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 cm³
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.

....

....

.... **[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 cm³						
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.

....

....

.... **[2]**

(c) Katy repeats the experiment at 20 °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.
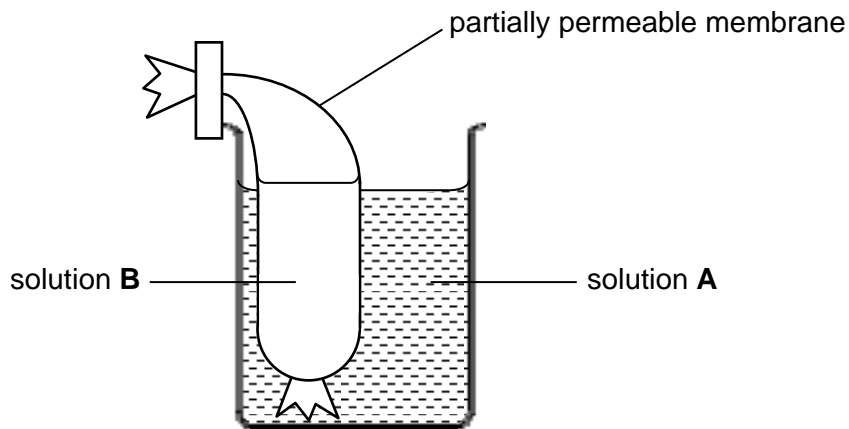
The concentration of glucose in solution **A** is higher than in solution **B**.

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.

....

....

.... [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.*

....

....

....

....

....

....

....

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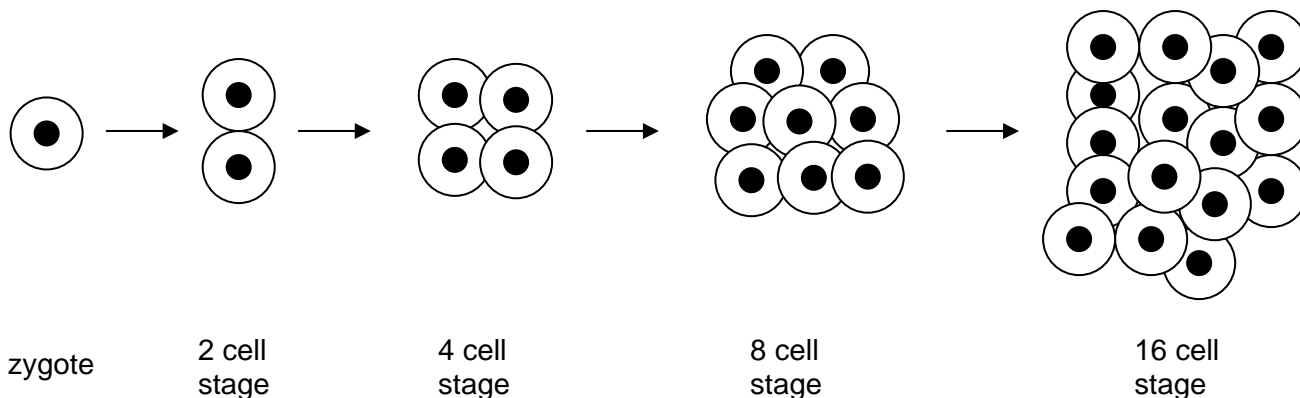
(i) At which of these stages in humans is it **not** possible to use every cell to produce identical embryos?

.... 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.

....

....

....

.... **[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.

....

.... **[1]**

[Total: 6]

7 The human nervous system contains neurons.
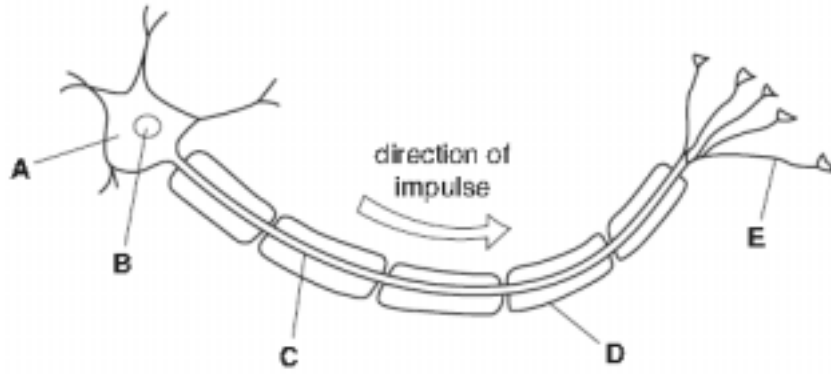
(a) Which part, **A**, **B**, **C**, **D**, or **E**, is the fatty sheath?

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

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

Liam

It detects the stimulus.

Joel

It increases the speed of the nerve impulse.

Daniel

It insulates the neuron from the neighbouring cells.

Emily

It acts as a link between two neurons.

Safina

It stimulates the neuron.

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.

....

....

....

....

....

.... **[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
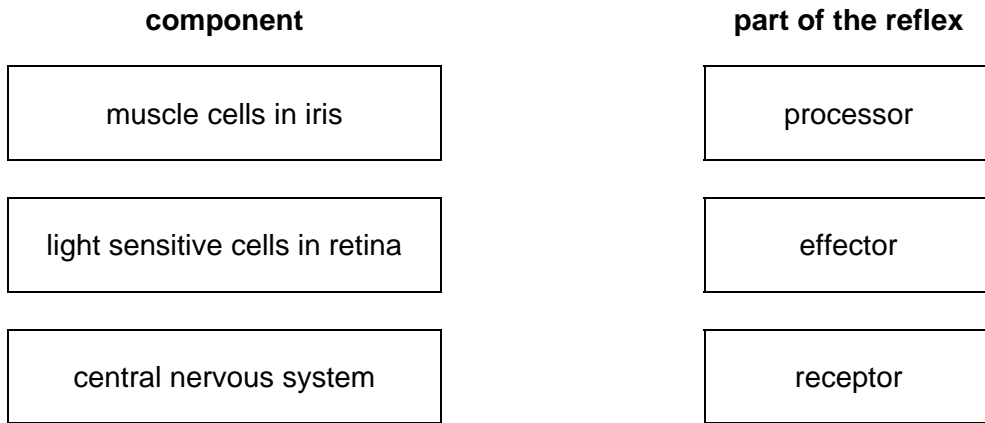
[2]

(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.*

....

....

....

....

....

....

....

.... **[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.

....

....

.... **[2]**

[Total: 3]

[Paper Total: 60]

END OF QUESTION PAPER

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE   **A162/01**
BIOLOGY A
Unit A162: Modules B4, B5, B6 (Foundation Tier)

MARK SCHEME

Duration: 1 hour

MAXIMUM MARK   60

This document consists of 16 pages

Guidance for Examiners

> Additional guidance within any mark scheme takes precedence over the following guidance.

1.   Mark strictly to the mark scheme.

2.   Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.

3.   Accept any clear, unambiguous response which is correct, e.g. mis-spellings if phonetically correct (but check additional guidance).

4.   Abbreviations, annotations and conventions used in the detailed mark scheme:

/	=	alternative and acceptable answers for the same marking point
(1)	=	separates marking points
not/reject	=	answers which are not worthy of credit
ignore	=	statements which are irrelevant - applies to neutral answers
allow/accept	=	answers that can be accepted
(words)	=	words which are not essential to gain credit
<u>words</u>	=	underlined words must be present in answer to score a mark
ecf	=	error carried forward
AW/owtte	=	alternative wording
ORA	=	or reverse argument

     e.g. mark scheme shows 'work done in lifting / (change in) gravitational potential energy' (1)
         work done = 0 marks
         work done lifting = 1 mark
         change in potential energy = 0 marks
         gravitational potential energy = 1 mark

5.   Annotations:
     The following annotations are available on SCORIS.

✓	=	correct response
✗	=	incorrect response
bod	=	benefit of the doubt
nbod	=	benefit of the doubt **not** given
ECF	=	error carried forward
^	=	information omitted
I	=	ignore
R	=	reject

6.   If a candidate alters his/her response, examiners should accept the alteration.

7. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

    e.g.
    For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.
☐	☐	✓̶
☐	☐	✓̶
✓	✓̶	✓
✓̶	✓̶	✓
☐	☐	☐
This would be worth 0 marks.	This would be worth one mark.	This would be worth one mark.

8. The list principle:
    If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, e.g. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

9. Marking method for tick boxes:

    Always check the additional guidance.

    If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.
    If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses.
    Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

    E.g. If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

    the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	✗	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	✗		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

10.   Three questions in this paper are marked using a Level of Response (LoR) mark scheme with embedded assessment of the Quality of Written Communication (QWC). When marking with a Level of Response mark scheme:

- Read the question in the question paper, and then the list of relevant points in the 'Additional guidance' column of the mark scheme, to familiarise yourself with the expected science. The relevant points are not to be taken as marking points, but as a summary of the relevant science from the specification.

- Read the level descriptors in the 'Expected answers' column of the mark scheme, starting with Level 3 and working down, to familiarise yourself with the expected levels of response.

- *For a general correlation between quality of science and quality of QWC*: determine the level based upon which level descriptor best describes the answer; you may awarded either the higher or lower mark within the level depending on the quality of the science and/or the QWC.

- *For high-level science but very poor QWC*: the candidate will be limited to Level 2 by the bad QWC no matter how good the science is; if the QWC is so bad that it prevents communication of the science the candidate cannot score above Level 1.

- *For very poor or totally irrelevant science but perfect QWC*: credit cannot be awarded for QWC alone, no matter how perfect it is; if the science is very poor the candidate will be limited to Level 1; if there is insufficient or no relevant science the answer will be Level 0.

Question			Expected answers	Marks	Additional guidance
1	(a)	(i)	**any three from:** the enzyme has <u>permanently</u> stopped working because the <u>active site</u> has changed shape (due to the high temperature), so hydrogen peroxide no longer fits so the enzyme cannot break down hydrogen peroxide to produce oxygen gas / the reaction cannot occur	[3]	**ignore** refs. to experimental error **credit** "the enzyme has been denatured"
		(ii)	so that she could obtain repeatable/reproducible results and could say for certain that temperature was causing the change in results because only the temperature varied	[2]	**ignore** reference to fair test
	(b)	(i)	6	[1]	**reject** "14 to 20"
		(ii)	the range is smaller than the differences between the mean results at 20°C and 30°C / the range does not overlap with the (mean) result at 30°C which increases confidence in the conclusion	[2]	**accept** confidence is decreased because the range is large compared to the (mean) result at 30°C / owtte for maximum of 1 mark

Question			Expected answers	Marks	Additional guidance
	(c)	✎	**[Level 3]** Answer correctly predicts that no gas will be collected and uses details of the 'lock and key' model in the correct order to explain why, with correct explanation of substrate/active site specificity. All information in the answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks) **[Level 2]** Answer correctly predicts that no gas will be collected and describes some details of the 'lock and key' model, but may omit some details and/or not make the correct order clear. Substrate specificity may be mentioned but not clearly explained. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks) **[Level 1]** Answer correctly predicts that no gas will be collected and may reference the 'lock and key hypothesis' by name or simply state that starch "will not fit" but does not explain any of the details. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	[6]	**relevant points include:** • she will not collect any gas • because catalase has an active site • and only the hydrogen peroxide (molecule) is the correct shape to fit into the active site • starch will not fit, so will not form an enzyme-substrate complex • so the reaction will not occur / starch will not be broken down • and no oxygen gas will be formed • this is the 'lock and key' model
			Total	**[14]**	

Question			Expected answers	Marks	Additional guidance
2	(a)	(i)	contains enzymes for the reactions in aerobic respiration	[1]	**accept** site of aerobic respiration
		(ii)	where enzymes are made for respiration / contains enzymes used in anaerobic respiration	[1]	**accept** site of anaerobic respiration
	(b)		ethanol	[1]	**accept** phonetic spellings
	(c)		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]	

Question			Expected answers	Marks	Additional guidance
3	(a)	(i)	2 and 4	[1]	
		(ii)	the amount of diffusion is greater when the concentration difference is greater	[1]	
	(b)		glucose <u>molecules</u> would <u>diffuse</u> across into solution **A** until they balance / reach equilibrium	[1]	
			Total	**[3]**	

Question			Expected answers		Marks	Additional guidance
4	(a)		**mitosis**	**meiosis**	[2]	one mark for each correct set of responses/ each box
			A	B		
			D	C		
			E			
	(b)		so that the cell/gamete can fuse with/fertilise another gamete and produce a zygote/cell with the correct number of chromosomes		[1]	
	(c)		organelles increase in number chromosomes are copied		[2]	
			Total		**[5]**	

Question			Expected answers	Marks	Additional guidance

5	(a)	✎	**[Level 3]**
			Answer correctly predicts that the stem will grow towards the light, explains how this directional growth occurs and explains why this gives the plant a better chance of survival. All information in the answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling.
			
			(5 – 6 marks)
			
			[Level 2]
			Answer correctly predicts that the plant will grow towards the light, and explains how this occurs but does not explain the effect on the plant's survival
			OR
			Answer correctly predicts that the plant will grow towards the light, and explains the effect on the plant's survival but does not explain how the directional growth occurs.
			For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling.
			
			(3 – 4 marks)
			
			[Level 1]
			Answer correctly predicts that the plant will grow towards the light, and may predict the effect of survival without explaining it, but does not explain how the directional growth occurs. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science.
			
			(1 – 2 marks)
			
			[Level 0]
			Insufficient or irrelevant science. Answer not worthy of credit.
			(0 marks)
				[6]	**relevant points include:**
					• the stem of the plant
					• will grow towards the light
					  - **ignore** references to the plant "bending" towards the light
					  - **accept** "will grow towards the window"
					• because the growth (rate) is higher on the dark side / lower on the side facing the light source
					• this directional growth is called phototropism
					• and will increase the plant's chance of survival
					• because the plant obtains more light
					• which allows it to photosynthesise more (rapidly) / make more food
					• this causes the plant to grow more quickly / is an advantage
					
					ignore refs. to the plant being better able to compete with other plants, as there are no other plants on the windowsill

Question			Expected answers	Marks	Additional guidance
5	(b)		accept the conclusion because roots grew in the solution containing the plant hormone reject the conclusion because the solution also contained glucose so we do not know which chemical caused the roots to grow	[2]	
			Total	[8]	

Question			Expected answers	Marks	Additional guidance
6	(a)	(i)	16 (cell stage)	[1]	
		(ii)	(the cells) start to specialise	[1]	
	(b)	(i)	after 12 hours some embryos have passed the stage where cells are unspecialised / 8 cell stage	[1]	
		(ii)	**any two from:** there were three rounds of cell division in embryo **B** but four in embryo **E** the rate of cell division in embryo **B** was , slower / half , (compared to embryo **E**) between 12 and 18 hours the rate of cell division was constant in embryo **E** (over the twelve hours) but , changed / decreased , in embryo **B** the , average / mean , rate of cell division was slower in embryo **B** than in embryo **E**	[2]	
		(iii)	there were 3 rounds of cell division in embryo A between 12 and 18 hours (which is more than in the 6 to 12 hour period for any of the embryos)	[1]	OWTTE **accept** any other correct pattern which does not support the conclusion
			Total	[6]	

Question			Expected answers	Marks	Additional guidance
7	**(a)**		**D**	**[1]**	
	(b)		Daniel Joel	**[2]**	**accept** answers in either order
			Total	**[3]**	

Question			Expected answers	Marks	Additional guidance
8			*against:* **any 2 from:** it is wrong / ethical objection it is cruel / it hurts the animals it is like playing God / religious objection animals cannot give consent drugs may work differently in animals compared to humans / information obtained may not be applicable to humans *in support:* **any 2 from:** it helps to discover new or useful information many people benefit and only a few animals are harmed / benefits outweigh costs it is better than experimenting with models / simulations it is cheaper than experimenting on humans allows larger scale experiments	**[4]**	credit a maximum of 2 points against animals experiments, and a maximum of 2 points in support of animal experiments **ignore** "better than testing on humans", unless explained
			Total	**[4]**	

Question			Expected answers	Marks	Additional guidance
9	(a)		**component** **part of the reflex** muscle cells in the iris — effector light sensitive cells in the retina — receptor central nervous system — processor	[2]	
	(b)		**any two from:** stepping grasping sucking	[2]	**accept** suckling for sucking
			Total	[4]	

Question	Expected answers	Marks	Additional guidance
10 ✎	**[Level 3]** Answer correctly names all parts of CNS and PNS, and clearly describes what the CNS and PNS do. Location and structure of CNS are clearly linked to the difficulties in studying it. All information in the answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks) **[Level 2]** Answer considers components and roles at a high level but only for **one** of the parts (CNS **or** PNS, but not both) **OR** Answer considers both parts (CNS and PNS) but omits details and/or technical terms. There is some mention of the difficulty in understanding how the CNS works e.g. less accessible than PNS, very complicated. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks) **[Level 1]** Answer names or describes components, but omits or confuses roles. Little or no effort is made to describe the difficulties of understanding the CNS. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	**[6]**	**relevant points include:** *CNS:* • comprises brain and spinal cord • processes signals from sensory neurons • links sensory neurons to motor neurons (via relay neurons) *PNS:* • comprises sensory and motor neurons • sensory neurons transmit/communicate/deliver signals/impulses from receptors (to CNS) - **accept** skin/eyes/ears/taste buds/nose etc. instead of the word "receptors" but award 5 marks max. • motor neurons transmit/communicate/deliver signals/impulses from CNS to effectors • motor neurons stimulate effectors - **accept** named types of effectors (e.g. muscles, endocrine glands) instead of the word "effectors"
Total		**[6]**	

Question			Expected answers	Marks	Additional guidance
11	(a)		light mean = 7 dark mean = 13	[1]	**accept** light = 5 if the outlier (test 1) is rejected **accept** dark = 15 if the outlier (test 1) is rejected
	(b)		woodlice prefer the dark which helps them avoid predators	[2]	**accept** this helps them stay cool / prevents drying out
			Total	[3]	

Assessment Objectives (AO) Grid

(includes quality of written communication ✎)

Question	AO1	AO2	AO3	Total
1(a)(i)		3		**3**
1(a)(ii)		2		**2**
1(b)(i)		1		**1**
1(b)(ii)		1	1	**2**
1(c)✎	2	4		**6**
2(a)(i)	1			**1**
2(a)(ii)	1			**1**
2(b)	1			**1**
2(c)	1			**1**
3(a)(i)		1		**1**
3(a)(ii)			1	**1**
3(b)			1	**1**
4(a)	2			**2**
4(b)	1			**1**
4(c)	2			**2**
5(a)✎	4	2		**6**
5(b)			2	**2**
6(a)(i)	1			**1**
6(a)(ii)	1			**1**
6(b)(i)			1	**1**
6(b)(ii)		2		**2**
6(b)(iii)			1	**1**
7(a)	1			**1**
7(b)	2			**2**
8		4		**4**
9(a)	1	1		**2**
9(b)	2			**2**
10✎	3	3		**6**
11(a)		1		**1**
11(b)		1	1	**2**
Totals	**26**	**26**	**8**	**60**

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