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A-LEVEL

# Applied Science

SC14 The Healthy Body

Mark scheme

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Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Question	Answers	Additional Comments/Guidance	Mark	ID details
1(a)(i)	D	AO1	1	
1(a)(ii)	A	AO1	1	
1(b)	Pressure is higher in the ventricle (than artery) <b>or</b> pressure is higher below the valve	AO1	1	
1(c)(i)	Left ventricle	AO1	1	
1(c)(ii)	Thick(er) muscle / thick(er) walls / more muscle	AO1 ignore stronger muscle	1	
1(d)(i)	<ul style="list-style-type: none"> <li>Allows blood to pass into the ventricles / from the atria / so the atria can empty</li> <li>before the ventricles contract</li> </ul>	AO1  allow to prevent backflow of blood	2	
1(d)(ii)	<ul style="list-style-type: none"> <li>Ventricles contract from the base / upwards</li> <li>all the blood is ejected</li> </ul>	AO1	2	
<b>Total</b>			<b>9</b>	

2(a)(i)	<ul style="list-style-type: none"> <li>• High calcium</li> <li>• Vitamin C / A high</li> <li>• Protein high</li> <li>• Energy is low(er) (than RDA)</li> </ul>	AO2 Any two from the list	2	
2(a)(ii)	<ul style="list-style-type: none"> <li>• Increased carbohydrate / named</li> <li>• Increased sugar / named</li> <li>• Increased fat / named</li> </ul>	Can allow two different named examples of each food group for 2 marks	2	
2(b)(i)	Haematocrit / packed cell volume	AO1	1	
2(b)(ii)	Anaemia	AO1	1	
2(b)(iii)	<ul style="list-style-type: none"> <li>• Increase iron intake, e.g. iron supplements</li> <li>• <b>Named</b> food high in iron (e.g. liver or spinach)</li> <li>• Increase folic acid</li> </ul>	AO1 Any two from the list  Allow increase vitamin C	2	
2(c)	<ul style="list-style-type: none"> <li>• Gut contents softer</li> <li>• Increases volume</li> <li>• (so) muscles can push (against the food)</li> <li>• Less energy needed for muscle contraction / peristalsis</li> </ul>	AO2 Any two from the list	2	
2(d)	<ul style="list-style-type: none"> <li>• Protein levels (are often) low</li> <li>• Iron intake (is often) low</li> <li>• Calcium intake (is often too) low</li> <li>• Other correctly named nutrient low (e.g. B12 / zinc / vitamin D / essential amino acids)</li> </ul>	AO2 Any two from the list  Allow energy intake low	2	
<b>Total</b>			<b>12</b>	

3(a)	<ul style="list-style-type: none"> <li>• Dipstick / clinistix test</li> <li>• Test a urine sample</li> <li>• Compare the colour to a standard chart</li> </ul>	<p style="text-align: center;">AO1 Accept same answer for finger-prick test with blood test Ignore ref to glucose tolerance test</p>	3	
3(b)	<ul style="list-style-type: none"> <li>• Line peaks in the early part of graph (first third)</li> <li>• then returns to start level by the end of the graph</li> </ul>	<p style="text-align: center;">AO3  No second mark if line goes to zero</p>	2	
3(c)	<ul style="list-style-type: none"> <li>• Release glucose / sugar over a long(er) period of time</li> <li>• Avoids fluctuations in blood sugar/ sugar highs / peaks</li> <li>• Reduces the need for insulin</li> <li>• (Body) uses glucose as it is released</li> </ul>	<p style="text-align: center;">AO1 Any two from</p>	2	
3(d)(i)	<ul style="list-style-type: none"> <li>• Protein is denatured</li> <li>• by stomach acid</li> <li>• so would not reach target organ/ liver</li> <li>• it could not be absorbed by the blood</li> </ul> <p style="text-align: center;"><b>or</b></p> <ul style="list-style-type: none"> <li>• Protein is digested</li> <li>• by enzymes/ protease in the stomach</li> <li>• so would not reach target organ/ liver</li> <li>• it could not be absorbed by the blood</li> </ul>	<p style="text-align: center;">AO2 Any two from either story</p>	2	

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3(d)(ii)	Any two from: pale; cold; tired; confused; faint; loss of consciousness; headache	AO2 Use list rule	2	
<b>Total</b>			<b>11</b>	

4(a)	(Pulse) oximeter	AO1	1	
4(b)	<ul style="list-style-type: none"> <li>• Takes longer (to get oxygen into the blood) <b>or</b> is slower <b>or</b> less oxygen (in the blood)</li> <li>• (because of the) longer / greater diffusion distance</li> </ul>	AO2	2	
4(c)	<p>The nurse would need to discuss the problem of increased likelihood of many ailments such as muscle cramps and dehydration.</p> <p>Other more serious conditions could be low blood pressure, irregular heart rhythm and an electrolyte imbalance that could lead to shock. The most serious symptom could be the onset of heart disease.</p>	AO2	5	

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should apply a ‘best-fit’ approach to the marking.

**Level 1 (0—1 marks)**

Answer is largely incomplete. It may contain valid points which are not clearly linked to an argument structure.  
 Unstructured answer  
 Errors in the use of technical terms, spelling, punctuation and grammar or lack of fluency

**Level 2 (2—3 marks)**

Answer has some omissions but is generally supported by some of the relevant points below:  
 - the argument shows some attempt at structure  
 - the ideas are expressed with reasonable clarity but with a few errors in the use of technical terms, spelling, punctuation and grammar

**Level 3 (4—5 marks)**

Answer is full and detailed and is supported by an appropriate range of relevant points such as those given below:  
 - argument is well structured with minimum repetition or irrelevant points  
 - accurate and clear expression of ideas with only minor errors in the use of technical terms, spelling, punctuation and grammar

4(d)(i)	Anywhere in the right-hand third of axis where the curve has become horizontal	AO1	1	
4(d)(ii)	A parallel curve shifted to the right of the original, with the start at zero	AO1	1	
4(d)(iii)	<ul style="list-style-type: none"> <li>• Chemoreceptors</li> <li>• Detect a fall in pH</li> <li>• Impulses sent to the medulla / brain</li> <li>• Increased impulses to the respiratory muscles / diaphragm / intercostal muscles</li> <li>• Increased breathing rate</li> <li>• Breathe out excess CO<sub>2</sub></li> </ul>	AO1  Accept similar answer but for heart rate Any 4 points	4	
<b>Total</b>			<b>14</b>	



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5(a)	Aldosterone	AO1	1	
5(b)	<ul style="list-style-type: none"><li>• The hypothalamus detects (an increased water level)</li><li>• Less / no ADH (produced)</li><li>• Water re-absorption reduces / stops in kidney</li><li>• A large volume of urine (is produced) <b>or</b> more dilute urine (is produced)</li></ul>	AO2	4	
5(c)(i)	56%	AO2	1	
5(c)(ii)	(Needed for) muscle contraction / nervous control / nervous system	AO2	1	
<b>Total</b>			<b>7</b>	

6(a)	<ul style="list-style-type: none"> <li>• Curve shows maximum activity at pH 2</li> <li>• Curve shows zero activity by pH 6</li> </ul>	AO3	2	
6(b)(i)	<p>A good answer would be:</p> <p>Equipment: would need waterbath, thermometer and stopwatch as well as test tubes/boiling tubes, any volumetric measuring equipment, milk and pepsin. You would need to ensure that the same amount of milk was used as well as the same amount of pepsin (1 cm<sup>3</sup> pepsin added to 9 cm<sup>3</sup> milk would be ideal here).</p> <p>A good range of temperatures should be used that are suitable for this kind of enzyme and at least 5 different temperatures should be used (ideally the range should be from 20 to 60 degrees).</p> <p>A repeat experiment would need to be carried out for reliability and you would need to time how long it took for the reaction to complete.</p>	AO3	5	
Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should apply a 'best-fit' approach to the marking.				
<b>Level 1 (0—1 marks)</b>				
Answer is largely incomplete. It may contain valid points which are not clearly linked to an argument structure. Unstructured answer Errors in the use of technical terms, spelling, punctuation and grammar or lack of fluency				
<b>Level 2 (2—3 marks)</b>				
Answer has some omissions but is generally supported by some of the relevant points below: - the argument shows some attempt at structure - the ideas are expressed with reasonable clarity but with a few errors in the use of technical terms, spelling, punctuation and grammar				

<b>Level 3 (4—5 marks)</b>			
Answer is full and detailed and is supported by an appropriate range of relevant points such as those given below: - argument is well structured with minimum repetition or irrelevant points - accurate and clear expression of ideas with only minor errors in the use of technical terms, spelling and punctuation and grammar			
6(b)(ii)	No or little product formed <b>or</b> no activity <b>or</b> the milk stays white	AO3	1
<b>Total</b>			<b>8</b>

7(a)	<ul style="list-style-type: none"> <li>• ATP is converted to ADP</li> <li>• Phosphate bonds broken <b>or</b> (ATP breaks down and) energy is released</li> </ul>	AO1	2	
7(b)	Aerobic respiration yields more ATP than anaerobic	AO1 Allow any figure between 34 and 38 molecules for aerobic compared with 2 for anaerobic	1	
7(c)	Mitochondrion / mitochondria	AO1	1	
7(d)	$(10 \times 3 \text{ ATP}) + (2 \times 2 \text{ ATP}) = \mathbf{34 \text{ (ATP)}}$	AO1 Correct answer alone gains mark	1	
7(e)	<ul style="list-style-type: none"> <li>• (Fats are) broken down into glycerol</li> <li>• Glycerol / fats are broken down into fatty acids</li> <li>• Glycerol forms pyruvate</li> <li>• which enters at the Krebs cycle</li> </ul>	AO2	4	
<b>Total</b>			<b>9</b>	

8(a)	Any two of: named dietary factor / smoking / high blood pressure / Gender / age / alcohol / genes / lack of exercise / obesity / stress / diabetes	AO1 Ignore cholesterol	2	
8(b)(i)	Healthy volunteers: <ul style="list-style-type: none"> <li>• have normally functioning blood vessels</li> <li>• blood vessels are normal / similar size / not affected by other risk factors</li> </ul>	AO3 Allow no other risk factors likely to affect results	1	
8(b)(ii)	Avoids bias	AO3	1	
8(c)(i)	Ensure that the effect is caused by polyphenols <b>or</b> not caused by some other substance <b>or</b> to ensure the result is caused by the apples	AO3	1	
8(c)(ii)	<ul style="list-style-type: none"> <li>• Same conditions / diet as the experimental group</li> <li>• with no polyphenols / apples</li> </ul>	AO3	2	
8(d)	<ul style="list-style-type: none"> <li>• Coronary artery also likely to have a large lumen (owtte)</li> <li>• Less chance of high blood pressure <b>or</b> low blood pressure</li> <li>• Less chance of blood clot / thrombus / thrombosis <b>or</b> less / no blood clots</li> <li>• Less chance of atheroma / description given <b>or</b> less / no atheroma</li> <li>• So (oxygenated) blood can reach heart/heart muscle can respire</li> </ul>	AO2 Accept 'it may lower blood pressure' for mark point 2  Any three points needed Allow there is less strain on the heart	3	
<b>Total</b>			<b>10</b>	