

Question	Part	Step	Answer	Mark scheme
1	a	4th 4th	Lines connecting: circulatory system → carries oxygen ... urinary system → removes poisonous ... locomotor system → supports the body ... breathing system → moves air ...	2 marks All correct = 2 marks 2 or 3 correct = 1 mark 0 or 1 correct = 0 marks
	b	4th	digestive system	1 mark
2		7th	B selective breeding	1 mark
3	a	6th 6th	Any two from: <ul style="list-style-type: none"> • has tail/can swim/is motile • has streamlined shape • has mitochondria 	2 marks – 1 for each point
	bi	4th	A	1 mark
	bii	6th 6th	Listed under 'from mother to baby': oxygen nutrients drugs Listed under 'from baby to mother': carbon dioxide	2 marks All 4 correct = 2 marks 3 correct = 1 mark Fewer than 3 correct = 0 marks
4	ai	6th	B Triceps correctly drawn on diagram (labelled B). The mark is for the drawing not the labelling.	1 mark
	aii	5th	D Muscle A relaxes and muscle B contracts.	1 mark
	b	7th 7th 7th	Any three from: <ul style="list-style-type: none"> • the longer the distance run, the more dark cells • sprinters have more light/fewer dark • 800 m runners have 50% of each type • 5000 m runners have more dark/fewer light 	3 marks – 1 for each point
5	a	5th 5th	110 – 65 45 bpm	2 marks – 1 for each point Award both marks for a correct answer (number and unit) with no working shown
	b	5th	(pulse rate) increases	1 mark
	c	6th 6th	Any two from: <ul style="list-style-type: none"> • size of the person • sex of the person • influence of food/water intake • drug influence • medical conditions 	2 marks – 1 for each point
6	ai	7th	27 cm ³	1 mark – Number and unit

Question	Part	Step	Answer	Mark scheme
	aii	7th	54 cm ²	1 mark – Number and unit
	b	9th 9th	SA : volume ratio of cube A is 54 : 27 = 2 : 1 cube A has a larger SA : volume ratio than cube B/cube A has double the SA : volume ratio of cube B	2 marks – 1 for each point
	c	7th 7th 7th	Any three from: <ul style="list-style-type: none"> • large surface area/many alveoli • reference to more/faster diffusion • good blood supply • thin walls 	3 marks
7	a	4th 4th	caffeine alcohol nicotine	2 marks – 1 for each point (any order)
	b	4th 4th	(an addict) feels they cannot do without them (examples of) withdrawal symptoms if they try to stop	2 marks – 1 for each point
	c	5th 7th 8th	Any three from: <ul style="list-style-type: none"> • alcohol is a depressant/increases reaction time • slower nerve impulses to brain • takes longer to realise child is there • takes longer to contract muscle/respond/brake • car has not slowed down as much (with alcohol) before hitting child 	3 marks – Accept reverse argument for without alcohol
8	a	6th	×50	1 mark
	bi	5th 5th 5th	X is cytoplasm Y is chloroplast Z is cell (surface) membrane	3 marks – 1 for each point
	bii	7th	mitochondria	1 mark
	c	8th 8th	[LHS] glucose + oxygen (either order) [RHS] carbon dioxide + water (either order) [Ignore references to ATP/energy.]	2 marks – 1 for correct format of equation, 1 for correct products and reactants
	d	8th 8th	Any two from: <ul style="list-style-type: none"> • many chloroplasts... • ...absorb/trap light • ...for photosynthesis 	2 marks – 1 for each point
	e	6th	B Plants use oxygen for respiration.	1 mark
9	a	5th	if/how water flea heart rate changes with temperature	1 mark
	bi	5th	as temperature increases, heart rate increases	1 mark

Question	Part	Step	Answer	Mark scheme
	bii	6th 6th	Any two from: <ul style="list-style-type: none"> • did not test above 25 °C • did not repeat investigation • could have been higher at an intermediate temperature (example given) 	2 marks – 1 for each point
	ci	5th 5th	both show heart rate increased with increasing temperature all student B's results higher than student A's also accept use of student's names – Sofia (student A) and Matthias (student B)	2 marks – 1 for each point
	cii	6th 6th	Any two from: <ul style="list-style-type: none"> • student B was using a different water flea species • student B left the slides on the microscope for longer, which warmed up the water fleas • student B made a mistake and timed for longer than one minute • they might have measured temperature differently • there might have been some other variable such as light that also affected the heart rate • there might have been some chemicals in the water that affected the water flea Also accept use of student's names – Sofia (student A) and Matthias (student B)	2 marks – 1 for each point
	d	6th 6th 6th	Any three from: <ul style="list-style-type: none"> • leave water fleas in solution with and without alcohol • control other variables/named variables • put the water fleas under a microscope • count the heartbeats • repeat 	3 marks

Question	Part	Step	Answer	Mark scheme
10		See below	<p>Answers will be credited according to student's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and students are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <p>Indicative content:</p> <ul style="list-style-type: none"> • size/surface area of body parts/ears • fur colour as camouflage in snow • fur thickness for heat loss/insulation • fat storage even/localised • behavioural adaptations, e.g. shade/burrow/slow pace/avoid midday activity/hibernate. 	See marks below

Marks	Step	Descriptor
1–2	4th	<p><u>Level 1</u></p> <p>A description that includes the role of at least one adaptation shown in the picture(s) and its purpose.</p> <p>The description contains basic information with some attempt made to link knowledge and understanding to the given context.</p>
3–4	5th	<p><u>Level 2</u></p> <p>A description that includes the role of at least two different adaptations shown in the picture(s) and their purpose.</p> <p>The description shows some linkages and lines of scientific reasoning with some structure.</p>
5–6	6th–7th	<p><u>Level 3</u></p> <p>A description that includes the role of most adaptations extending beyond the picture(s) and their purpose.</p> <p>The description shows a well-developed, sustained line of scientific reasoning which is clear and logically structured.</p>

Final Step Calculation

Marks	Step
1–10	Below 4th
11–19	4th
20–30	5th
31–40	6th
41–48	7th
49–54	8th
55–60	9th

Question	Part	Step	Answer	Mark scheme
1	a	5th	if/how water flea heart rate changes with temperature	1 mark
	bi	5th	as temperature increases, heart rate increases	1 mark
	bii	6th 6th	Any two from: <ul style="list-style-type: none"> did not test above 25 °C did not repeat investigation could have been higher at an intermediate temperature (example given) 	2 marks – 1 for each point
	ci	5th 5th	both show heart rate increased with increasing temperature all student B's results higher than student A's also accept use of student's names – Sofia (student A) and Matthias (student B)	2 marks – 1 for each point
	cii	6th 6th	Any two from: <ul style="list-style-type: none"> student B was using a different water flea species student B left the slides on the microscope for longer, which warmed up the water fleas student B made a mistake and timed for longer than one minute they might have measured temperature differently there might have been some other variable such as light that also affected the heart rate there might have been some chemicals in the water that affected the water flea Also accept use of student's names – Sofia (student A) and Matthias (student B)	2 marks – 1 for each point
	d	6th 6th 6th	Any three from: <ul style="list-style-type: none"> leave water fleas in solution with and without alcohol control other variables/named variables put the water fleas under a microscope count the heartbeat repeat 	3 marks – 1 for each point
2	a	6th 7th 7th	Any three from: <ul style="list-style-type: none"> using photosynthesis water and carbon dioxide needed oxygen and glucose produced chlorophyll/chloroplasts trap energy (transferred by light) 	3 marks – 1 for each point
	b	6th	A chlorophyll	1 mark
	c	7th 7th	photosynthesis/glucose production stops less starch stored in the bulb (for the following year) if cut back too soon	2 marks – 1 for each point

Question	Part	Step	Answer	Mark scheme
3		5th	Any three from:	3 marks – Accept reverse argument for without alcohol
		7th	• alcohol slows reactions/increases reaction time	
		8th	• slower nerve impulses to brain	
			• takes longer to realise child is there	
4			• takes longer to contract muscle/respond/brake	1 mark
			• car has not slowed down as much (with alcohol) before hitting child	
	a	6th	x50	
	b	7th	B mitochondria	
5	c	8th	[LHS]	2 marks – 1 for correct format of equation, 1 for correct products and reactants
		8th	glucose + oxygen (either order)	
			[RHS]	
			carbon dioxide + water (either order)	
6			[Ignore references to ATP/energy.]	2 marks – 1 for each point
	d	8th	large surface area	
		8th	speeds up/helps absorption (of nutrients)	
7	ai	7th	27 cm ³	1 mark – Number and unit
	aii	7th	54 cm ²	1 mark – Number and unit
	b	9th	SA : volume ratio of cube A is 54 : 27 = 2 : 1	3 marks – 1 for each point
		9th	cube B is 96 : 64 = 1.5 : 1	
8		9th	cube A has a larger SA : volume ratio than cube B	
	c	7th	Any three from:	3 marks – 1 for each point
		7th	• large surface area/many alveoli	
		7th	• reference to more/faster diffusion	
9			• good blood supply	3 marks – 1 for each point
			• thin walls	
10	a	5th	Any three from:	3 marks – 1 for each point
		6th	• mean mass for variety A always higher than for variety B/always higher than or similar to variety B	
		6th	• mean mass for both varieties was higher with other plants (than alone)	
			• variety A has greatest mean mass when grown with poppies	
11			• variety A had greater mean mass than variety B with both types of other plant	3 marks – 1 for each point
			• correct pair of data values to support any statement (award once)	
	b	8th	B selective breeding	1 mark

Question	Part	Step	Answer	Mark scheme
	ci	5th 5th	$\frac{(32 + 33 + 25)}{3}$ 30 g	2 marks – 1 for the working and 1 for the correct answer (number and unit) Award both marks for a correct answer with no working shown
	cii	5th 6th 7th	mean mass of wheat plants is less when grown outside <i>and</i> Any two from: <ul style="list-style-type: none"> plants in the greenhouse at a constant temperature plants supplied with sufficient water soil in the greenhouse could have more nitrates/nutrients less competition from weeds 	3 marks – 1 for the difference and 2 for the explanation Accept reverse arguments
7	a	7th 7th	provides energy to swim/move tail	2 marks – 1 for each point
	b	8th 8th	damaged = 16 million not damaged = 24 million	2 marks – 1 for each
8		8th 8th 8th 8th	characteristics genes survival reproduce	4 marks – 1 for each correct letter
9		9th 10th 10th	(plant) photosynthesis releases oxygen animal <i>and</i> plant respiration releases carbon dioxide (plant) photosynthesis uses carbon dioxide released from respiration	3 marks – 1 for each point
10		See below	<p>Answers will be credited according to student's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and students are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <p>Indicative content:</p> <ul style="list-style-type: none"> carbohydrates as an energy resource fat as an energy resource, insulation and for hormones fibre allow peristalsis through the alimentary canal/aid digestion vitamins and minerals to allow cells to function properly protein for growth and repair. 	See marks below

Marks	Step	Descriptor
1–2	4th–5th	<u>Level 1</u> A description that includes the role of at least one dietary group. The description will contain basic information with some attempt made to link knowledge and understanding to the given context.
3–4	6th	<u>Level 2</u> A description that includes the role of at least two dietary groups. The description shows some linkages and lines of scientific reasoning with some structure.
5–6	7th	<u>Level 3</u> A description that includes the role of most dietary groups. The description shows a well-developed, sustained line of scientific reasoning which is clear and logically structured.

Final Step Calculation

Marks	Step
1–5	Below 4th
6–12	4th
13–21	5th
22–31	6th
32–41	7th
42–49	8th
50–54	9th
55–60	10th