OCR
RECOGNISING ACHIEVEMENT

SPECIMEN H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE **A162/02**

BIOLOGY A

Unit A162: 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	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- The number of marks for each question is given in brackets **[ ]** at the end of the 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.

For Examiner's Use		
	Max	**Mark**
1	**4**	
2	**5**	
3	**11**	
4	**4**	
5	**10**	
6	**6**	
7	**3**	
8	**4**	
9	**6**	
10	**3**	
11	**4**	
TOTAL	**60**	

Answer **all** the questions.

1 Respiration is the process by which we release energy from our food.

(a) Anaerobic respiration is different from aerobic respiration.

Describe **two** ways in which it is different.

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

(b) Working muscle cells can carry out **anaerobic** respiration.

Complete the word equation for anaerobic respiration.

..... → ..... (+ energy released) **[1]**

(c) Muscle cells contain different structures.

The structures have different roles in the process of respiration.

Draw a straight line between each **structure in the muscle cell** and its **role in respiration**.

structure in the muscle cell	role in respiration
mitochondrion	contains enzymes for anaerobic respiration
cell membrane	contains the genetic code for enzymes
DNA in nucleus	allows dissolved gases and water to pass freely in and out
cytoplasm	contains enzymes for aerobic respiration

[1]

[Total: 4]

2 Plants produce food by the process of photosynthesis.

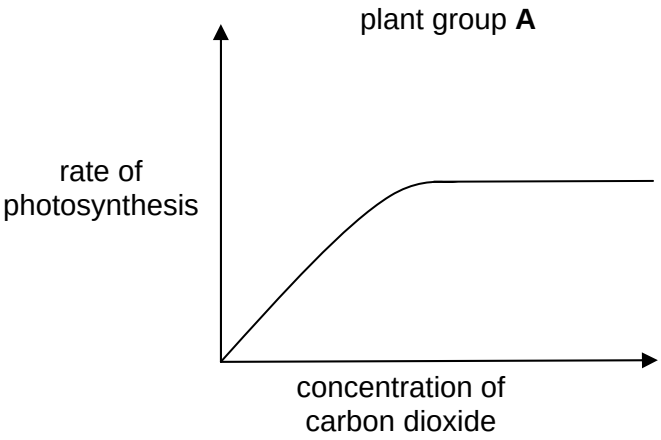
(a) Complete the balanced symbol equation to show this process.

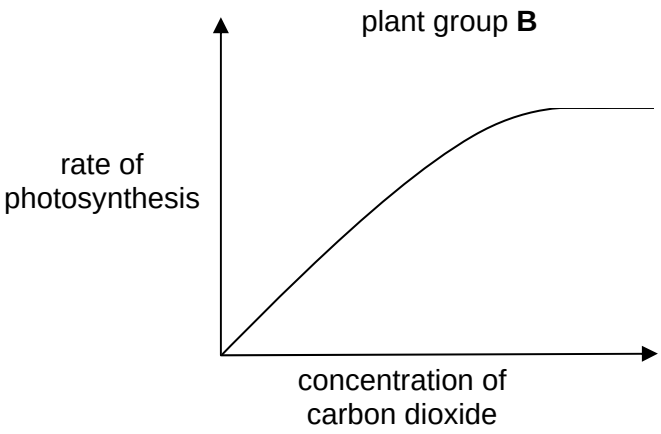
..... + $6H_2O$ → $C_6H_{12}O_6$ + ... **[1]**

(b) A student investigates the rate of photosynthesis in plants. She tests two groups of plants of the same species in different conditions.

For each group she measures the rate of photosynthesis at different concentrations of carbon dioxide.

The graphs show her results.





Suggest how the conditions for group **B** may have differed from group **A**, and explain why this has produced the results shown in the graphs.

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..... **[4]**

[Total: 5]

3 Alex is investigating the activity of an enzyme called salivary amylase. The enzyme breaks down starch into glucose, and is present in saliva in the human mouth.

(a) Alex has read that the digestion of some foods begins in the mouth.

Alex has chicken and chips for lunch. She wonders which parts of her lunch will start to be digested by salivary amylase in her mouth. She knows that chicken meat is made of protein.

Explain why salivary amylase will start digesting the chips in her mouth but will not start digesting the chicken.

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

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

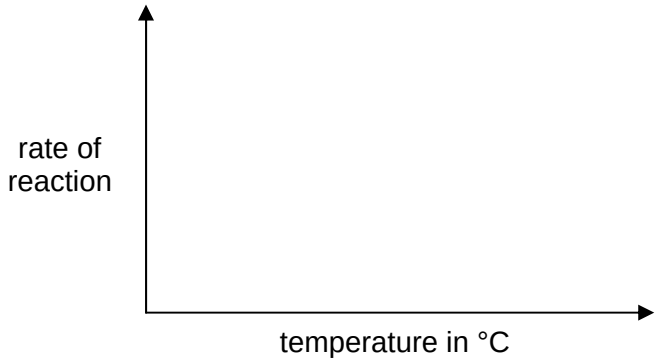
(b) Alex calculates the rate of reaction when salivary amylase breaks down starch.

She does this reaction four times at seven different temperatures.

Here are her results.

temperature in °C	rate of reaction in arbitrary units			
	experiment 1	experiment 2	experiment 3	experiment 4
20	5	8	5	4
30	9	11	6	10
40	14	17	19	16
50	9	4	3	5
60	2	3	1	2
70	1	0	0	1
80	0	0	0	0

(i) Sketch on the axes the **shape** of the graph that these data would give. Do not plot any data points.



[1]

(ii) Alex concludes that salivary amylase is well adapted to perform its role in the body.

Explain how the data and the graph you have drawn support this conclusion.

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

(iii) Alex repeats the experiment at 40 °C but uses solutions of the substrate and enzyme in dilute acid instead of water.

Suggest what effects this could have on the rate of reaction, and explain why.

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

[Total: 11]

4 Human enzymes can be made by genetically modified yeast cells.

- Human DNA is inserted into the yeast cells.
- The **modified** yeast cells now have the ability to synthesise human enzymes.

(a) Complete the sentences about the production of human enzymes by modified yeast cells.

Choose words from this list.

amino acids

bases

fatty acids

proteins

sugars

The modified yeast cells can code for the production of the human enzymes because their DNA now contains the correct sequence of ..... .

The human enzymes produced will have the correct number and sequence of …… . **[1]**

(b) The modified yeast cells go through the cell cycle and reproduce to form a culture.

The two main parts of the cell cycle are cell growth and mitosis.

Which statements about the cell cycle are true?

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

The nucleus divides during cell growth.	☐
The chromosomes are copied to form new strands of DNA.	☐
The number of organelles in each cell decreases as the cell grows.	☐
The copies of each chromosome stay together when a cell divides during mitosis.	☐
The number of chromosomes doubles in each cell before the cell divides.	☐

[1]

(c) **Meiosis** is a type of cell division that takes place in humans.

Use ideas about chromosomes to describe how cells made by meiosis are different from cells made by mitosis, and why this is important.

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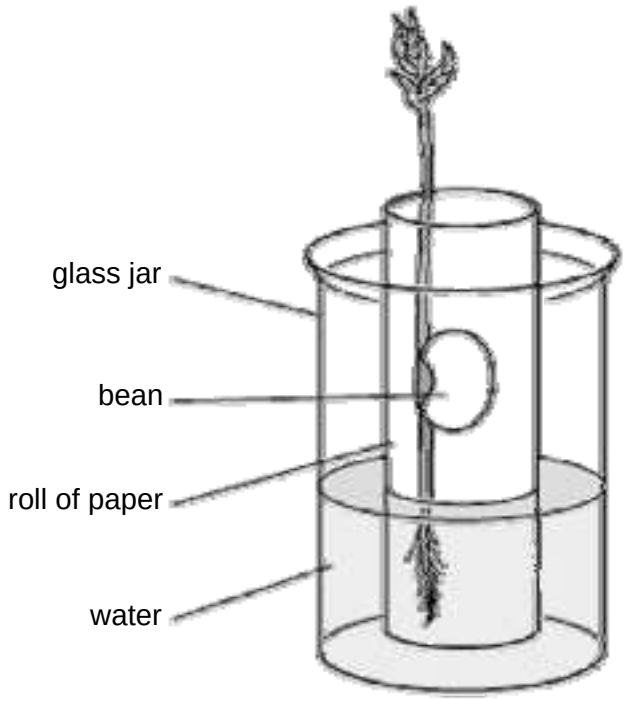
..... **[2]**

[Total: 4]

5 Joe does an experiment to investigate the effect of light on the growth of a bean seedling.

He sets up the experiment as shown in the diagram.



(a) Some parts of the seedling contain meristems.

Explain why these meristems are important to the seedling.

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

(b) Joe puts the glass jar containing the bean seedling next to a window.

After several days he notices that the tip of the seedling stem has grown towards the window.

Explain how the seedling stem grows towards the light coming through the window.

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

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

(c) A team of plant scientists predict that a chemical they have produced will make plant roots grow.

The team test their prediction by growing plants with and without the chemical and then measuring root growth.

They found that there was **agreement** between the data and their prediction. The scientists concluded that this proved the chemical made roots grow.

Write down whether you agree or disagree with this conclusion, and explain why.

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

[Total: 10]

6 A scientist is trying to produce specialised cells from adult stem cells. She hopes to use the specialised cells to replace damaged tissues in the human body.

She divides a sample of identical adult stem cells into two different solutions of chemicals. She wants to find out whether the chemicals affect the rate of cell division of the stem cells.

She counts the number of live cells present in each solution every six hours over a 24-hour period.

Here are her results.

solution	**number of live cells to the nearest thousand**			
	6 hours	**12 hours**	**18 hours**	**24 hours**
A	4000	16 000	16 000	32 000
B	2000	8000	32 000	128 000

(a) The scientist concludes that the **rate** of cell division increased steadily between 6 and 24 hours in solution **B**.

Is this conclusion correct? Justify your answer.

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

(b) The scientist also concludes that there was no cell division in solution **A** between hours 12 and 18 of the experiment.

(i) Suggest **two** reasons why this conclusion may **not** be correct.

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

(ii) The scientist realises that a fault in the incubator for solution **A** caused the temperature to vary between hours 12 and 18 of the experiment.

Suggest how this could account for the results at hours 12 and 18.

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

(c) The scientist needs to make the stem cells specialise so that she can use them to replace damaged tissues in the body.

One way to make the cells specialise is to expose them to certain chemicals.

What is the first thing that must happen in a cell before it can form a specific tissue type?

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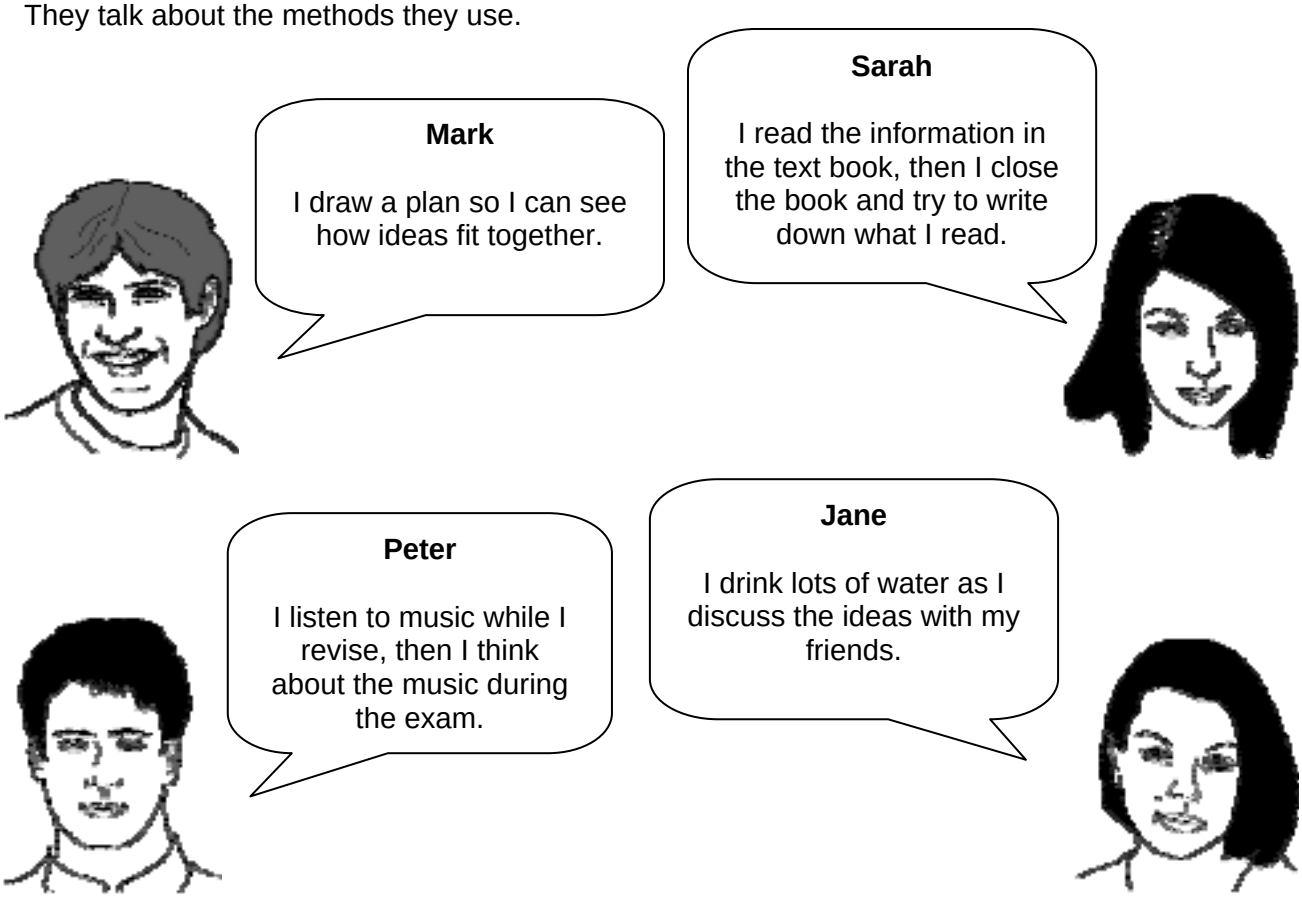
..... **[1]**

[Total: 6]

7 Four friends are revising for their exams.

They talk about the methods they use.



(a) Which person is using a stimulus to help them remember?

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

(b) Memory depends on two different processes.

Which person describes the use of both of these processes? Explain why you have chosen this person.

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

[Total: 3]

8 Brian walks out of the cinema into bright sunshine.

The bright light dazzles his eyes, and at first he cannot see properly.

Then, his eyes adjust as his pupils get smaller. This is the pupil reflex.

(a) Draw straight lines to join each **component** to the correct **part of the reflex**.

component	part of the reflex
muscle cells in iris	processor
light sensitive cells in retina	effector
central nervous system	receptor

[2]

(b) Newborn babies have some reflexes that disappear after time.

Write down two newborn reflexes.

1 .....

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

[Total: 4]

9 Pujitha is reading about an anti-depressant drug called paroxetine.

He reads that paroxetine increases the transmission of nerve impulses in the brain by increasing the concentration of serotonin.

Suggest how paroxetine could cause this change in serotonin concentration and the increase in transmission of nerve impulses in the brain.

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

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

[Total: 6]

10 Some scientists are investigating the speed at which nerve impulses travel along different human neurons.

They measure the length of four different neurons and record how long it takes for a nerve impulse to travel from one end of each neuron to its other end.

They repeat the experiment five times for each neuron. Here are their results.

neuron	length of neuron in m	mean time taken for impulse to travel along neuron in seconds
A	1.3	1.25
B	1.0	0.05
C	1.2	0.06
D	0.1	0.06

(a) How far would a nerve impulse travel along neuron **A** in 1 second?

answer = ... m **[1]**

(b) One of these neurons was a motor neuron that connected the spinal cord to a muscle in the big toe. The neuron was in a patient with multiple sclerosis (MS).

MS is a disease in which the patient's own immune system breaks down the fatty sheath on their neurons.

Which neuron was the motor neuron in the patient with MS? Justify your answer.

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

[Total: 3]

11 Stuart is a doctor. He has a patient with a brain injury.

Stuart wants to do research on this patient's brain.

Some people think he should be allowed to do this, while other people think he should not be allowed.

Discuss reasons in **support** of Stuart's plan to study this patient's brain.

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[Total: 4]

[Paper Total: 60]

END OF QUESTION PAPER

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