

| 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 | 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 | <p>*2(b) 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 data-bbox="264 297 363 334">*3(c)</p> <p data-bbox="384 297 1358 373">An explanation of thermoregulation in response to a low external temperature</p> <ul data-bbox="432 410 1321 1054" 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 | 1 - 2 | <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 | 3 - 4 | <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 | 5 - 6 | <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)