OCR
RECOGNISING ACHIEVEMENT

SPECIMEN F

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE **A162/01**

BIOLOGY A

Unit A162: Modules B4, B5, B6 (Foundation 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 **16** pages. Any blank pages are indicated.

For Examiner's Use		
	Max	**Mark**
1	**14**	
2	**4**	
3	**3**	
4	**5**	
5	**8**	
6	**6**	
7	**3**	
8	**4**	
9	**4**	
10	**6**	
11	**3**	
TOTAL	**60**	

Answer **all** the questions.

1 Katy uses the enzyme catalase to break down hydrogen peroxide.

The reaction gives off oxygen gas. She collects this oxygen gas.

Katy investigates the effect of different temperatures on the activity of the enzyme.

(a) Here are Katy's results.

temperature of catalase and hydrogen peroxide in °C	**mean volume of gas collected in 1 minute in cm^3**
20	16
30	35
40	40
90	0

(i) Explain the result obtained at 90 °C.

…… ……

…… ……

…… … **[3]**

(ii) Katy was careful to make sure that all factors other than temperature were kept constant in her experiment.

Explain why.

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.....

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

(b) Katy calculated the mean volumes from seven repeats of the experiment at each temperature.

Here are the raw data she collected at 20 ^{o}C.

volume of gas collected in 1 minute at 20 ^{o}C in cm^3						
14	15	20	16	15	14	18

(i) Calculate the **size** of the range of these raw data.

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

(ii) Katy concludes that the rate of reaction increases from 20°C to 30°C.

What does the size of this range compared to the results suggest about the confidence that Katy should have in her conclusion?

Explain your answer.

.....

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

(c) Katy repeats the experiment at 20 ^{o}C with fresh catalase enzyme.

She uses starch solution instead of hydrogen peroxide solution.

Suggest how much gas she will collect in 1 minute, and **explain** why.

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

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

[Total: 14]

2 This question is about respiration.

(a) A number of structures in plant cells have roles in the process of respiration.

Describe the roles of the mitochondria and cytoplasm in respiration.

(i) mitochondria

.....

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

(ii) cytoplasm

.....

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

(b) Plant cells can carry out **anaerobic** respiration.

Complete the word equation for anaerobic respiration in plants.

glucose → ..... + carbon dioxide (+ energy released) **[1]**

(c) Why do human muscle cells sometimes undergo anaerobic respiration during vigorous exercise?

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

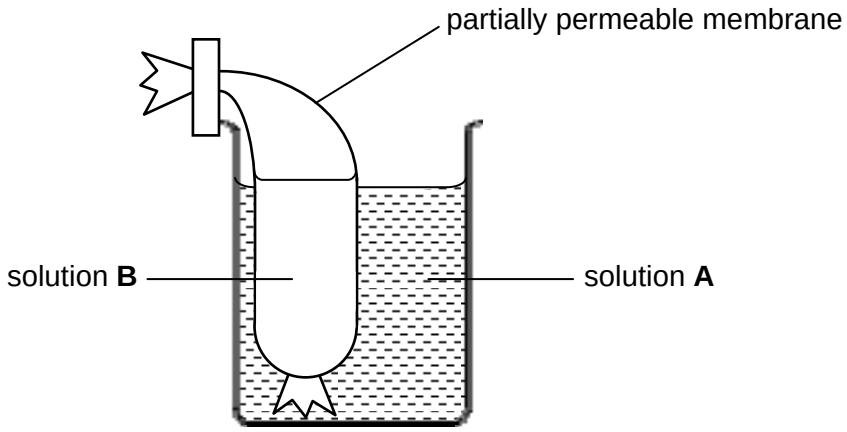
The blood does not supply enough glucose to the muscle cells.	☐
Too much blood reaches the muscle cells.	☐
The blood removes too much carbon dioxide from the muscle cells.	☐
The blood supplies too much lactic acid to the muscle cells.	☐
The blood does not supply enough oxygen to the muscle cells.	☐
The blood removes too much water from the muscle cells.	☐

[1]

[Total: 4]

3 Jenny is investigating the diffusion of glucose molecules across a partially permeable membrane.

She uses two solutions of glucose, **A** and **B**, separated by the membrane.



The concentration of glucose in solution **A** is higher than in solution **B**.

She measures the glucose concentration in each solution every two minutes. She records her results in arbitrary units.

time following the start of the investigation in minutes	**glucose concentration in arbitrary units**	
	solution A	**solution B**
2	30	10
4	25	15
6	22	18
8	20	20

(a) **(i)** Between which of these times is there the most movement of glucose from solution **A** to solution **B**?

answer ..... minutes and ..... minutes **[1]**

(ii) What does this result tell you about the link between diffusion and concentration difference?

.....

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

(b) Look at Jenny's results for solution **A** and solution **B**. The glucose concentrations in the two solutions appear to have balanced by the end of the experiment.

Predict what would happen if Jenny added more glucose to solution **B** at the end of the experiment.

.....

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

[Total: 3]

4 This question is about cell division and the cell cycle.

(a) The statements **A** to **E** are about either mitosis or meiosis.

A produces cells identical to the parent cells

B produces cells with only half the number of chromosomes

C produces gametes

D produces cells with a full set of paired chromosomes

E is a process within the cell cycle

Put the letters **A**, **B**, **C**, **D** and **E** in the correct column of the table to show whether they refer to either **mitosis** or **meiosis**.

mitosis	**meiosis**

[2]

(b) Why is it important that a cell produced by meiosis contains half the number of chromosomes of the parent cell?

.....

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

(c) Describe what happens to the cell organelles and the chromosomes during cell growth.

.....

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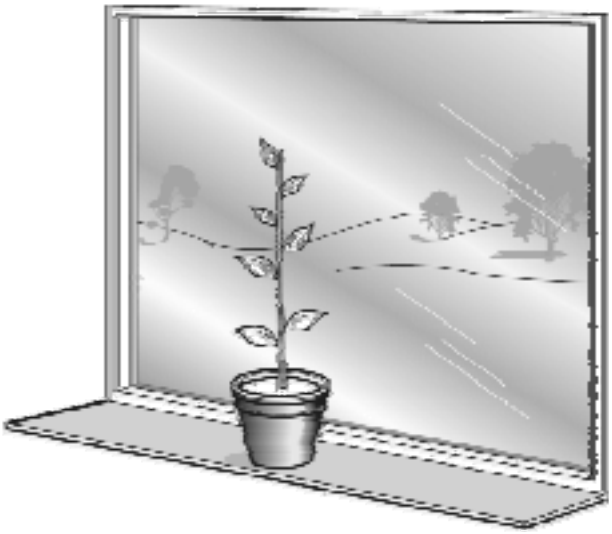
..... **[2]**

[Total: 5]

5 Joe does an experiment to show the effect of light on the growth of a plant.

He puts the plant next to a window.



(a) Explain

- what will happen to this plant if it is kept next to the window
- how this will affect this plant's chance of survival.

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

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

(b) Joe takes two cuttings from the plant.

He dips the cut stem surface of one of the cuttings in water, and dips the cut stem surface of the other cutting in a solution containing water, glucose and a plant hormone.

After 10 days, Joe looks to see whether roots have been produced at the cut stem of each cutting.

Here are his results.

	roots produced at cut stem
cutting dipped in solution containing water, glucose and a plant hormone	✓
cutting dipped in water only	✗

Joe concludes that the plant hormone had caused the plant stem cells to form root cells.

Use Joe's results to give one reason to **accept** his conclusion and one reason to **reject** his conclusion.

.....

.....

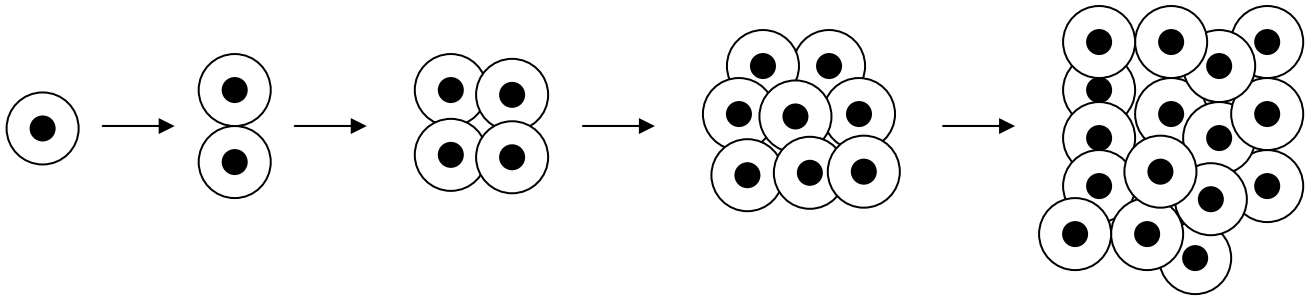
..... **[2]**

[Total: 8]

6 Embryos are formed by cell division in a fertilised egg cell (zygote).

(a) It is possible to produce clones of animals. This is done by removing cells from a single embryo and growing them to form identical embryos.

The human embryo grows from a single cell (zygote), which divides to form a group of cells.



zygote | 2 cell stage | 4 cell stage | 8 cell stage | 16 cell stage

(i) At which of these stages in humans is it **not** possible to use every cell to produce identical embryos?

..... cell stage **[1]**

(ii) What happens to the cells at this stage that stops them from producing identical embryos?

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

The cells …

… start to specialise. ☐

… start to break down. ☐

… become too large to divide. ☐

[1]

(b) A scientist investigates the growth rate of embryos.

She records the number of cells found in different embryos, **A** to **E**, over a 24-hour period following fertilisation.

embryo	**number of cells in each embryo**			
	6 hours	**12 hours**	**18 hours**	**24 hours**
A	2	8	64	128
B	4	16	32	64
C	2	8	16	32
D	4	16	16	32
E	2	8	32	128

(i) Use the results to explain why scientists seeking to produce clones cannot simply collect all cells at a fixed length of time after fertilisation.

.....

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

(ii) The results of the investigation can be studied to observe patterns of cell division and to make conclusions.

Describe **two** differences between the pattern of cell division shown by embryo **B** and the pattern shown by embryo **E** between hours 6 and 18 of the experiment.

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

(iii) The scientist concluded that the highest rates of cell division took place between the 6 hour and 12 hour period.

Identify **one** source of data in the results table that does not support the scientist's conclusion.

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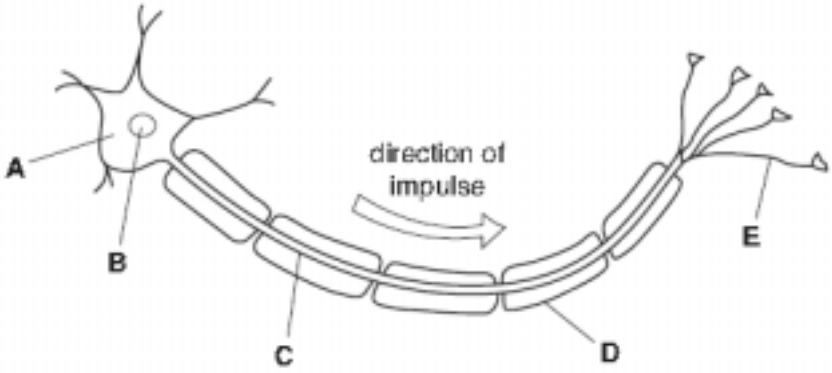
..... **[1]**

[Total: 6]

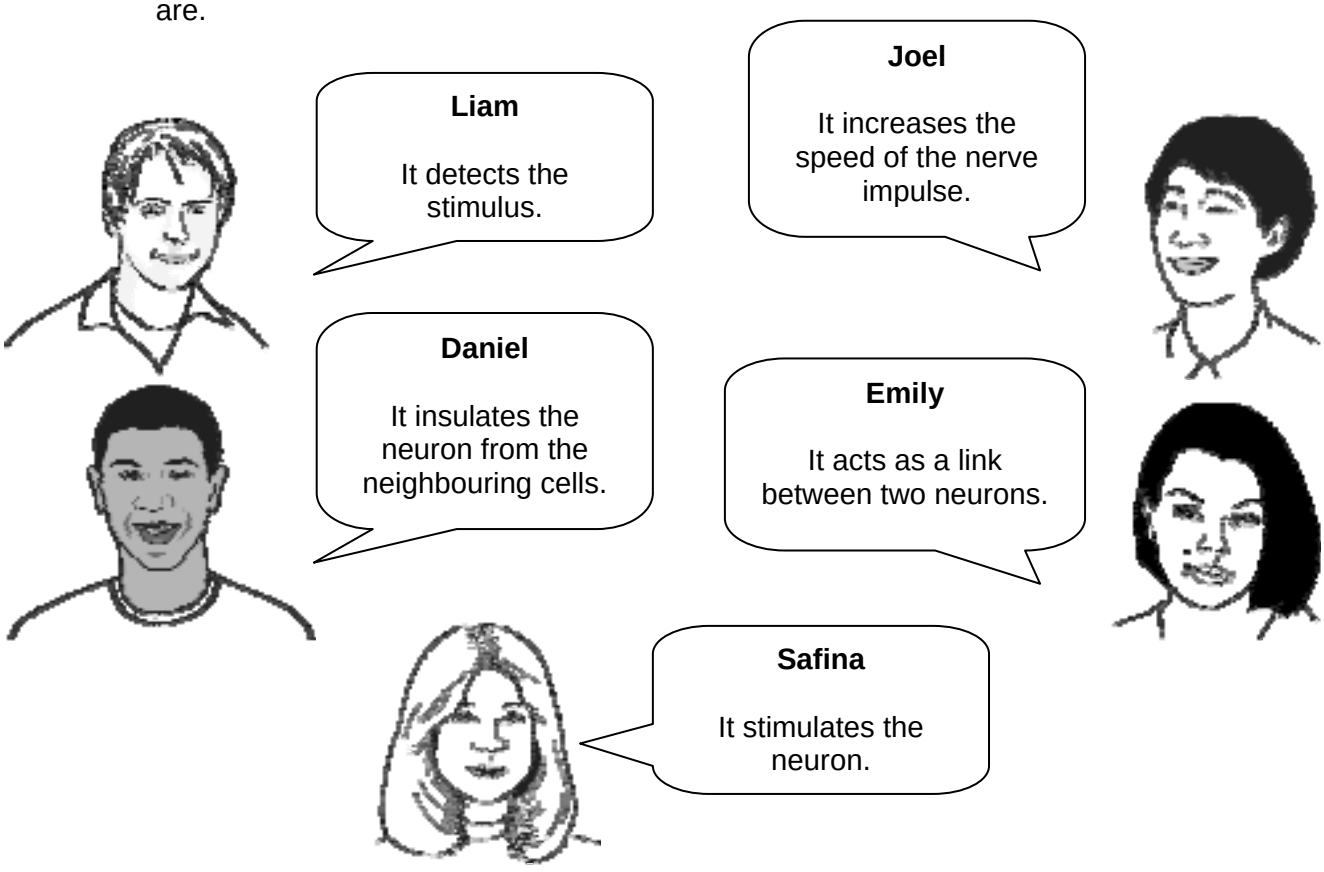
7 The human nervous system contains neurons.



(a) Which part, **A**, **B**, **C**, **D**, or **E**, is the fatty sheath?

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

(b) The fatty sheath has two functions. Some friends discuss what they think these functions are.



Which **two** people give correct answers?

answer ..... and ..... **[2]**

[Total: 3]

8 Some of our knowledge of how the nervous system works is based on experiments with animals.

People have different opinions about animal experiments.

Describe arguments **for** and arguments **against** animal experiments.

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

[Total: 4]

9 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]

10 The human nervous system is made up of the central nervous system (CNS) and the peripheral nervous system (PNS).

Outline the structures and organs that make up each of these parts, and

- explain what the CNS and PNS do
- suggest why it is more difficult for scientists to understand how the CNS works compared to the PNS.

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

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

[Total: 6]

11 Animals such as woodlice respond to changes in their environment.

Kieron does some experiments to test how woodlice react to light.

He prepares a tank for them, half of which is lit brightly with a lamp, and half of which he keeps dark and shaded.

He puts 20 woodlice into the tank and notes down how many are in each half of the tank after 20 minutes.

He repeats the experiment six times with different woodlice.

	number of woodlice						
	test 1	**test 2**	**test 3**	**test 4**	**test 5**	**test 6**	**mean**
light	17	9	7	3	5	2	
dark	3	11	13	17	15	18	

(a) Complete the table by calculating the mean number of woodlice in each area after 20 minutes. Record the mean for each group in the empty box, rounding your answers to the nearest whole number.

[1]

(b) Comment on what the mean values tell you about how woodlice react to light, and suggest why it is an advantage to woodlice to have this reflex.

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

[Total: 3]

[Paper Total: 60]

END OF QUESTION PAPER