Paper 2 Higher

Question number	Answer	Mark
1(a)(i)	B	**(1)**

Question number	Answer	Mark
1(a)(ii)	to pump blood around the body under higher pressure	**(1)**

Question number	Answer	Mark
1(a)(iii)	An answer that combines the following points of understanding to provide a logical description: • blood would flow backwards from the ventricle to the atrium/blood will leak through (1) • less (oxygenated) blood would be pumped to the body (1)	**(2)**

Question number	Answer	Mark
1(b)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • the blood vessel has thick walls/small lumen (1) • to carry oxygenated blood/to carry blood under higher pressure (1)	**(2)**

Question number	Answer	Mark
1(c)	• the fish heart has two chambers rather than four chambers (1) • the fish heart only has one ventricle and one atrium rather than two ventricles and two atria (1) • only deoxygenated blood flows through the fish heart (1) • the fish heart shows a single circulatory system rather than a double circulatory system (1)	**(4)**

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Question number	Answer	Mark
2(a)(i)	• person 2 had a slightly higher blood glucose level than person 1 after fasting (by up to 0.2 mmols/l) (1)	**(1)**

Question number	Answer	Mark
2(a)(ii)	• person 3 had a much higher blood glucose level than person 1 two hours after taking glucose (up by up to 5.6 mmols/l) (1)	**(1)**

Question number	Answer	Mark
2(a)(iii)	Insulin	**(1)**

Question number	Answer	Mark
2(b)(i)	An answer that combines points of interpretation/evaluation to provide a logical description: • levels remain low up until day 14 then rise (1) • they continue to rise to day 23 and drop at day 24 (1)	**(2)**

Question number	Answer	Mark
2(b)(ii)	An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (1 mark): • as ovulation occurs (1) • the levels of progesterone released from the corpus luteum increases to maintain the lining of the uterus (1)	**(2)**

Question number	Answer	Mark
2(b) (iii)	An explanation that combines identification via a judgment (1 mark) to reach a conclusion via justification/reasoning (1 mark): • progesterone levels fall after day 23 to 17.11 (1) • so uterus wall thickness is not maintained and therefore pregnancy has not occurred (1)	**(2)**

Question number	Answer	Additional guidance	Mark
3(a)(i)	29 ÷ 500 = 0.058 (1) 0.058 × 100 = 5.8 (1)	award full marks for correct numerical answer without working	**(2)**

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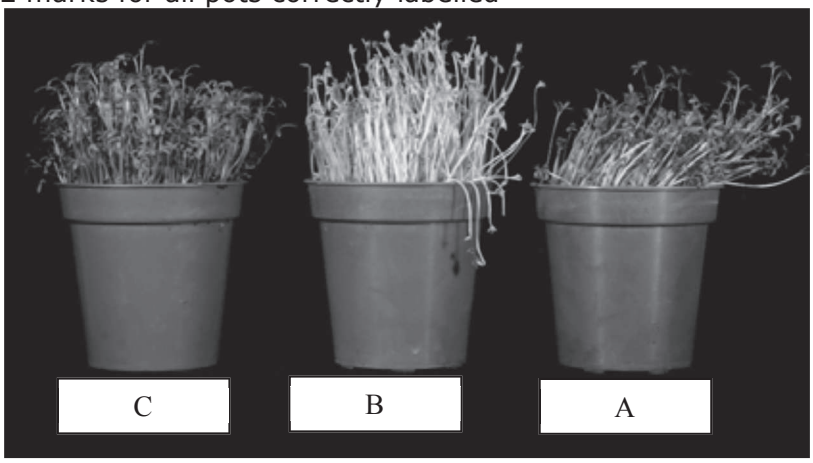
Question number	Answer	Mark
3(a)(ii)	An explanation that combines identification via a judgment (1 mark) to reach a conclusion via justification/reasoning (1 mark): • compost B (1) as it has the highest percentage water retained • and there is a higher amount of water loss in the plants due to higher temperatures causing a {larger rate of evaporation of water/higher transpiration rates} (1)	**(2)**

Question number	Answer	Additional Guidance	Mark
3(a)(iii)	Use the same starting mass of compost (1)	accept any other relevant improvement	**(1)**

Question number	Answer	Additional guidance	Mark
3(b)(i)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • by reducing the water content it reduces the number of microorganisms that can reproduce (1) • because there is a reduction of microorganisms this reduces the decay process/preserves the food (1)	accept bacteria/pathogens for microorganisms	**(2)**

Question number	Answer	Mark
3(b)(ii)	to kill unwanted micro-organisms	**(1)**

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Question number	Answer	Mark
4(a)(i)	1 mark for 1 or 2 correctly labelled pots 2 marks for all pots correctly labelled  	(2)

Question number	Answer	Mark
4(a)(ii)	D	(1)

Question number	Answer	Mark
4(a)(iii)	Auxin	(1)

Question number	Answer	Mark
4(b)	An answer that combines the following points to provide a logical description of the method: • remove the tip from one of the plant shoots and leave the other (1) • measure the changes in growth and direction of movement (1)	(2)

Question number	Answer	Mark
4(c)(i)	An explanation that makes reference to: identification – knowledge (1 mark) and reasoning /justification – knowledge (1 mark): • it surrounds the pine leaf (1) • so prevents water loss from the pine leaf/prevents dehydration (1)	(2)

Question number	Answer	Mark
4(c)(ii)	D	(1)

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Question number	Answer	Additional guidance	Mark
5(a)(i)	25 × 25 = 625 (1) 1 ÷ 625 = 0.0016 (1)	award full marks for correct numerical answer without working	**(2)**

Question number	Answer	Mark
5(a)(ii)	An answer that combines points of interpretation/evaluation to provide a logical description: • as light intensity decreases the rate of photosynthesis also decreases (1) • after 20 cm away when light intensity appears to have little effect on the rate of photosynthesis (1)	**(2)**

Question number	Answer	Mark
5(a)(iii)	use a light meter/lux meter	**(1)**

Question number	Answer	Additional guidance	Mark
5(a)(iv)	An explanation that combines identification – improvement of the experimental procedure (1 mark) and justification/reasoning which must be linked to the improvement (1 mark): • collect the gas/oxygen produced in a graduated gas syringe (1) • to reduce the errors generated when counting bubbles which maybe of different sizes (1)	accept alternative gas collection method with measuring cylinder and beehive shelf accept leave the apparatus for a longer amount of time	**(2)**

Question number	Answer	Mark
5(b)	An explanation that combines identification via a judgment (1 mark) to reach a conclusion via justification/reasoning (1 mark): • the volume of gas produced would decrease to below four bubbles (1) • because light is needed for photosynthesis (1)	**(2)**

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Question number	Answer	Mark
6(a)	An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (1 mark): • same temperature to act as control (1) • to provide the optimum temperature for enzyme action in the peas (1)	**(2)**

Question number	Answer	Additional guidance	Mark
6(b)(i)	• headed table with units (1) • accurately completed table (1)	negative values do not need to be shown if table heading states oxygen used/lost accept time in row 1 as an alternative	**(2)**

	A	B	C
O_2 used /ml at 10 mins	0.8	0.1	0.0
O_2 used /ml at 20 mins	1.6	0.1	0.0
O_2 used /ml at 30 mins	2.4	0.1	0.0

Question number	Answer	Additional guidance	Mark
6(b)(ii)	2.4 ÷ (30 × 60) (1) = 0.0013 (ml/second) (1)	accept 1.6 ÷ (20 × 60) accept 0.8 ÷ (10 × 60) award full marks for correct numerical answer without working maximum one mark if no unit conversion	**(2)**

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Question number	Answer	Mark
6(b)(iii)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • the peas in respirometer A are germinating so using up oxygen (1) • during the process of respiration to release energy for growth (1)	**(2)**

Question number	Answer	Additional guidance	Mark
6(c)	Any one improvement from: soda lime (1) • cotton wool soaked with potassium hydroxide (1)	accept other relevant chemical that would remove carbon dioxide	**(1)**

Question number	Answer	Additional guidance	Mark
7(a)(i)	• 156 ÷ 10 (1) • 16 units (1) Answer to two significant figures	award full marks for correct numerical answer without working	**(2)**

Question number	Answer	Mark
7(a)(ii)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • an increase in the units of insulin injected would cause more blood glucose to be converted to glycogen and stored in the liver/muscles (1) • leading to blood glucose levels becoming critically low/person would become hypoglycemic (1)	**(2)**

Question number	Answer	Mark
7(b)(i)	B	**(1)**

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Question Number	Indicative content	Mark
***7(b)(ii)**	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO1 (6 marks)** • the thyroid gland produces thyroxine • thyroxine helps to regulate metabolic rate • low levels of thyroxine should stimulate the production of TRH • TSH being produced and more thyroxine being released • an underactive thyroid would cause less thyroxine to be produced • metabolic rate to drops • less energy (calories) are available for tasks • more fat storage so the person gains body mass	**(6)**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3–4	• Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5–6	• Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

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Question number	Answer	Additional guidance	Mark
8(a)(i)	• $2.1 \times 10^4 = 21\,000 \times 0.1 =$ 2 100 in the water beetle (1) • 210 J in the bird (1)	award full marks for correct numerical answer without working	**(2)**

Question number	Answer	Mark
8(a)(ii)	it limits the length of the food chain	**(1)**

Question number	Answer	Additional guidance	Mark
8(b)(i)	• 107 ÷ 153 (1) • 0.699 3464 × 100 = 70% (1) Answer to 2 significant figures	award full marks for correct numerical answer without working	**(2)**

Question number	Answer	Additional guidance	Mark
8(b)(ii)	An explanation that combines identification via a judgment (1 mark) to reach a conclusion via justification/reasoning (1 mark): • stream B is more polluted that stream A (1) Plus one from: • (because) stream A contains stonefly larvae/mayfly larvae/caddis fly larvae (which are indicators of clean water) (1) • (because) stream B contains larger numbers of blood worm and sludge worm (which are indicators of polluted water) (1)	accept other correct indicators from the table. accept higher oxygen levels in place of clean water accept lower oxygen levels in place of polluted water	**(2)**

Question number	Answer	Mark
8(c)	An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (3 marks): • plants growing on the bottom of the stream will be unable to receive sunlight due to the thick layer of algae (1) • these plants will not be able to photosynthesise and will die and start to decompose (1) • the microorganisms decomposing the plants will respire, removing oxygen from the water (1) • the stream will become anoxic/oxygen depleted and other respiring organisms (plants and animals) will not be able to survive so biodiversity will be reduced (1)	**(4)**

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Question number	Answer	Mark
9(a)	C	(1)

Question number	Answer	Mark
9(b)(i)	An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (2 marks): • ultrafiltration occurs in the glomerulus where the liquid part of the blood passes into the Bowman's capsule (1) • reabsorption takes place as it travels through the proximal convoluted tubule into the loop of Henle (1) • finally urine production occurs in the collecting duct and excess fluid and sodium ions are removed (1)	(3)

Question number	Answer	Mark
9(b)(ii)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • the kangaroo rat lives in the desert so it needs to retain as much water as possible (1) • as most water is reabsorbed in the loop of Henle, a longer loop gives more surface area for water reabsorption (1)	(2)

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Question Number	Indicative content	Mark
*9(b)(iii)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO2 (6 marks)** water content • increased ADH causes more water to be reabsorbed into the bloodstream • prevents dehydration • decreased concentrations of ADH cause less water reabsorption • greater volume of urine produced • at 0.0 mol/dm^{-3} of sodium ions the volume of ADH stored is at its highest • so the lowest amount of ADH is released • water levels in the body are regulated sodium ions • as sodium ion concentration increases the levels of ADH stored decrease • at 0.25 mol/dm^{-3} ADH stored reduced by 5 au • so a small amount of water is reabsorbed • at 0.50 mol/dm^{-3} ADH stored reduced by a further 30 au • a greater amount of water is reabsorbed • the volume of ADH stored remains stable at 8 au • causing the maximum amount of water to be reabsorbed • preventing dehydration when sodium levels are high	**(6)**

Level	Mark	Descriptor
	0	No awardable content
Level 1	1–2	• The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. • Lines of reasoning are unsupported or unclear. (AO2)
Level 2	3–4	• The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. • Lines of reasoning mostly supported through the application of relevant evidence. (AO2)
Level 3	5–6	• The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the

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		context of the question. • Lines of reasoning are supported by sustained application of relevant evidence. (AO2)

Question number	Answer	Mark
10(a)(i)	B	**(1)**

Question number	Answer		Mark
10(a)(ii)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • the bacteria convert the ammonia into nitrites then nitrates maintaining the pH (1) • (this prevents an increase in pH) which would cause enzymes to denature and kill the fish (1)		**(2)**

Question number	Answer	Mark
10(a)(iii)	An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (1 mark): • the aquatic plant will take up nitrates by active transport (1) • against the concentration gradient/from where there is a low concentration to where there is a high concentration of nitrates (1)	**(2)**

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Question number	Answer	Additional guidance	Marks
10(b)	An answer that combines the following points of application of knowledge and understanding to provide a logical description: • a description of the use of a quadrat either by random sampling or using a belt transect (1) • a sample size 10–100 and count the number of clover plants in each quadrat (1) • multiplication factor dependent on the number of quadrats sampled (1)	to gain maximum marks steps must be in a logical sequence	**(3)**

Question number	Answer	Mark
10(c)	An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (3 marks): • clover/leguminous plants could be used in crop rotation (1) • where at intervals (2–3 years) a field is planted with clover/leguminous plants and left fallow (1) • the clover/leguminous plants will have colonies of nitrogen fixing bacteria which will produce nitrates (1) • the nitrates will increase the fertility of the soil and negate the need for artificial fertilisers (1)	**(4)**

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