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EDEXCEL COMBINED SCIENCE BIOLOGY: QUESTIONS BY TOPIC

Cells and Control (2)

Combined Science Biology (Foundation) Topic 2

5 questions · 57 marks · Mark schemes included

Pearson Edexcel Combined Science (9-1) Biology 1SC0, Foundation Tier, June 2018 - June 2025

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HOW TO USE THIS BOOKLET

Questions run from the lowest mark tariff to the highest, so similar questions sit together.

Click any row below to jump straight to that question.

On every question page, click ANSWER in the top-right corner to jump to its mark scheme.

Diagrams, graphs, tables and data are printed exactly as they appeared in the original papers.

QUESTION	SOURCE	MARKS	PAGE
1. Q1	Paper 1 November 2021	8	4
2. Q5	Paper 1 November 2021	12	7
3. Q4	Paper 1 June 2022	12	11
4. Q4	Paper 1 June 2025	12	14
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QUESTIONS

5 questions · 57 marks · lowest tariff first



8-MARK QUESTIONS

1 question in this booklet



1 Figure 1 shows a cell from an onion root tip.

This cell is dividing by mitosis.

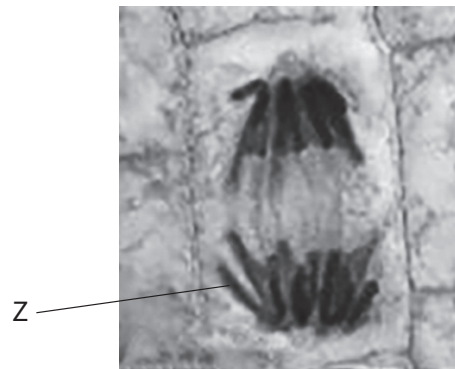


Figure 1

(a) (i) Which structure is labelled Z?

(1)

- ☐ A allele
- ☐ B chromosome
- ☐ C spindle
- ☐ D nuclear membrane

(ii) Mitosis produces new cells.

Give **two** reasons why mitosis is important in living things.

(2)

- 1
- 2

(iii) Draw **one** straight line from each stage of the cell cycle to its description.

(2)

stage of cell cycle

description

interphase

the nuclear membrane breaks down

two nuclei are formed

the cell divides in two

cytokinesis

a spindle is formed

DNA is copied

(b) A student is preparing a microscope slide of plant cells.

(i) State what can be added to the slide to make the plant cells more visible.

(1)

(ii) The microscope has two lenses:

- an eyepiece lens with $\times 10$ magnification
- an objective lens with $\times 40$ magnification

Which is the **total** magnification of this microscope?

(1)

☐ **A** $\times 4$

☐ **B** $\times 30$

☐ **C** $\times 50$

☐ **D** $\times 400$

(c) Name **one** part of a light microscope that can be moved to obtain a clear image of plant cells.

(1)

(Total for Question 1 = 8 marks)



12-MARK QUESTIONS

3 questions in this booklet



- 5 (a) Motor neurones are found in the nervous system.

Figure 8 shows a motor neurone.

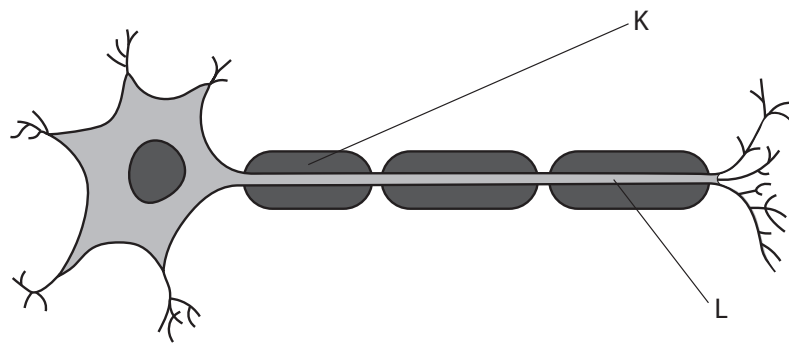


Figure 8

- (i) Draw an arrow on Figure 8 to show the direction of travel of an electrical impulse along the motor neurone.

(1)

- (ii) Name both structure **K** and structure **L**.

(2)

K

L

(b) Figure 9 shows part of a reflex arc in the spinal cord.

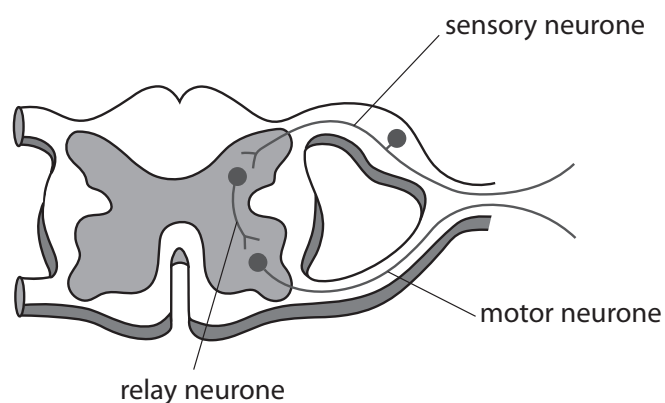


Figure 9

(i) Describe how an impulse passes from the relay neurone to the motor neurone.

(3)

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(ii) Explain the function of a reflex arc.

(2)

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- (c) A scientist investigated the reaction times of five students using a computer program.

The computer screen showed a blue square at the start.

As soon as the blue square turned yellow, each student had to press a key on the keyboard as fast as possible.

Figure 10 shows the results for the five students.

student	reaction time in milliseconds
1	245
2	200
3	210
4	215
5	225

Figure 10

- (i) Which is the median result for these students?

(1)

- ☐ **A** 200 milliseconds
- ☐ **B** 210 milliseconds
- ☐ **C** 215 milliseconds
- ☐ **D** 225 milliseconds



- (ii) The scientist wanted to investigate if the colours of the squares used on the computer program affected reaction time.

The computer program started with blue squares that turned into yellow squares.

Describe how the scientist could compare the reaction times of these students when they respond to red squares turning into yellow squares.

(3)

(Total for Question 5 = 12 marks)



- 4 (a) Figure 7 shows a height percentile chart for boys.

The numbers on the right-hand side of the graph show the percentiles of the population for each growth curve.

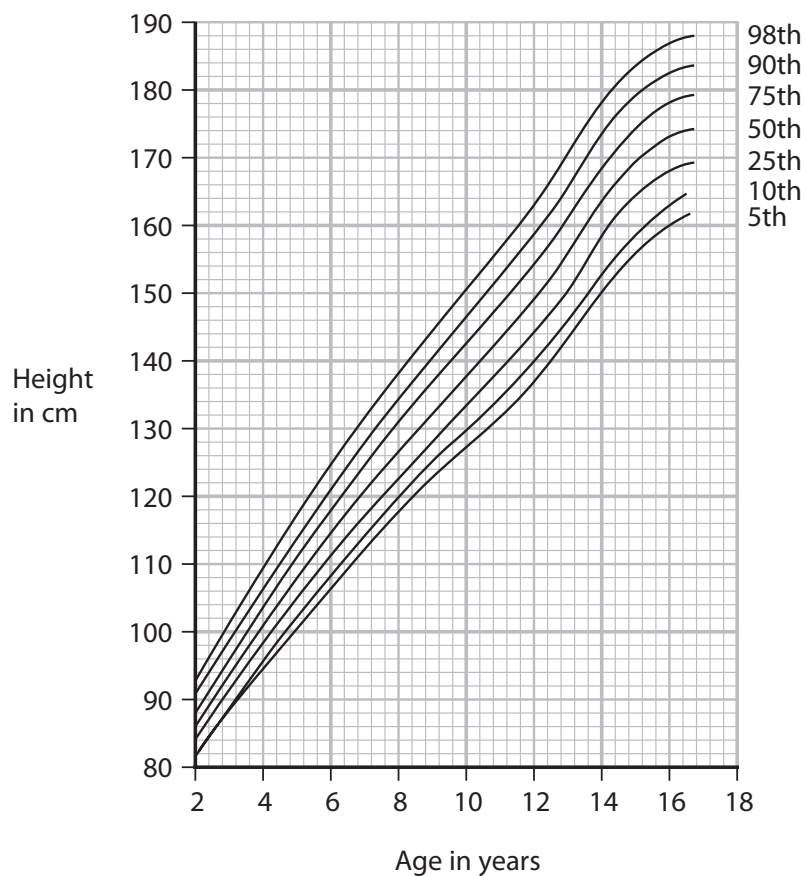


Figure 7

- (i) A 10-year-old boy has a height of 140 cm.

Which is the percentile range for height for this boy?

(1)

- ☐ **A** 10th to 25th
- ☐ **B** 25th to 50th
- ☐ **C** 50th to 75th
- ☐ **D** 75th to 90th

- (ii) State how percentile charts are used.

(1)

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(b) As we grow, we make new cells by mitosis and meiosis.

(i) The cells that are made can become specialised.

Figure 8 shows a diagram of a sperm cell.

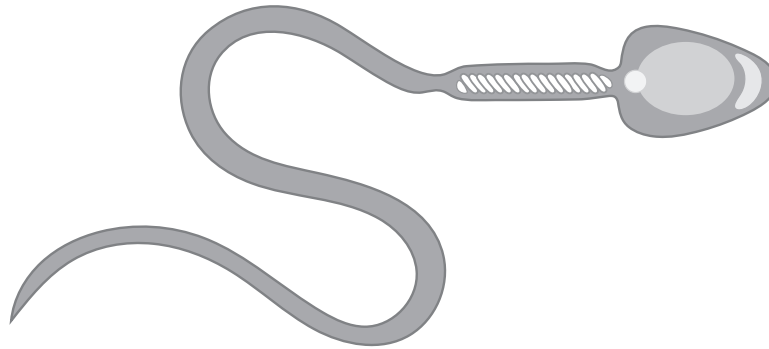


Figure 8

Describe **two** ways that the sperm cell is specialised.

(2)

- 1
- 2

(ii) Complete the table to show the results when a cell divides by mitosis or meiosis in humans.

Human body cells, except gametes, have 23 pairs of chromosomes.

(4)

	mitosis	meiosis
number of daughter cells produced		
number of chromosomes in each daughter cell		

(c) The tips of plant roots are where many cells are dividing by mitosis.

(i) Which term describes the area of a root where many cells are dividing by mitosis?

(1)

- ☐ A meristem
- ☐ B root hair cell
- ☐ C xylem
- ☐ D phloem

(ii) Plant root cells contain an enzyme that joins glucose molecules together to make starch.

Devise a plan to investigate the effect of pH on the activity of this enzyme.

(3)

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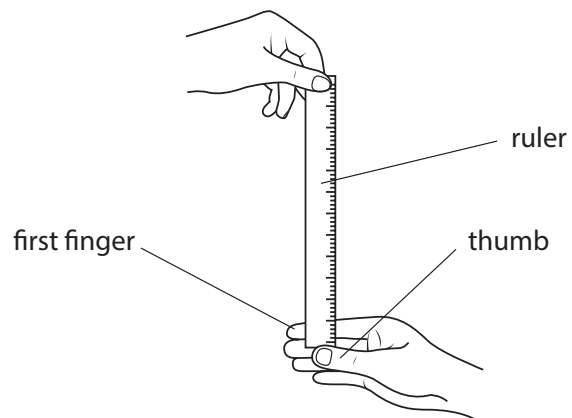
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(Total for Question 4 = 12 marks)

- 4 (a) A scientist uses the method shown in Figure 7 to investigate the reaction times of some students.



Method

The scientist

- holds the ruler as shown
- suddenly lets the ruler fall

The student

- catches the ruler between their first finger and thumb
- measures a variable

Figure 7

- (i) Which measurement should be recorded to compare reaction times?

(1)

- ☐ A the time taken to complete the investigation
- ☐ B the distance the ruler falls
- ☐ C the distance between the two hands
- ☐ D the temperature of the room

(ii) Figure 8 shows the results of five students.

student	distance measured in cm
J	15
K	12
L	14
M	13
N	13

Figure 8

Which is the mean of the results in Figure 8?

(1)

- ☐ **A** 12.2 cm
- ☐ **B** 12.8 cm
- ☐ **C** 13.4 cm
- ☐ **D** 14.3 cm

(iii) Explain which of the five students had the slowest reaction time.

(2)

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(iv) Give **two** variables that need to be controlled during this investigation.

(2)

1

2

(b) Figure 9 shows a motor neurone.

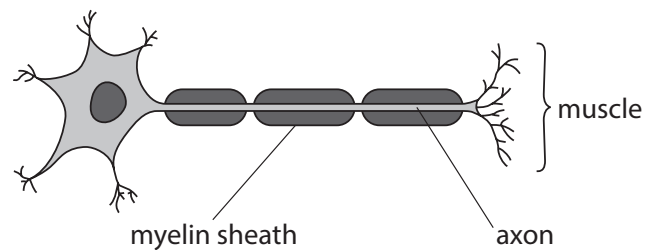


Figure 9

(i) State the role of a motor neurone in a reflex arc.

(1)

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(ii) Explain the function of the myelin sheath.

(2)

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(iii) Describe how a nerve impulse passes across the gap between two neurones.

(3)

(Total for Question 4 = 12 marks)



13-MARK QUESTIONS

1 question in this booklet



6 Figure 8 shows a banana plantation.



© warmer/Shutterstock

Figure 8

After the bananas have been harvested, the old plants are cut down.

The suckers then develop into mature plants producing the next crop of bananas.

The tip of each sucker contains a group of cells called a meristem.

(a) (i) Describe the function of a meristem in the growth of a plant.

(2)

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(ii) A student took a sample of cells from a meristem to view under a light microscope.

Describe how the student would prepare a microscope slide using these cells.

(3)

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(b) Figure 9 is a drawing of a eukaryotic cell.

Structure **Z** is found in plant leaf cells.

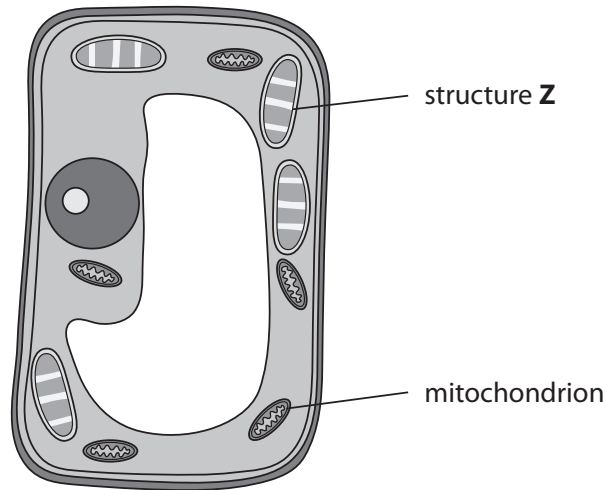


Figure 9

(i) Name structure **Z**.

(1)

(ii) Give **one** function of the mitochondrion.

(1)

* (c) DNA is found in the nucleus of cells.

Describe the structure of DNA and how it can be extracted from plant cells.

(6)

(Total for Question 6 = 13 marks)



MARK SCHEMES

official Pearson Edexcel mark schemes



Question Number	Answer	Mark
1(a)(i)	B chromosome The only correct answer is B <i>A is not correct because Z is not an allele</i> <i>C is not correct because Z is not the spindle</i> <i>D is not correct because Z is not the nuclear membrane</i>	(1) AO1 1

Question Number	Answer	Mark
1(a)(ii)	Any two from: • for growth (1) • for repair (of tissues / organs) (1) • for asexual reproduction (1)	(2) AO1 1

Question Number	Answer	Mark
1(a)(iii)	stage of cell cycle interphase cytokinesis description the nuclear membrane breaks down two nuclei are formed the cell divides in two a spindle is formed DNA is copied Do not award mark if two lines are drawn from interphase box Do not award mark if two lines are drawn from cytokinesis box	(2) AO1 1

Question Number	Answer	Additional guidance	Mark
1(b)(i)	use a stain / named stain	accept dye accept add a cover slip	(1) A02 2

Question Number	Answer	Mark
1(b)(ii)	D x 400 The only correct answer is D <i>A is not correct because the total magnification is not x 4</i> <i>B is not correct because the total magnification is not x 30</i> <i>C is not correct because the total magnification is not x 50</i>	(1) A02 2

Question Number	Answer	Additional guidance	Mark
1(c)	focusing wheel	accept (move the) stage / lens (up and down) accept (adjust) mirror	(1) A01 1

(Total for question 1 = 8 marks)

Question Number	Answer	Mark
5(a)(i)	arrow showing direction of travel is from left to right	(1) AO1 1

Question Number	Answer	Mark
5(a)(ii)	K – myelin (sheath) (1) L – axon (1)	(2) AO1 1

Question Number	Answer	Additional guidance	Mark
5(b)(i)	A description including three from: - the impulse (in the relay neurone) triggers the release of a chemical (1) - neurotransmitter (1) (neurotransmitter) diffuses (1) - across the synapse (1) - new impulse triggered in {motor neurone / next neurone} (1)	accept chemical messenger accept across the gap	(3) AO1 1

Question Number	Answer	Additional guidance	Mark
5(b)(ii)	An explanation linking two from: • a process that occurs in response to danger (1) • which bypasses the {brain / parts of the brain} / is an {involuntary process / subconscious process} (1) • so there is a faster transmission (of electrical impulses) / faster response / allows a quick reaction (1) • to protect the body from harm (1)	accept goes to the spinal cord accept react without thinking accept examples of actions to protect the body e.g. pulling hand away	(2) A01 1

Question Number	Answer	Mark
5(c)(i)	C 215 milliseconds The only correct answer is C <i>A is not correct because the median is not 200 milliseconds</i> <i>B is not correct because the median is not 210 milliseconds</i> <i>D is not correct because the median is not 225 milliseconds</i>	(1) A02 1

Question Number	Answer	Additional guidance	Mark
5(c)(ii)	A description including three from: • measure their reaction time using red squares (1) • keep everything else the same (as using blue squares) (1) • repeat measurements (for each student) (1) • calculate a mean reaction time (1) • control other variables (1)	accept see how fast they react with red squares accept examples of other variables e.g. tiredness / environment / health	(3) AO3 3a

(Total for question 5 = 12 marks)

Question number	Answer	Mark
4(a)(i)	C 50th to 75th The only correct answer is C <i>A is incorrect because his height percentile is 50 – 75</i> <i>B is incorrect because his height percentile is 50 – 75</i> <i>D is incorrect because his height percentile is 50 – 75</i>	(1) A03 1a

Question number	Answer	Mark
4(a)(ii)	Any one from: - to monitor height / growth (over time) (1) - to compare the growth of an individual against the standard growth pattern (1)	(1) A01 1

Question number	Answer	Additional guidance	Mark
4(b)(i)	A description including any two from: - tail / flagellum (1) - acrosome / sac with enzymes (1) (many) mitochondria (1) - streamlined (1) - haploid / has 23 chromosomes (1)	accept has enzymes to digest the membrane around the egg	(2) A01 1

Question number	Answer	Mark									
4(b)(ii)	Award one mark for each correct square in the table. <table border="1"> <thead> <tr> <th></th><th>mitosis</th><th>meiosis</th></tr> </thead> <tbody> <tr> <td>number of daughter cells produced</td><td>2</td><td>4</td></tr> <tr> <td>number of chromosomes in each daughter cell</td><td>46 / <u>23 pairs</u></td><td>23</td></tr> </tbody> </table> For mitosis (number of chromosomes) ignore 23 on its own, must be qualified as 23 pairs		mitosis	meiosis	number of daughter cells produced	2	4	number of chromosomes in each daughter cell	46 / <u>23 pairs</u>	23	(4) A01 1
	mitosis	meiosis									
number of daughter cells produced	2	4									
number of chromosomes in each daughter cell	46 / <u>23 pairs</u>	23									

Question number	Answer	Mark
4(c)(i)	A meristem The only correct answer is A <i>B is incorrect because root hair cells are not the area of the root where many cells are dividing by mitosis.</i> <i>C is incorrect because xylem is not the area of the root where many cells are dividing by mitosis.</i> <i>D is incorrect because phloem is not the area of the root where many cells are dividing by mitosis.</i>	(1) A01 1

Question number	Answer	Additional guidance	Mark
4(c)(ii)	An answer including three of the following • add {enzyme (solution) / plant root cells} to glucose (solution) (1) • test for presence of starch (1) • test {each minute / at set time intervals} / time until a positive result for starch (1) • repeat at more than one pH / (in buffers) of different pH values (1) • reference to controlling one variable, e.g., same volume of solutions / same temperature (1)	accept use iodine	(3) A03 3a

(Total marks for question 4 = 12)



Question number	Answer	Mark
4(a)(i)	B the distance the ruler falls The only correct answer is B A, C and D are not correct because they would not allow the reaction times to be compared	(1) AO2 2

Question number	Answer	Mark
4(a)(ii)	C 13.4 cm The only correct answer is C A, B and D are not correct because they are not the calculated mean	(1) AO2 1

Question number	Answer	Mark
4(a)(iii)	An explanation linking: (student) J (1) - because the ruler fell the longest distance before it was caught / 15 cm is the longest distance (1)	(2) AO3 2a 2b

Question number	Answer	Additional guidance	Mark
4(a)(iv)	Any two from: - the same ruler (1) - distance between {the finger and thumb / hands} / height ruler is dropped from (1) - catch ruler with same / dominant hand (1) - no stimulant / depressant / drugs taken (1) - same environmental conditions (1)	accept size / length / mass of ruler accept keeping named environmental conditions the same, e.g. noise, room temperature	(2) AO3 3b

Question number	Answer	Additional guidance	Mark
4(b)(i)	transmit (electrical) {impulses / messages / signals} from the CNS (1) OR transmit (electrical) {impulses / messages / signals} to effectors (1)	accept brain / spinal cord / relay neurone for CNS accept muscles / glands for effector	(1) AO1 1

Question number	Answer	Additional guidance	Mark
4(b)(ii)	An explanation including two from: - insulates the axon (1) - so nerve impulses travel faster (1)	accept messages / signals for impulses accept ensures impulses move in one direction (1)	(2) AO1 1

Question number	Answer	Additional guidance	Mark
4(b)(iii)	A description including three from: • a chemical is released (1) • neurotransmitter (1) • (neurotransmitter / chemical) diffuses (1) • (across the) synapse (1) • (neurotransmitter / chemical) binds to receptors (1)	accept named neurotransmitter accept moves from a high concentration to a low concentration reject impulse diffuses across accept (across the) synaptic cleft (neurotransmitter / chemical) triggers an impulse / message / signal in the next neurone (1) by neurotransmission (1)	(3) AO1 1

Total for Question 4 = 12 marks

Question number	Answer	Additional guidance	Mark
6(a)(i)	Two from: (meristem cells) are undifferentiated (1) (meristem cells) divide / produce more cells (1) - by mitosis (1)	accept are stem cells accept (the cells produced) can differentiate /become specialised/elongate (1)	(2)

Question number	Answer	Additional guidance	Mark
6(a)(ii)	An answer including - use a thin section of {cells/meristem} (1) - add a stain / named stain (1) - place a cover slip on top of the sample (1)	accept add a sample of the cells to the microscope slide accept a description of a coverslip	(3)

Question number	Answer	Mark
6(b)(i)	chloroplast / chloroplasts accept phonetically correct misspellings	(1)

Question number	Answer	Additional guidance	Mark
6(b)(ii)	(aerobic) respiration / release energy	ignore make / produce energy accept word equation for respiration accept to produce ATP	(1)



Question number	Indicative content	Mark
6(c)	Structure of DNA • polymer • four bases (A, T, C, G) • (complementary) base pairs • A-T and C-G • (weak) hydrogen bonds join bases • two strands • double helix • nucleotides DNA extraction • crush up / grind / squash cells • add detergent / salt solution / protease • heat in a water bath / heat to 60°C • add to (ice cold) ethanol • DNA forms as a precipitate /white strands	(6)

Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1–2	• Demonstrates elements of biological understanding, some of which is accurate. Understanding of scientific, enquiry, techniques and procedures lacks detail. • Presents a description which is not logically ordered and with significant gaps.
Level 2	3–4	• Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas, enquiry, techniques and procedures is not fully detailed and/or developed. • Presents a description of the procedure that has a structure which is mostly clear, coherent and logical with minor steps missing.
Level 3	5–6	• Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas, enquiry, techniques and procedures is detailed and fully developed. • Presents a description that has a well-developed structure which is clear, coherent and logical.



Level	Mark	Additional Guidance	General additional guidance The level is determined by the areas of indicative content covered within the response. The mark within the level is determined by the detail within each description.
	0	No rewardable material	
Level 1	1–2	- A simple description of DNA structure. - A brief description of how to extract DNA from plants	<u>Possible candidate responses</u> - DNA contains four bases - DNA can be extracted by crushing up fruit
Level 2	3–4	- A description of DNA structure. - A description of how to extract DNA from plants	<u>Possible candidate responses</u> - DNA contains four bases A, T, C and G and DNA is a double helix. - DNA can be extracted by crushing up fruit and adding detergent.
Level 3	5–6	- A detailed description of DNA structure. - A detailed description of how to extract DNA from plants.	<u>Possible candidate responses</u> - The DNA molecule is a double helix. DNA contains four bases which pair A-T and C-G. The bases are held together by hydrogen bonds. - DNA can be extracted by crushing up fruit with detergent and pouring the mixture into (ice-cold) ethanol. DNA appears as a precipitate.

(Total for question 6 = 13 marks)

