

Friday 6 June 2014 – Afternoon

**GCSE TWENTY FIRST CENTURY SCIENCE
BIOLOGY A/ADDITIONAL SCIENCE A**

A162/02 Modules B4 B5 B6 (Higher Tier)

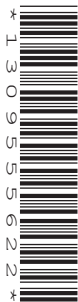
Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:

- Pencil
- Ruler (cm/mm)

Duration: 1 hour




Candidate forename		Candidate surname	
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Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

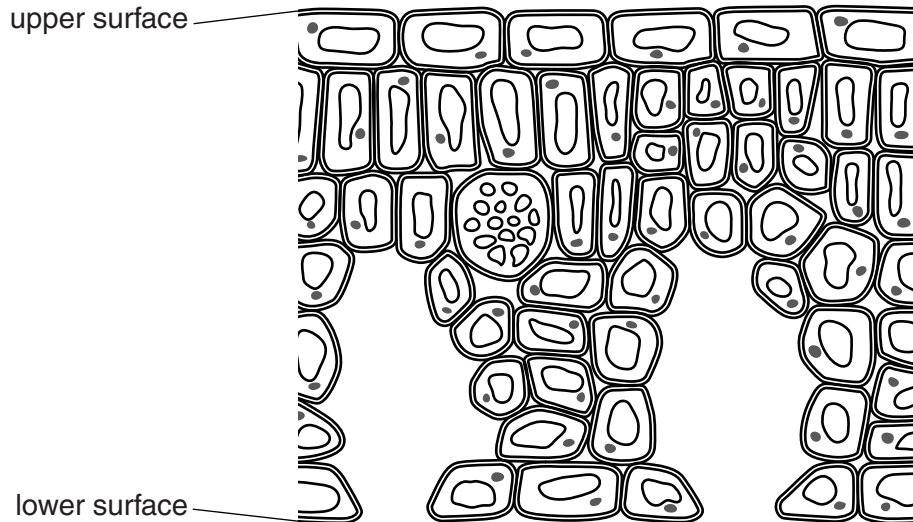
INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with a pencil ().
- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are indicated.

Answer **all** the questions.

1 Plants are adapted to live in many different types of habitat.

(a) Look at the section of a leaf as seen through a microscope.



Leaves have openings (stomata) on their lower surface.

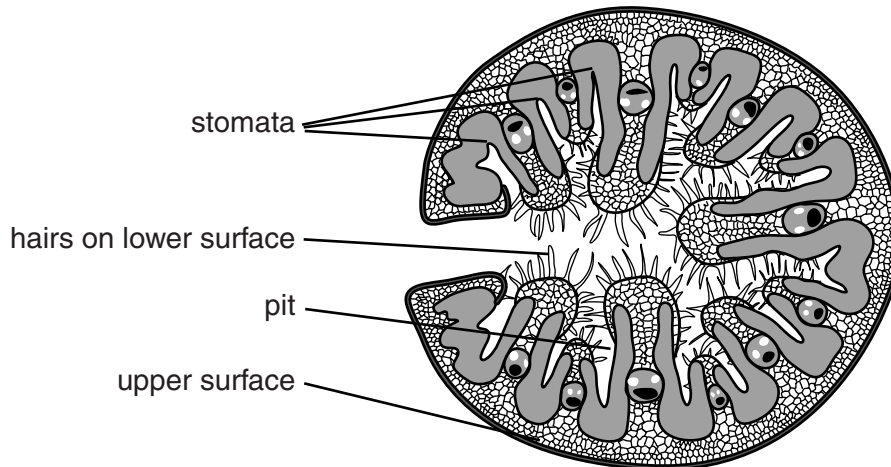
Water vapour, oxygen and **carbon dioxide** can pass through these openings.

The plant is photosynthesising in bright light.

Draw **two** labelled arrows on the diagram to show the overall direction that **oxygen** and **carbon dioxide** pass through the openings.

[1]

- (b) This diagram shows a section of a leaf that is adapted to live in very dry conditions. The leaf is rolled up to form a tube shape.



Three of these explanations describe how this leaf is adapted to reduce the loss of water vapour.

Put ticks (✓) in the boxes next to the **three** correct explanations.

The leaf only photosynthesises during the day.

Rolled up leaves are much stronger.

Hairs reduce air movement around the lower surface of the leaf.

Water vapour builds up inside the rolled up leaf.

Some cells contain the green pigment chlorophyll.

Light intensity is a limiting factor.

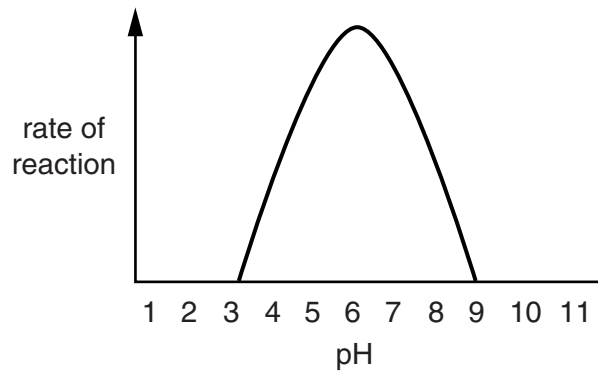
The stomata are at the bottom of pits.

The leaf only respire at night.

[3]

[Total: 4]

- 2 The graph shows how pH affects the rate of reaction of an enzyme.



Use your knowledge of enzymes and how they work, to describe and explain the shape of the graph.



The quality of written communication will be assessed in your answer.

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..... [6]

[Total: 6]

- 3 Living organisms obtain energy using respiration.

Look at the equations for the two different types of respiration.

They show the energy released from the same amount of glucose.

Type A glucose + oxygen \longrightarrow carbon dioxide + water + 2880 kJ

Type B glucose \longrightarrow lactic acid + 150 kJ

- (a) Calculate the ratio:

$$\frac{\text{energy released in Type A}}{\text{energy released in Type B}}$$

Show your working.

ratio =

[2]

- (b) Jenny is running in a 26 mile marathon race.

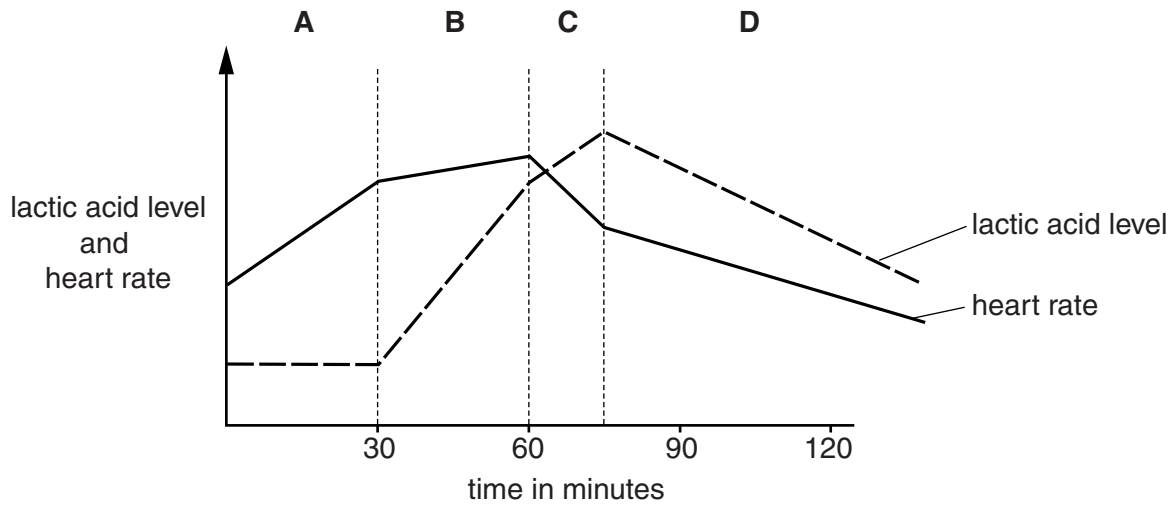
For **most** of the race Jenny respire using **Type A** respiration.

Suggest reasons why this is important.

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 [2]

- (c) The graph shows Jenny's heart rate and the lactic acid level in her blood during a training session.



- (i) Jenny makes this conclusion.

There is always the same correlation between my heart rate and my lactic acid level, however long or fast I run.



Discuss how well her conclusion fits the data in the graph.

Use information from sections **A**, **B**, **C** and **D** in your answer.

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..... [4]

(ii) Jenny thinks that some of her data is incorrect.

What should she do to become more confident in her conclusion?

Put a tick (✓) in the box next to the correct answer.

Repeat the same training a number of times.

Repeat her training but only run for 60 minutes.

Run more slowly so that her heart rate does not rise too much.

Repeat the same experiment on other runners.

[1]

[Total: 9]

4 Embryonic stem cells can develop into any other type of tissue.

- (a) Some genes need to be switched on and some need to be switched off to make a specialised cell.

Some of these statements describe genes that would need to be switched on to produce a **cell where photosynthesis takes place**.

Put ticks (✓) in the boxes next to the correct statements.

- | | |
|-----------------------------------|--------------------------|
| Genes to control temperature. | <input type="checkbox"/> |
| Genes to make chlorophyll. | <input type="checkbox"/> |
| Genes to make a neurotransmitter. | <input type="checkbox"/> |
| Genes to make a cell membrane. | <input type="checkbox"/> |
| Genes to make carbon dioxide. | <input type="checkbox"/> |
| Genes to control diffusion. | <input type="checkbox"/> |
| Genes to make enzymes. | <input type="checkbox"/> |

[3]

- (b) Ethical issues need to be considered when using human embryonic stem cells.

Which ethical issues need to be considered?

Put ticks (✓) in the boxes next to the best answers.

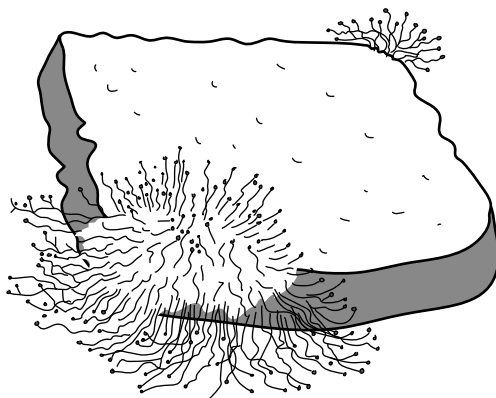
- | | |
|--|--------------------------|
| Embryos are living things. | <input type="checkbox"/> |
| Embryos have some genes switched off. | <input type="checkbox"/> |
| Embryos can develop into human beings. | <input type="checkbox"/> |
| Embryo cells contain DNA. | <input type="checkbox"/> |
| Embryos have some genes switched on. | <input type="checkbox"/> |

[2]

[Total: 5]

5 Moulds are living things that can grow on bread.

They make and release a digestive enzyme onto the bread.



Describe how the DNA in the mould codes for the enzyme and how the enzyme is made.



The quality of written communication will be assessed in your answer.

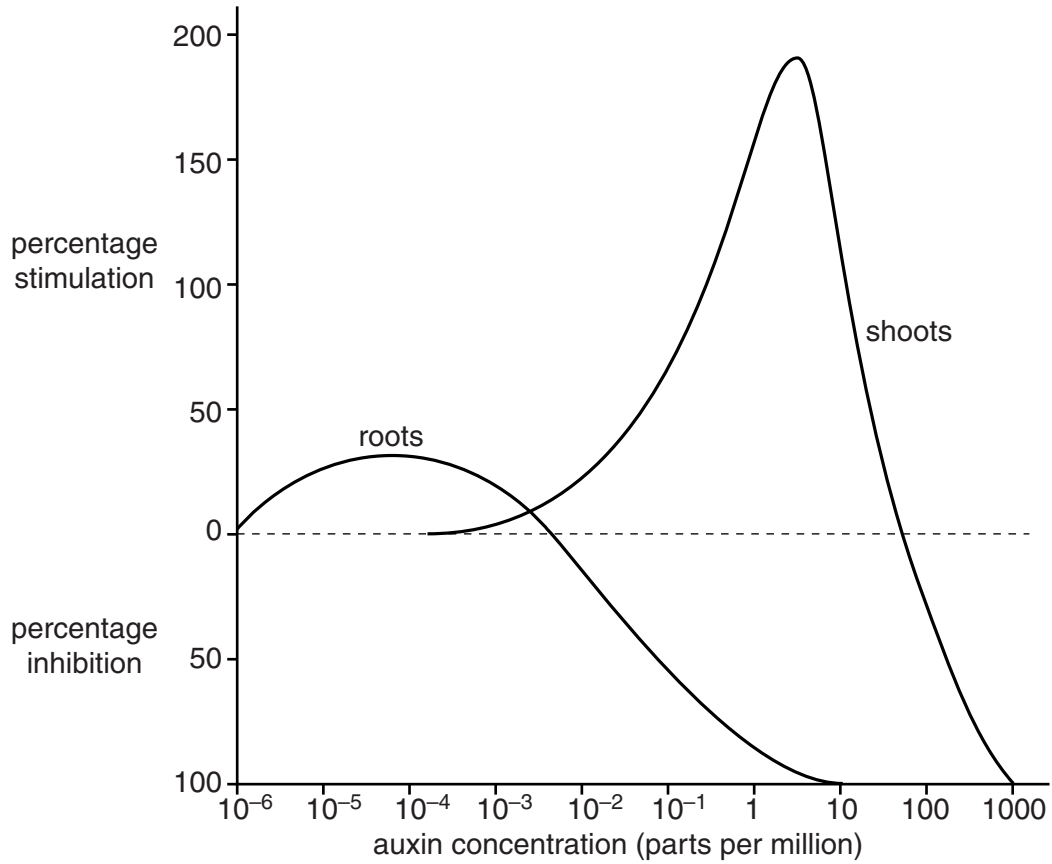
..... [6]

[Total: 6]

6 Auxin is a plant hormone that can stimulate or inhibit the growth of shoots and roots.

Look at the graph.

It shows the effect of different concentrations of auxin on shoot and root growth.



(a) The graph shows auxin concentrations ranging from 10^{-6} to 1000.

How much more concentrated is 1000 than 10^{-6} ?

Show your working.

answer = [2]

(b) Write down three conclusions that can be made about **shoot growth** from this data.

conclusion 1

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conclusion 2

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conclusion 3

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[3]

(c) Auxin is important in phototropism.

Explain how auxin causes phototropism in shoots.

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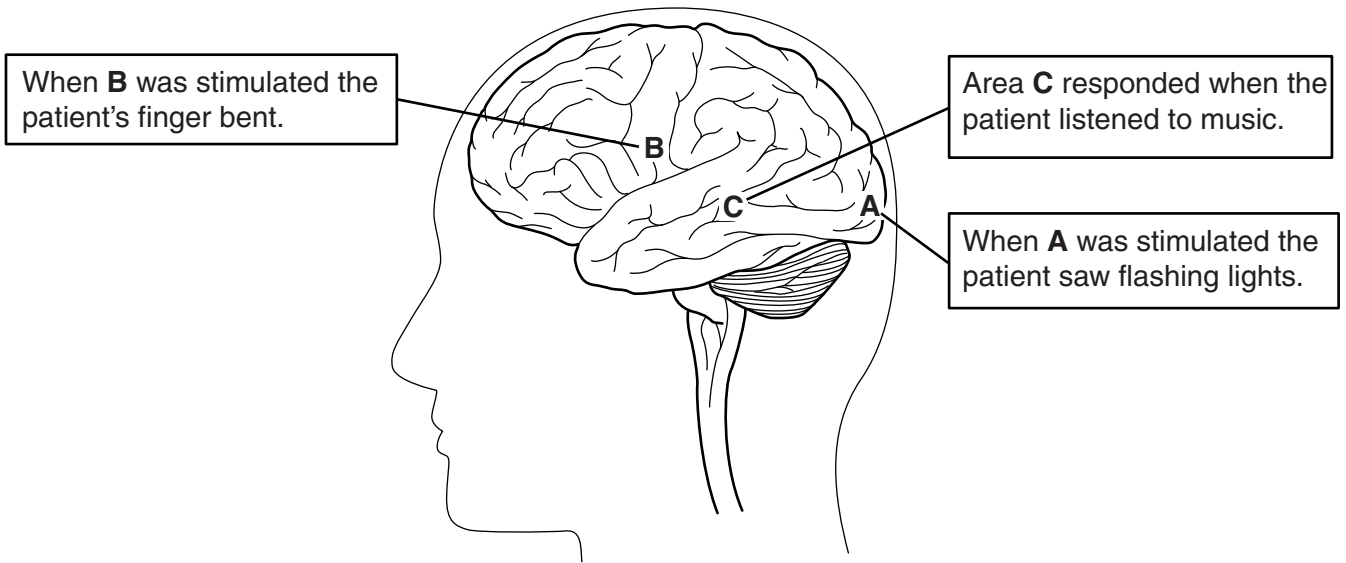
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[4]

[Total: 9]

7 Scientists study different areas of the brain.

They discover this information.



(a) A student makes two conclusions from this information:

- the lower back part of the brain is concerned with sensory information
- the upper front part of the brain is concerned with motor responses.

Comment on the student's conclusions.

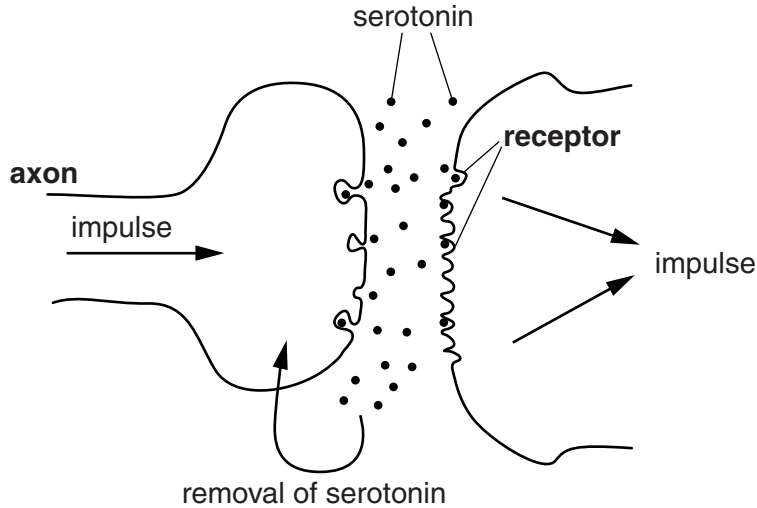
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..... [2]

- (b) Serotonin is a transmitter substance found in synapses in the brain. Impulses passing across these synapses prevent depression. SSRIs are drugs used to treat depression. They act at the synapse. The diagram shows a synapse.



Four of these statements about SSRIs could be true.

Put ticks (✓) in the boxes next to these **four** statements.

- SSRIs break down serotonin molecules.
- SSRIs stop serotonin from being produced.
- SSRIs block sites where serotonin is removed from the synapse.
- SSRIs stimulate the serotonin receptor sites on the second neuron.
- SSRIs slow down the production of serotonin.
- SSRIs have a similar effect to serotonin.
- SSRIs are rapidly broken down in the synapse.
- SSRIs effects are due to an increased serotonin concentration in the synapse.

[3]

- (c) Scientists discover a lot about the brain by studying patients with brain damage.

Discuss the ethical issues involved in this kind of scientific research.

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..... [2]

[Total: 7]

Turn over

8 Reflexes in living things can be simple reflexes or conditioned reflexes.

(a) Look at these examples of reflexes.

Write the letter **C** in the boxes next to the reflexes that are conditioned.

An insect flies away when it sees sudden movement.

Steve is frightened of the dentist and starts to sweat when he goes for a check-up.

A baby jumps when there is a loud noise.

A baby who was frightened by a clown cries when given a clown doll.

Jane's pupils get smaller in bright light.

[2]

(b) Pavlov conditioned dogs.

His experiments involved various actions.

Draw straight lines to link each **action** with its correct **description**.

action

description

dog sees food

secondary stimulus

dog produces saliva

final response

dog hears bell ring

primary stimulus

[2]

(c) Conditioned reflexes can be very useful.

Give one example of a **useful** conditioned reflex.

Explain how this reflex can be useful.

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(d) Dropping a hot plate is the result of a reflex arc.

Explain how the brain can modify this reflex in order to keep hold of the hot plate.

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[Total: 8]

Question 9 begins on page 16

