THIS IS A NEW SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

F

Wednesday 20 June 2012 – Morning

GCSE TWENTY FIRST CENTURY SCIENCE BIOLOGY A

A162/01 Modules B4 B5 B6 (Foundation Tier)

A136120612

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

A162201

Candidate forename		Candidate surname	

Centre number						Candidate number				

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

- Your 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 **20** pages. Any blank pages are indicated.

Answer **all** the questions.

1 The human eye is an organ of the nervous system.

(a) Two students are learning about the pupil reflex. The coloured part of the eye (the iris) changes size in response to changes in light level. This reflex is very fast.

Georgia searches on the internet for data on the speed of transmission of nerve impulses in this reflex. She concludes that the speed of transmission is **usually** between 90 and 150 m/s.

Paige collects primary data. She measures the speed of nerve transmission in the pupil reflex ten times. Here are her data.

speed of nerve impulse in m/s									
75	129	92	141	98	148	105	170	118	145

(i) What percentage of these data are within the range of 90 to 150 m/s?

Show your working.

answer = ...% **[2]**

(ii) Does your answer to part **(i)** support Georgia's conclusion?

Explain why.

.....

..... **[1]**

(b) Damage to the fatty sheath around neurons leading to and from the eye can cause vision problems.

Complete the sentences to explain this. Use words from this list.

Each word can be used once, more than once, or not at all.

axon **cell body** **faster** **nucleus**

receptors **slower** **stopped**

The fatty sheath surrounds the ..... of a neuron.

When the fatty sheath is lost, transmission of nerve impulses to and from the eye will be ..... .

This could cause vision problems. **[1]**

(c) Other reflexes involve the spinal cord. In these reflexes, the impulses travel along a **spinal reflex arc**.

Describe the pathway followed by the impulses in a **named** spinal reflex.

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

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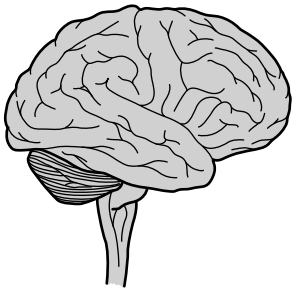
..... **[6]**

[Total: 10]

2 This question is about the brain.



(a) The brain contains billions of synapses.

What is a synapse?

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

A synapse is …

… a type of neuron. ☐

… the cell body of a neuron. ☐

… a gap between two adjacent neurons. ☐

… the membrane on the outside of a neuron. ☐

[1]

(b) Serotonin is a chemical that is released at synapses in the brain.

- When a nerve impulse arrives at a synapse, serotonin is released from the neuron.
- The serotonin allows the nerve impulse to be transmitted across the synapse.
- The serotonin is then reabsorbed into the neuron.

A new antidepressant drug stops the serotonin from being reabsorbed into the neuron. The average (mean) dose of the drug over five days must be **greater than 10 mg** to cause this effect.

A patient takes part in two trials, **A** and **B**.

In trial **A** the patient takes the drug each day for five days. After a rest period of one week, the patient starts trial **B** and again takes the drug each day for five days.

The doses taken in trial **A** and trial **B** are shown in the tables.

trial A

day	dose of drug in mg
1	6
2	6
3	8
4	9
5	9
mean dose	7.6

trial B

day	dose of drug in mg
1	14
2	14
3	16
4	18
5	20
mean dose	.....

(i) Complete the table for trial **B** to show the mean dose. **[1]**

(ii) In which trial or trials would reabsorption of serotonin be blocked?

Explain your answer.

.....

.....

..... **[2]**

(iii) At the end of trial **B** the transmission of nerve impulses across the patient's brain synapses increases.

Suggest why.

.....

..... **[1]**

(c) Scientists can map the regions of the human brain using different techniques.

Two of these techniques are

- electrical stimulation of the brain
- MRI brain scans.

Suggest advantages and disadvantages of each technique. You may include ethical issues.

electrical stimulation .....

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.....

MRI brain scan .....

.....

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[4]

[Total: 9]

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Question 3 begins on page 8

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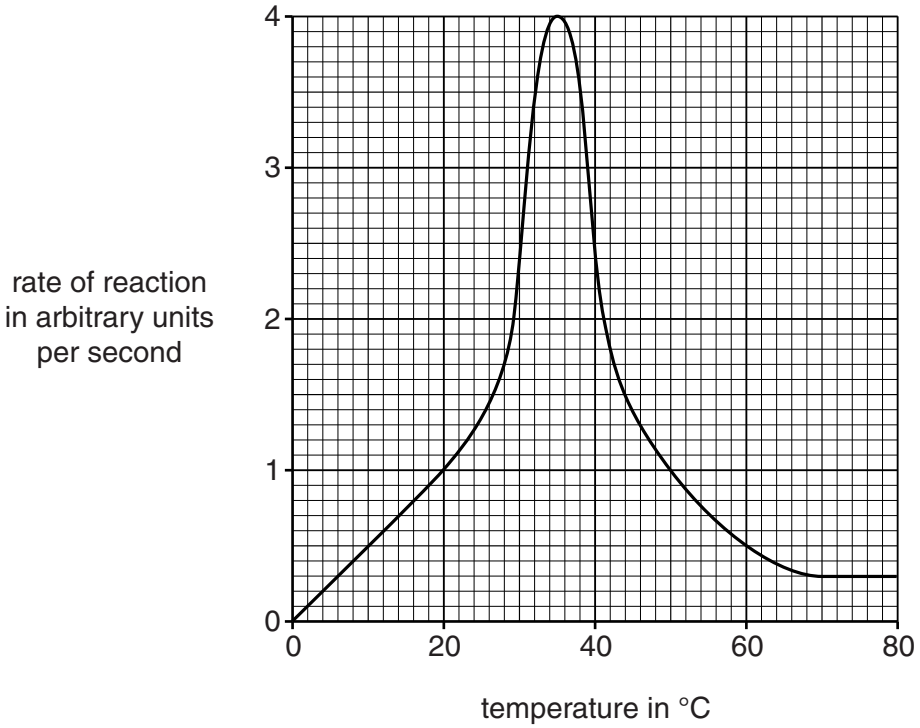
3 The activity of enzymes is affected by temperature.

(a) The graph shows the effect of temperature on the rate of a reaction involving the enzyme catalase.



(i) What is the rate of this reaction when the temperature is 10 °C?

rate of reaction = ... arbitrary units per second **[1]**

(ii) Enzymes need a specific temperature to work at their optimum.

What is the temperature when the rate of this reaction is at its optimum?

temperature = ...°C **[1]**

(iii) Describe what happens to the rate of reaction between 40 °C and 80 °C.

.....

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..... **[2]**

(b) A version of the enzyme catalase is found in many different organisms.

However, the optimum temperature for catalase is different in different organisms. This is because the organisms have adapted to different environments.

The table shows the optimum temperature for catalase in several different organisms.

organism	**optimum temperature for catalase in °C**
P. cyclopium fungus	15
E. coli bacterium	22
cow	35
mosquito	40
high temperature bacterium	90

Look again at the graph in part **(a)**. The catalase used in the experiment was taken from one of the organisms in the table.

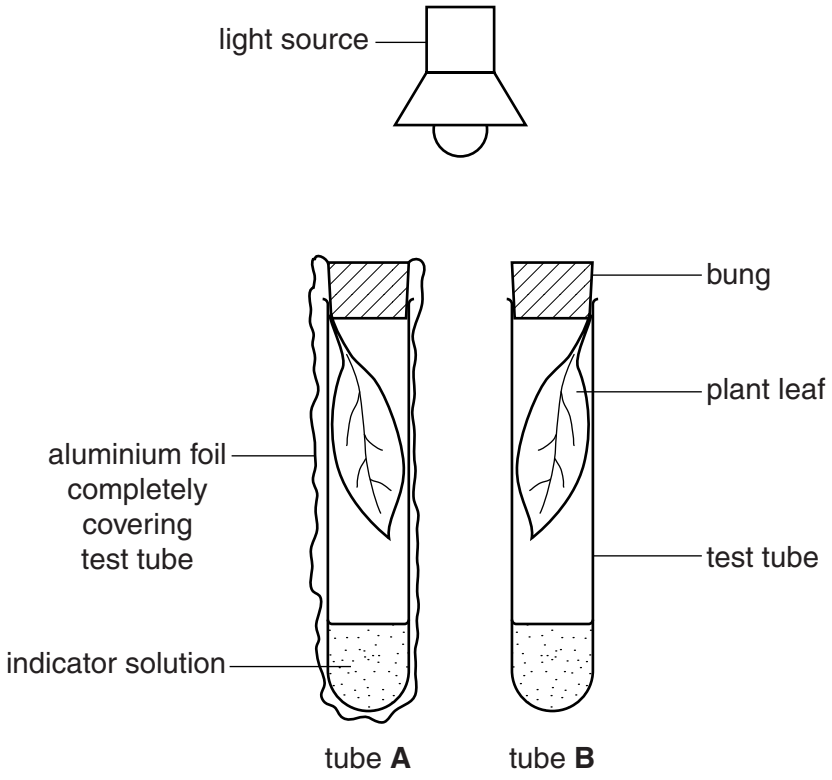
Which organism is the catalase most likely to have been taken from?

..... **[1]**

[Total: 5]

4 Tom wants to investigate the effect of light on photosynthesis in plant leaves.

He sets up the experiment shown in the diagram.



The indicator solution is **red** at the start of the experiment in both tubes.

The indicator will change colour if the level of carbon dioxide in either tube changes. The table shows how the colour of the indicator could change.

level of carbon dioxide in the tube	**colour of indicator solution**
increases	yellow
stays the same	red
decreases	purple

(a) Complete the sentences about Tom's experiment.

Choose the correct words from this list.

Each word can be used once, more than once, or not at all.

chlorophyll
decrease
fats
increase
purple
red
starch
stay the same
stop
yellow

Carbon dioxide moves into the leaves by diffusion.

During photosynthesis light energy is absorbed by ..... in the leaves.

Increased levels of light will cause the rate of photosynthesis to ..... .

At the end of the experiment, the colour of the indicator solution in tube **B** will be ..... . **[3]**

(b) **(i)** Tom wants to make his experiment a 'fair test'.

Explain why he should use leaves of similar sizes in the two tubes.

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..... **[2]**

(ii) Carbon dioxide and light can be **limiting factors** for photosynthesis.

Write down one **other** limiting factor that Tom should control in his experiment.

..... **[1]**

(iii) Tom plans to repeat his experiment several times.

Explain why.

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..... **[2]**

(c) Tom did the experiment with leaves from a plant that grows in bright sunlight.

He repeats the experiment using leaves from a plant that grows in shaded conditions. This time, the indicator solution in tube **B** changes colour more quickly.

Suggest why.

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..... **[2]**

[Total:10]

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Question 5 begins on page 14

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5 Yeast is a microorganism.

Yeast can respire by using aerobic and anaerobic respiration.

(a) Complete the **word** equations for these reactions.

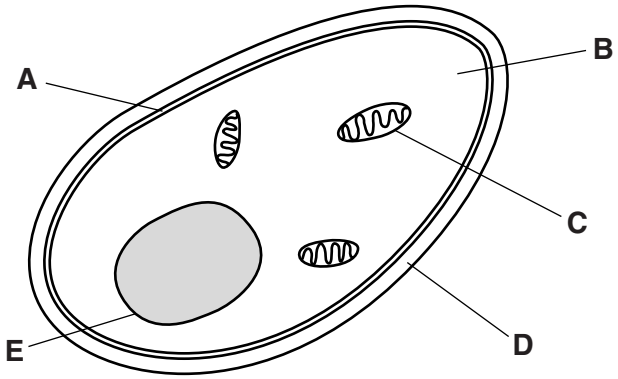
(i) **aerobic** respiration in yeast

glucose + ... → ..... + water (+ energy released) **[2]**

(ii) **anaerobic** respiration in yeast

..... → ..... + carbon dioxide (+ energy released) **[2]**

(b) The diagram shows some structures in a yeast cell.



Complete the table using the labels in the diagram.

Write the correct letter, **A**, **B**, **C**, **D** or **E**, in each box.

cell membrane	
cytoplasm	
nucleus	

[3]

(c) Scientists are investigating some properties of structures in a yeast cell.

They are examining the processes of aerobic respiration and anaerobic respiration.

Their results are shown in the table.

structure in yeast cell	property
cell membrane	freely permeable to gases
cytoplasm	contains enzymes
mitochondria	contain enzymes
nucleus	holds the genetic code

Explain how the properties of these structures help the yeast cell to respire using aerobic respiration **and** anaerobic respiration.

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

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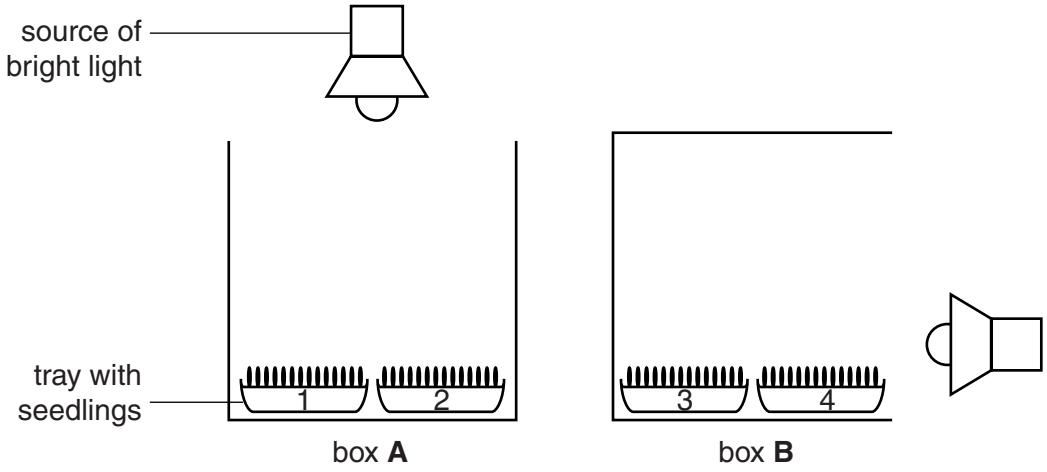
..... **[6]**

[Total: 13]

6 Ruth wants to develop a model of how plants grow in her garden.

She uses four trays of cress seedlings. There are 100 seedlings in each tray. All the seedlings are approximately 2 cm tall.

- She places two of the trays in an open box, **A**, with a source of bright light above it.
- She places the other two trays in another open box, **B**, with a source of bright light on one side of it.



Ruth records the appearance of the seedlings after 24 hours, and again after 48 hours.

She sees that some of the seedlings have grown with a straight stem but others have grown with a curved stem.

		percentage (%) of seedlings with a curved stem	
		after 24 hours	**after 48 hours**
box A	**tray 1**	2	3
	tray 2	1	3
box B	**tray 3**	48	89
	tray 4	42	81

(a) Describe the results.

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..... **[3]**

(b) Does Ruth's experiment accurately represent how plants would grow in her garden?

Give **two** reasons to support your answer.

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..... **[2]**

[Total: 5]

7 Human body cells have a cell cycle.

The cell cycle can be divided into two main processes.
The table shows observations of cells during each process.

The two processes have been labelled **process A** and **process B**.

observation	process A	process B
number of cells	1	2
number of organelles	changes from 300 to 600	changes from 600 in one cell to 300 in each of two cells
mass of DNA in arbitrary units	changes from 20 to 40	changes from 40 in one cell to 20 in each of two cells
number of chromosomes	each of 46 chromosomes is copied	46 in each of two new cells

(a) Look at the table of observations.

Identify **process A** and **process B**.

Justify your conclusions using evidence from the table **and** your knowledge of the cell cycle.

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

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(b) Cells in different parts of the human body are specialised to do different jobs.

All body cells from the same human contain the same genes.

However, a specialised cell in the liver and a specialised cell in the kidney produce different proteins.

Explain why they produce different proteins.

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..... **[2]**

[Total: 8]

END OF QUESTION PAPER

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