

Question Number	Answer	Acceptable answers	Mark
1(a)(i)	(5.2 + 2.8 + 4.9 + 3.5 =) 16.4 (1) (16.4/4 =) 4.1	two marks for correct answer	(2)

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	A suggestion including two of the following variation in human population/different body sizes (1) hydration level (1) salt intake (1) drug influence (1)	accept genetic variation accept fluid / food intake / level of exercise accept levels vary depending on the time of day (1)	(2)

Question Number	Answer	Acceptable answers	Mark
1(a)(iii)	C <input checked="" type="checkbox"/> pituitary gland		(1)

Question Number	Answer	Acceptable answers	Mark
1(a)(iv)	dehydration / thirst / increased volume of urine	accept dilute urine/frequent urination/tiredness/dizzy/headache	(1)

Question Number		Indicative Content	Mark
QWC	*1(b)	<p>An explanation to include some of the following points</p> <ul style="list-style-type: none"> • negative feedback <p>Hydration</p> <ul style="list-style-type: none"> • increased water/decreased salt in blood • detected by hypothalamus • acts on the pituitary gland • decreased release of ADH • decreased permeability of collecting duct/renal tubules/nephron • less re-absorption of water • Increased volume of urine <p>Dehydration</p> <ul style="list-style-type: none"> • decreased water/increase salt in blood • detected by hypothalamus • acts on the pituitary gland • increased release of ADH • increased permeability of collecting duct/renal tubules/nephron • more re-absorption of water • decreased volume of urine 	(6)
Level 1	0	No rewardable content	
1	1 - 2	<ul style="list-style-type: none"> • a limited explanation of increase in ADH OR decrease in ADH OR the role of the pituitary gland, hypothalamus or negative feedback in the release of ADH • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy 	
2	3 - 4	<ul style="list-style-type: none"> • a simple explanation of both ADH increase and decrease OR a detailed explanation of either an increase or decrease • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy 	
3	5 - 6	<ul style="list-style-type: none"> • a detailed explanation of both ADH increase and decrease including mention of permeability of the renal tubules and role of the hypothalamus or pituitary gland • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors 	

Total for Question 1 = 12 marks

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	2.7	Allow -2.7 (°C)	(1)

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	<p>a comparison to include the following linked points</p> <p>(Rebecca's) brain temperature fluctuated / stayed similar / did not change very much (1)</p> <p>(whereas) finger temperature decreased (1)</p>	Ignore references to brain temperature going up	(2)

Question Number	Answer	Acceptable answers	Mark
2(a)(iii)	<p>an explanation to include three of the following points</p> <p>heat lost to the environment /from finger (1)</p> <p>less blood delivered to the skin's surface/finger (1)</p> <p>narrowing of the arterioles near the skin's surface (1)</p> <p>vasoconstriction (1)</p> <p>less heat loss by radiation(1)</p>	<p>accept ref to temperature gradient</p> <p>accept more blood flow to vital organs</p> <p>accept blood vessels for arterioles</p>	(3)

Question Number		Indicative Content	Mark
QWC	*2(b)	<p>A explanation to include some of the following</p> <ul style="list-style-type: none"> • homeostasis / regulation of the body's internal environment • controlled by the hypothalamus / thermoregulatory • hypothalamus / thermoregulatory centre monitors blood temperature • negative feedback mechanism • sweat rate increases • sweat glands will release sweat on to skin surface • evaporation of this sweat / water will remove heat energy from skin • hairs on skin's surface lay flat • no trapping of insulating air layer so body loses heat • vasodilation occurs • widening of the arterioles / blood vessels eg, near the skin delivers warm blood to skin surface • body loses heat by radiation 	(6)
Level	0	No rewardable content	
1	1 - 2	<ul style="list-style-type: none"> • a limited explanation of at least one method of thermoregulation • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy 	
2	3 - 4	<ul style="list-style-type: none"> • a simple explanation including at least two methods of thermoregulation • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy 	
3	5 - 6	<ul style="list-style-type: none"> • a detailed explanation of at least 3 methods of thermo regulation. Use of the term vasodilation or including information on the process of homeostasis • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors 	

Total for Question 2 = 12 marks

Question Number	Answer	Acceptable answers	Mark
3(a) (i)	homeostasis / thermoregulation / osmoregulation		(1)

Question Number	Answer	Acceptable answers	Mark
3(a) (ii)	D 37 °C		(1)

Question Number	Answer	Acceptable answers	Mark
3(b)	<p>An explanation linking the following points</p> <ul style="list-style-type: none"> • (travel along) sensory neurones (1) • axons / dendrons (1) • as electrical / electric impulses (1) • across synapses (gap between two neurones) (1) • using neurotransmitters (1) • reference to spinal cord /CNS (1) • reference to myelin sheath (1) 	<p>dendrites</p> <p>accept signals for impulses ignore electronic</p>	(4)

Question Number	Indicative Content	Mark
QWC	<p>*3(c) An explanation of thermoregulation in response to a low external temperature</p> <ul style="list-style-type: none"> • hypothalamus detects a drop in the blood's temperature • vasoconstriction • blood vessels near the surface of the skin constrict • reduce blood flow to the skin • reduce heat loss via radiation • hair erector muscles contract • raises hairs on body to trap a layer of insulating air between cold environment and body surface • reduce heat loss via conduction • shivering will occur • skeletal muscles contract and relax involuntarily • produces respiratory heat to warm up body • hypothalamus detects a rise in the blood's temperature • reference to negative feedback 	(6)
Level	0 No rewardable content	
1	<p>1 - 2</p> <ul style="list-style-type: none"> • a limited explanation is provided for one of the methods of raising body temperature • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy 	
2	<p>3 - 4</p> <ul style="list-style-type: none"> • a simple explanation of two of the methods of raising body temperature or one method explained in detail, alternatively a limited explanation of all three methods • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy 	
3	<p>5 - 6</p> <ul style="list-style-type: none"> • a detailed explanation of at least one of the methods of raising body temperature with a simple explanation of two others • most of the steps are identified and are in a logical order and reference may be made to hypothalamus and negative feedback • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors 	

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	substitution (1) $4.8 - 2.6$ $= 2.2$ (%) evaluation (1) $2.2 \times 600\,000$ $= 1\,320\,000$	give full marks for correct answer, no working	(2)

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	Any two of the following points <ul style="list-style-type: none"> • (increase in people who are) overweight / have a high BMI / are obese (1) • (increased number of people) who do not take enough exercise (1) • increased calorie intake (1) • increase in elderly population (1) 	(Increased number of people) who eat too much / eat the wrong types of food / eat too much fat / sugar / carbohydrates	(2)

Question Number	Answer	Acceptable answers	Mark
4(b)	An explanation including two of the following points <ul style="list-style-type: none"> • diet to lose weight (1) • reduce the amount of carbohydrates / glucose (1) • take more exercise so reduce blood glucose levels (1) 	accept sugar for glucose	(2)

Question Number		Indicative Content	Mark
QWC	*4(c)	<p>An explanation linking some of the following points</p> <p>When blood glucose is high</p> <ul style="list-style-type: none"> • insulin is released from the pancreas • the insulin converts the excess glucose • into glycogen • which is stored in the liver • blood glucose levels are reduced <p>When blood glucose levels are low</p> <ul style="list-style-type: none"> • glucagon is released from the pancreas • the glucagon converts glycogen • from the liver • into glucose • blood glucose levels are raised <p>This is a homeostatic mechanism which maintains the correct glucose levels in the bloodstream</p>	(6)
Level	0	No rewardable content	
1	1 - 2	<ul style="list-style-type: none"> • a limited explanation of blood glucose regulation including the role of hormones, specific hormones do not need to be mentioned • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy 	
2	3 - 4	<ul style="list-style-type: none"> • a simple explanation of blood glucose regulation including the role of insulin or glucagon and some of the body organs involved • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy 	
3	5 - 6	<ul style="list-style-type: none"> • a detailed explanation of blood glucose regulation including the role of the liver and pancreas and the methods of reducing and raising blood glucose concentrations • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors 	

(Total for question 4 = 12 marks)