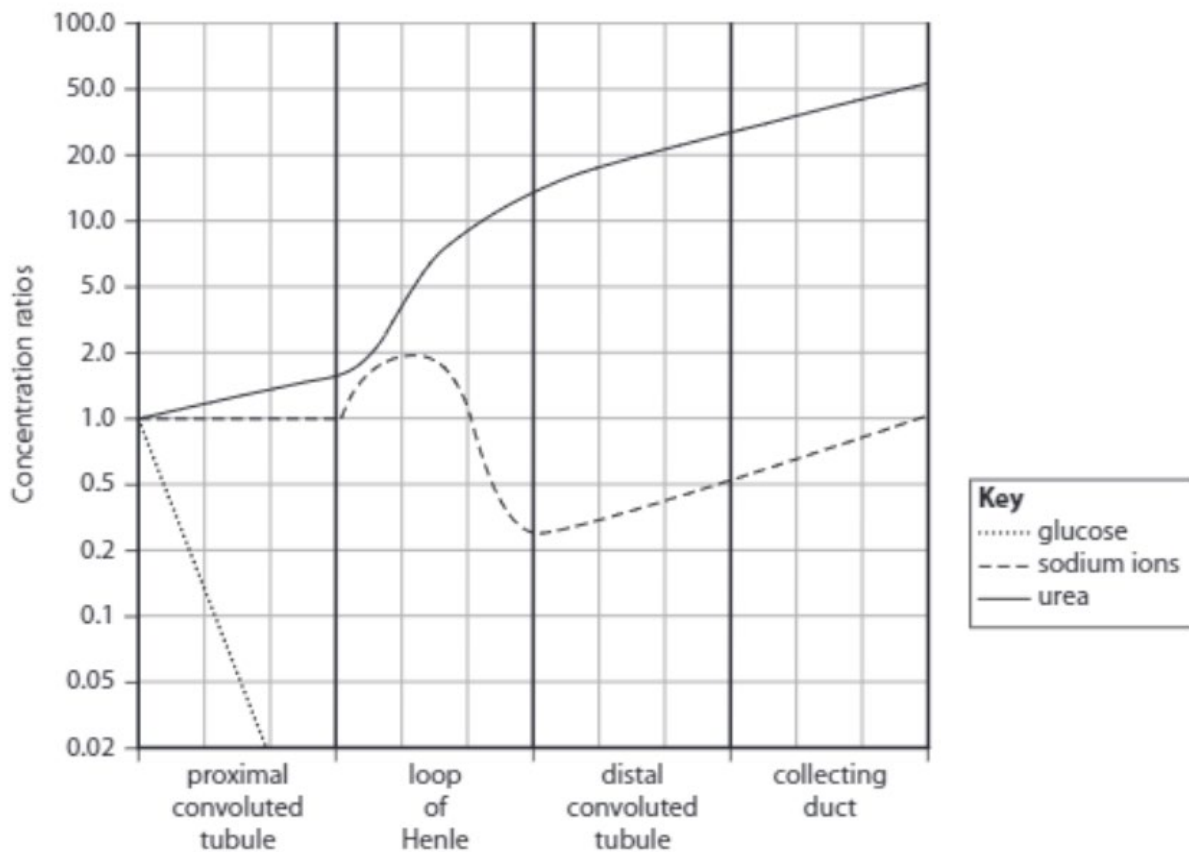
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\*(c) The renal (Bowman's) capsule is part of each nephron found in the kidney.

The graph shows the concentration ratios of three solutes in different parts of the nephron compared with their concentrations in the renal capsule.

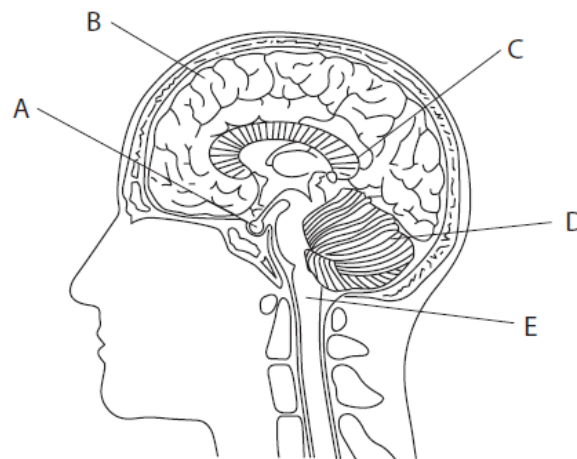




4

The human brain controls many functions.

The diagram shows a section through a human brain with parts labelled A to E.



(a) Which letter labels the part of the brain that controls heart rate?

(1)

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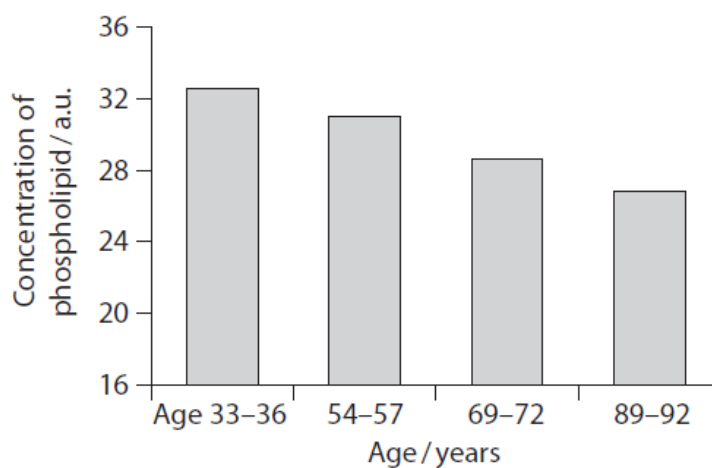
(b) The human brain consists of 100 billion neurones.

The function of these neurones is affected by many factors.

The concentration of phospholipid in neurones from one part of the brain was measured.

This was carried out in people from different age ranges.

The graph shows the results.



Explain how age might affect the structure of a neurone and the speed of transmission of an impulse.

(3)

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(c) Poisons can also affect the function of neurones in the brain.

The photograph shows a pufferfish, a traditional food delicacy in Japan.



Pufferfish have to be carefully prepared by a chef to remove a poison called tetrodotoxin. This poison causes muscle paralysis.

Neurones were placed in a solution containing tetrodotoxin and in a control solution.

The neurones were stimulated and the potential difference across the axon membrane was measured.

The table shows the results.

Solution	Potential difference after stimulation / mV
tetrodotoxin	-70
control	+40

Analyse the data to explain the effect of tetrodotoxin on the neurone.

(4)

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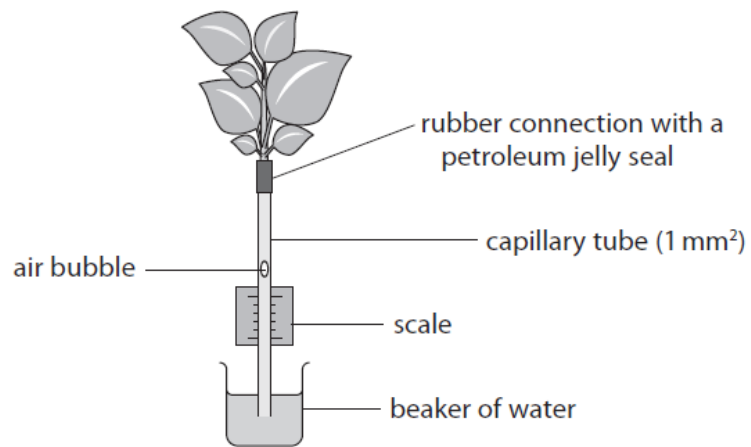
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5

A student investigated the effect of moving air on transpiration in a leafy shoot.

The diagram shows the potometer used by the student.



(a) In this investigation, a leafy shoot was cut from a plant.

The leafy shoot was then put under water and the stem inserted into the rubber connection.

Explain how this procedure should be modified to produce accurate readings.

(2)

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(b) During the investigation, the air bubble moved off the scale very quickly.

Explain how this potometer could be modified to obtain repeat readings.

(2)

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**TOTAL FOR TEST = 45 Marks**