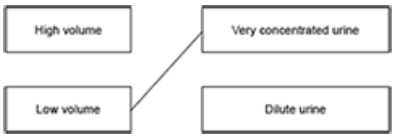
Mark scheme

Question			Answer/Indicative content	Marks	Guidance
1	a		Glucose (from food) ✓ **PLUS** Pancreas (detects) ✓ **OR** Increase insulin (levels) ✓	2 (AO 2.1) (AO 3.2a)	**Assume answer refers to insulin unless stated** **ALLOW** sugar **IGNORE** carbohydrate **DO NOT ALLOW** glucose from food decreases **DO NOT ALLOW** other named nutrients **ALLOW** produce insulin **Examiner's Comments** This question discriminated well between candidates at different grades. There was an even spread of marks given. The most common mark given was for correctly identifying that the glucose in food affected the athlete's insulin levels. **Misconception** Some students incorrectly thought that insulin breaks glucose down. There was confusion between the role of insulin and digestive enzymes. Other students did not correctly identify that it is the glucose in food, but rather other food nutrients such as lipids and proteins, which affect insulin levels. **Assessment for learning** Glucose regulation and the role of insulin has been identified as a

					knowledge gap. Candidates would benefit from revisiting the role of insulin through the GCSE course to reduce the misconceptions raised.
	b		 ✓	1 (AO 2.1)	**DO NOT ALLOW** more than one line drawn **Examiner's Comments** The vast majority of candidates did not seem to read the question correctly and drew two lines instead of one line which negated the mark. Candidates would benefit from reading the question carefully to make sure they do not disadvantage themselves.
	c		Y ✓ Random ✓	2 (2 x AO 2.2)	**Examiner's Comments** Most candidates gained a mark for correctly identifying position Y for reading off the measurement at the meniscus. However the majority of candidates did not seem to know the difference between random and systematic error. **Assessment for learning** Knowledge gap identified in candidates' understanding between systematic and random error. The OCR specification clearly states that candidates will be assessed on working scientifically skills and WS1.3h states the ability to identify these two types of error. Centres should make sure that these skills are taught alongside the PAG practicals. **OCR support** The Language of Measurement in Context: Biology resource can be

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td>used to support students with understanding language of measurement terminology used, including systematic and random error.</td></tr>
<tr><td></td><td>d</td><td></td><td><table><tr><th>Response</th><th></th></tr><tr><td>Hairs stand up</td><td></td></tr><tr><td>Increases sweat production</td><td>✓</td></tr><tr><td>Shivering</td><td></td></tr><tr><td>Vasoconstriction of blood vessels</td><td></td></tr><tr><td>Vasodilation of blood vessels</td><td>✓</td></tr></table>✓✓</td><td>2
(2 x AO 2.1)</td><td>DO NOT ALLOW more than two ticks, each additional tick will negate a marking point.

<u>Examiner’s Comments</u>

Most candidates scored one or two marks on this question applying their knowledge and understanding of body temperature and homeostasis to exercise. The most common mark given was for increased sweat production. The most common incorrect response was vasoconstriction of the blood vessels instead of vasodilation.</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>8</td><td></td></tr>
<tr><td>2</td><td>a</td><td></td><td>Amino acids ✓
Enzymes ✓
Fatty acids and glycerol ✓
Sugar ✓
Respiration✓</td><td>5
(AO 1.1)
(AO 1.1)
(AO 1.1)
(AO 2.1)
(AO 1.1)</td><td>Either order

<u>Examiner’s Comments</u>

The majority of candidates gained at least 1 mark for the most common scoring mark for correctly identifying ATP is produced by respiration. A minority could correctly complete each sentence. Most candidates mixed up the role of enzymes with amino acids and also could not correctly identify fats are broken down into glycerol and fatty acids.

Assessment for learning

Knowledge gap identified with digestion of large (polymer) molecules and the role of enzymes into their constituent small molecules (monomer) respectively. Centres should reinforce the role of enzymes</td></tr>
</table>

					in digestion of protein, lipids and carbohydrates.
	b		Person C ✓ Risk identified as dangers of following the diet ✓ Benefit identified that the diet helps overweight people reduce health issues ✓	3 (3 ×AO 3.1a)	If answer is not person C then award 0 marks. **Examiner's Comments** Most candidates were able to achieve at least 1 mark for correctly identifying Person C discussing both the risks and benefits of following the diet. To gain more marks candidates needed to correctly identify which part Person C stated which referred to the risks and the benefit without simply rewriting the stem of the question, which only the minority could.
			Total	**8**	
3	a		Correct comparison identified of the effectiveness/preventing pregnancies of a contraceptive method when used incorrectly ✓ Correct comparison identified of the effectiveness/preventing pregnancies of a contraceptive method when used correctly ✓ Correct comparison of the difference in effectiveness/preventing pregnancies of a contraceptive method when used incorrectly compared to correctly ✓ Correct use of data to describe one comparison ✓	4 (2 ×AO 3.1a) (2 ×AO3.2a)	**ALLOW** hormonal methods more effective than barrier methods when used incorrectly ORA **ALLOW** hormonal methods more effective than barrier methods when used correctly ORA If no marks awarded allow a correct comparison on the effectiveness (in preventing pregnancies) of the different contraceptive methods **Examiner's Comments** This question discriminated well between candidates at different grades with only a few gaining full marks. The question was testing the ability to draw conclusions and evaluate from data provided. Despite the question asking to include data, most candidates did not include this. The most common scoring marks given were a correct comparison of any contraceptive method used correctly and/or used incorrectly on

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td>the number of unintended pregnancies. The less successful responses were able to gain a mark for a correct comparison between any contraception and impact on unintended pregnancies. Some candidates misinterpreted the data and stated the different contraceptive methods' success in working correctly or incorrectly instead of impact on unintended pregnancies.</td></tr>
<tr><td></td><td>b</td><td></td><td>Day 13 ✓

Ovulation has occurred/egg is released so fertilisation can happen ✓</td><td>2
(AO 3.1a)
(AO 3.2a)</td><td>ALLOW between day 12-15

ALLOW description of fertilisation

<u>Examiner's Comments</u>

More than half of candidates were able to correctly identify that around day 13 the female would ovulate and likely get pregnant, which matches the LH peak. Very few candidates could then go on and apply this knowledge that would mean the egg could be fertilised by the sperm.</td></tr>
<tr><td></td><td>c</td><td></td><td>Uterus lining will not be maintained/will be shed/will not stay thick ✓</td><td>1
(AO 3.2a)</td><td>ALLOW will not be able to support a pregnancy/ embryo will not be able to implant/will lose the baby/will miscarry/period happens

<u>Examiner's Comments</u>

A minority of candidates knew that progesterone maintains the uterus lining so could analyse the information to make judgements on what would happen if progesterone levels were low.</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>7</td><td></td></tr>
<tr><td>4</td><td></td><td></td><td>
<table>
<tr><th>Structure</th><th>Part of the nervous system</th><th>Part of the endocrine system</th><th>Not part of either system</th></tr>
<tr><td>Insulin producing cells in the pancreas</td><td></td><td>✓</td><td></td></tr>
</table>
</td><td>5
(5 ×AO 1.1)</td><td>One mark for each correct row

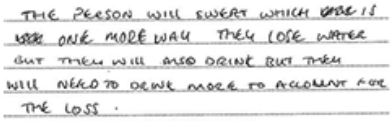
<u>Examiner's Comments</u>

This question discriminated between candidates at different grades well. The majority achieved 3 or more marks in identifying structures of the nervous and endocrine system.

Assessment for learning</td></tr>
</table>

			<table><tr><td>Kidney tubules</td><td></td><td></td><td>✓</td></tr><tr><td>Pituitary gland</td><td></td><td>✓</td><td></td></tr><tr><td>Spinal cord</td><td>✓</td><td></td><td></td></tr><tr><td>Temperature receptors in the skin</td><td>✓</td><td></td><td></td></tr></table> ✓✓✓✓✓		The most common incorrect response was not identifying insulin producing cells in the pancreas was part of the endocrine system. Candidates thought it was not part of either system. Centres could reinforce the key endocrine glands in future as a key knowledge gap.
			Total	**5**	
5	a	i	Medulla ✓	1 (AO 2.1)	
		ii	Cortex ✓	1 (AO 2.1)	**Examiner's Comments** This was one of the most challenging questions on the paper. Very few candidates could correctly identify region A as the medulla and B as the cortex. The majority of incorrect responses stated the nephron/tubules or stated random blood vessels. A large number of candidates did not attempt this question and were awarded a 'no response' which was not representative for the paper as a whole. **Assessment for learning** Knowledge gap identified in the application of knowledge and understanding of the structure of the kidney. Candidates would benefit with the reinforcement of the kidney structure to increase their knowledge and understanding.
		iii	Artery ✓	1 (AO 2.2)	**DO NOT ALLOW** more than one answer circled **Examiner's Comments** Roughly half of candidates could correctly identify the artery brings blood to the kidney.

	b	i	**First check the answer in table / on answer line** **If answer = 1.5 (litres) award 2 marks** (Water gain = 2.2 + 0.3) = 2.5 (litres) **PLUS** (Water loss = 0.9+0.1) = 1.0 (litres)✓ 2.5 – 1.0 = 1.5 ✓	2 (2 ×AO 2.2)	**ALLOW** one mark for clear evidence of incorrect water loss gain or loss with a correctly calculated difference **Examiner's Comments** Just over half of candidates could correctly calculate the volume of urine produced by taking the water gained from the water loss per day to gain full marks. The candidates who could not do this could also not total the water gained and lost each day correctly. Therefore candidates either gained full or 0 marks.
		ii	**Any three from:** (Water lost) in sweat (when running/exercising) ✓ The water concentration in blood falls ✓ The kidney (tubules) will reabsorb more water (into the blood) ✓ Making the urine more concentrated ✓ Lower volume of urine ✓	3 (3 ×AO 2.1)	**ALLOW** water potential in blood falls **ALLOW** the kidney (tubules) becomes more permeable Additional marking point ADH secreted from pituitary gland for 1 mark **Examiner's Comments** The candidates seemed to find the application of their knowledge and understanding of water balance difficult. The most common scored mark was idea of water loss through sweating. A lot of candidates could not correctly describe what was happening in the kidney to reduce water loss. Less successful responses gave answers such as they would drink more fluids during the race. This was also a question which had a high number of 'no responses' which was

					not representative for the rest of the paper. Exemplar 2  Exemplar 2 demonstrates the typical response for explaining water balance during running a race. This candidate gained the mark for losing water through sweat but gave no further detail of how the kidney would maintain this. **Assessment for learning** Knowledge gap identified in the application of knowledge and understanding of the role of the kidney in maintaining water balance. Candidates would benefit with the reinforcement of the kidney's role in homeostatic control of water balance to increase their knowledge and understanding.
			Total	**8**	
6			**A**	1 (AO 1.1)	
			Total	**1**	
7			**B**	1 (AO 2.1)	
			Total	**1**	
8			(Person 2 has) the dominant allele (A) ✓ Unable to control their blood glucose levels / have diabetes ✓ Would not be able to feel stimuli /	3 (AO 3.1a) (AO 2.1) (AO 2.1)	**ALLOW** person 2 is heterozygous **ALLOW** reference to a specific symptom of diabetes **IGNORE** low blood sugar **ALLOW** reference to a specific stimulus

			slower responses/reactions/reflexes ✓		**Examiner's Comments** This question had one of the highest no responses. The question tested the application of knowledge and understanding of scientific ideas and analysis of information to interpret. Over half of candidates scored here but very few gained full marks. The most common mark given was for symptoms of diabetes. Very few candidates identified the person had inherited the dominant allele.
			Total	**3**	
9			B ✓	1 (AO 1.1)	**Examiner's Comments** This question assessed the knowledge and understanding of communicable diseases and most candidates correctly identified B Tuberculosis.
			Total	**1**	
10	a		1.75 (million)	1 (1 × AO 2.2)	**ALLOW** in range of 1.65 – 1.8 million **Examiner's Comments** The vast majority of candidates scored this mark for correctly reading off data from the graph.
	b		**First check answer on answer line. If answer = 9.75 million award 2 marks** 11.5 million ✓ 11.5 million − 1.75 million = 9.75 million ✓	2 (2 × AO 2.2)	**ALLOW** ecf from Q22(a) for UK diabetes patient numbers **ALLOW** 1st mark for correct figure for USA in range of 11-12 million **ALLOW** second mark for correctly calculated difference between stated USA and UK figures **Examiner's Comments** This question differentiated well between candidates. A number of candidates did not show their workings. There were errors carried forward applied to this question which could have allowed some candidates gain an extra mark.
	c		**Any two from:** Idea in both countries the number of	2 (2 × AO 3.2b)	Assume answer refers to both countries if not stated.

			individuals has increased over time ✓ The rate has increased over time/ ref to gradient in both countries ✓ USA fluctuates more than UK ✓ Quotes correct data increases for both UK and USA ✓		**DO NOT ALLOW** only one countries rate has increased **Examiner's Comments** The vast majority of candidates scored at least 1 mark here for correctly being to identify the trend from the graph that diabetes patients have increased in both the USA and UK. Only the more successful candidates could describe the differences between the USA and UK with greater detail, such as differences between rates, gradients or fluctuations.
	d		Not all diabetics may be diagnosed/recorded/identified/aware ✓	1 (1 × AO 3.2a)	**IGNORE** estimates/averages **Examiner's Comments** The lower performing candidates found this question challenging. The main none scoring answer stated that there was something wrong with the graph such as errors in scales or numbers are estimates/means.
	e		Type 1 diabetes treated with insulin ✓ Type 2 diabetes controlled through diet/exercise ✓	2 (2 × AO 1.1)	**ALLOW** medication to lower blood glucose/sugar **ALLOW** reduce sugar/glucose intake **ALLOW** lose weight **IGNORE** causes of diabetes throughout **Examiner's Comments** There were some good responses demonstrating their knowledge and understanding of treatments for Type 1 and Type 2 diabetes. The most common answers which were given no marks were those which mixed up with the causes and treatments. Less successful responses did not reference which treatment was for Type 1 or Type 2.
			Total	**8**	
11	a	i	**First check answer on answer line.** **If answer = 35.0 award 2 marks** 349.7/ 10 = 34.97 ✓ **OR** 35 ✓	2 (2 × AO 2.2)	**ALLOW** 34.9 for 1 mark **ALLOW** one mark for clear evidence of rounding incorrect answer correctly to 1.d.p

			35.0 ✓		**Examiner's Comments** This question differentiated well between candidates. The majority of lower performing candidates were able to calculate the mean and more successful responses gained full marks for correctly rounding to 1.d.p
		ii	**First check answer on answer line.** **If answer = 50% award 2 marks** 5 / 10 ✓ **OR** 0.5 ✓ × 100 = 50% ✓	2 (2 × AO 2.2)	**ALLOW** half / ½ **ALLOW** one mark for clear evidence of incorrect fraction of rescued people identified with a correctly calculated percentage **Examiner's Comments** The majority of candidates achieved full marks here for correctly calculating the percentage.
		iii	Shivering / vasoconstriction ✓ **Maximum two from:** (Shivering) increases metabolic rate/respiration ✓ (Shivering) generates more heat ✓ (Vasoconstriction) decreases blood flow to the skin surface ✓ (Vasoconstriction) reduces heat loss ✓	3 (1 × AO 1.1) (2 × AO 2.1)	**ALLOW** blood vessels narrow **ALLOW** releases heat / increased thyroxine **ALLOW** redistribution of blood to organs **IGNORE** blood vessels move **IGNORE** go pale/blue/cold extremities If no credit worthy answer given allow goose bumps/hairs stand on end for one mark **Examiner's Comments** The candidates found the application of their knowledge and understanding of hypothermia difficult. The most common scored mark was shivering response. A lot of candidates did not write vasoconstriction as an import response or how it works. Less successful responses gave answers such as cold hands/feet and go blue.
		iv	**Any one from:** Blood sugar/glucose(level) ✓ Water balance/potential/concentration/levels (in the blood) ✓	1 (1 × AO 1.1)	**IGNORE** heart rate/breathing rate/blood pressure **Examiner's Comments** A small number of candidates know

			pH/carbon dioxide level (of the blood) ✓ Urea level (of the blood) ✓		examples of homeostatic control. The most common answer that was given a mark was blood glucose. A lot of candidates identified heart rate under homeostatic control rather than pH of the blood.
	b	i	**Any two from:** Scientists can replicate/reproduce/further develop the work ✓ To check/prove results ✓ To allow recognition for their work ✓	2 (2 × AO 1.1)	**IGNORE** scientists' review **ALLOW** comment/feedback on work / identify mistakes/misinformation **ALLOW** can see the value of the research **Examiner's Comments** This question challenged many of the candidates and the majority did not gain full marks. The most given mark was for the idea of checking the results are correct. Some candidates did get confused with the difference between reproducible and repeatable data. **OCR support** Our Language of Measurement in context resource can be used with candidates to help familiarise them with terms such as reproducible and repeatable, and where they are applicable in a given context.
		ii	Idea body temperature is altered ✓ This would affect the mean ✓	2 (2 × AO 3.1a)	Assume answer refers to people with illnesses and infections if not stated. **ALLOW** invalidate results **IGNORE** inaccurate results **Examiner's Comments** Most candidates were able to gain one mark for recognising that the body temperature would be altered while you have an infection. Very few candidates were able to state that this would affect the mean temperature.
		iii	**Any one from:** Limits impact/identification of	1 (1 × AO 3.1a)	**ALLOW** increases validity/reliability/repeatability/

			anomalies/outlier ✓ Representative of the population ✓ Gives greater confidence in the conclusion ✓		**IGNORE** accuracy **Examiner's Comments** The ability to analyse information from experimental procedures proved challenging for candidates. A large number of candidates who did not gain any marks stated that you repeat an experiment to gain a mean.
			Total	**13**	
12			A ✓	1 (AO 1.2)	
			Total	**1**	