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** ☒ 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)**	An explanation to include some of the following points • negative feedback Hydration • 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 Dehydration • 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	**0**	No rewardable content	
1	**1 - 2**	• 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**	• 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**	• 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 (^{o}C)	(1)

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

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

Question Number		Indicative Content	Mark
QWC	***2(b)**	A explanation to include some of the following • 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 eq, near the skin delivers warm blood to skin surface • body loses heat by radiation	(6)
Level	**0**	No rewardable content	
1	**1 - 2**	• 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**	• 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**	• 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)	An explanation linking the following points • (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)	dendrites accept signals for impulses ignore electronic	**(4)**

Question Number		Indicative Content	Mark
QWC	***3(c)**	An explanation of thermoregulation in response to a low external temperature • 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	**1 - 2**	• 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	**3 - 4**	• 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	**5 - 6**	• 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 x 600 000 = 1320 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 • (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 • 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)**	An explanation linking some of the following points **When blood glucose is high** • 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 **When blood glucose levels are low** • glucagon is released from the pancreas • the glucagon coverts glycogen • from the liver • into glucose • blood glucose levels are raised This is a homeostatic mechanism which maintains the correct glucose levels in the bloodstream	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• 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**	• 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**	• 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)