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A-LEVEL

# Applied Science

SC14 The Healthy Body

Mark scheme

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8770

June 2016

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Version: 1.0 Final

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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.

Further copies of this mark scheme are available from [aqa.org.uk](http://aqa.org.uk)



Question	Answers	Additional Comments/Guidance	Mark
2(a)	<ul style="list-style-type: none"> <li>• <math>C_6H_{12}O_6 + 6O_2</math></li> <li>• <math>6CO_2 + 6H_2O (+ATP)</math></li> </ul>	One mark for each side of the equation correctly written	1 (AO1) 1 (AO1)
2(b)(i)	pyruvate / pyruvic acid		1 (AO1)
2(b)(ii)	cytoplasm		1 (AO1)
2(c)	The electron transport system / oxidative phosphorylation	Allow other correct derivatives of the electron transport system	1 (AO1)
2(d)			3 (AO1) 2 (AO2)
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, punctuation and grammar			
<b>examples of the points made in the response</b>		<b>extra information</b>	
<ul style="list-style-type: none"> <li>• Glucose would be converted to pyruvate / pyruvic acid.</li> <li>• Pyruvate / pyruvic acid will be converted into lactic acid / lactate.</li> <li>• This will involve the use of co-enzymes / reduced NAD/NADH.</li> <li>• The hydrogen will be used to form the lactic acid / lactate and this allows NAD to be regenerated.</li> <li>• Using this method, glycolysis which occurs in the cytoplasm, can continue and energy can still be released / ATP formed even though oxygen is in short supply.</li> <li>• (advantage) this allows the muscles to continue working / contracting even during exercise.</li> </ul>			
<b>Total</b>			<b>10</b>

Question	Answers	Additional Comments/Guidance	Mark
3(a)	Aldosterone	If multiple hormones named, apply list rule	1 (AO1)
3(b)	<ul style="list-style-type: none"> <li>Source: (Aldosterone is released by the) adrenal gland</li> <li>Function: Increases permeability of the DCT / kidney / tubule (to sodium ions)</li> <li>Control: Aldosterone / hormone levels fall when plasma sodium rises <b>or</b> negative feedback</li> </ul>	<p>allow adrenal cortex</p> <p>allow more sodium ions pass out of DCT / Kidney / tubule</p> <p>allow converse</p>	3 (AO1)
3(c)	<p>Three from:</p> <ul style="list-style-type: none"> <li>Hypothalamus / osmoreceptors would detect the change in blood water level</li> <li>(ADH) production would stop</li> <li>Water reabsorption in the kidney would stop</li> <li>Large volume of dilute urine would be produced <b>or</b> excess water lost (in urine)</li> </ul>	ignore chemoreceptors	Max 3 (AO2)
3(d)(i)	<p>Three from:</p> <ul style="list-style-type: none"> <li>seizure</li> <li>weakness</li> <li>fatigue</li> <li>headache</li> <li>nausea / vomiting</li> <li>muscle cramps</li> <li>irritability</li> <li>confusion</li> </ul>	<p>ignore unconscious / passing out / pale</p> <p>accept low blood pressure</p> <p>accept hallucinations</p>	Max 3 (AO1)
3(d)(ii)	<ul style="list-style-type: none"> <li>minerals/ions/salts (dissolved) in the blood</li> <li>(that) carry a charge</li> <li>they affect the amount of water in the blood</li> <li>they affect the pH of the blood</li> </ul>		Max 3 (AO2)
<b>Total</b>			<b>13</b>

Question	Answers	Additional Comments/Guidance	Mark
4(a)(i)	Between 7.35 and 7.45	Both values needed for 2 marks A single value within the range gains 1	2 (AO1)
4(a)(ii)	Acidosis / pH too low	Accept acidic	1 (AO2)
4(a)(iii)	Four from: <ul style="list-style-type: none"> <li>• (Fall in blood pH) detected by chemoreceptors</li> <li>• Haemoglobin / Hb accepts hydrogen ions</li> <li>• which prevents drop / fall in blood pH <b>or</b> increases acidity or blood is buffered</li> <li>• stimulates increased breathing rate</li> <li>• which clears carbon dioxide from the system (quicker)</li> </ul>	allow description of increased breathing rate	Max 4 (AO1)
4(b)	Three from: <ul style="list-style-type: none"> <li>• he should eat small meals</li> <li>• at regular intervals</li> <li>• carbohydrate intake should be controlled</li> <li>• should eat complex carbohydrates / slow release / named carbohydrate</li> <li>• he should avoid sugary foods / drinks</li> </ul>	ignore balanced diet  allow correct examples	Max 3 (AO2)
<b>Total</b>			<b>10</b>

Question	Answers	Additional Comments/Guidance	Mark				
5(a)	4		1 (AO1)				
5(b)	<b>Statement</b>	<b>Protein</b>	<b>Fat</b>	<b>Starch</b>	[1] [1] [1]	Top row needs all three correct ticks for 1 mark	3 (AO1)
	Hydrolysis	✓	✓	✓			
	Cont. glucose			✓			
	Cont. amino acids	✓					
5(c)(i)	(because) it avoids bias <b>or</b> to account for the placebo effect			1 (AO3)			
5(c)(ii)	<ul style="list-style-type: none"> <li>• Random selection [1]</li> <li>• e.g. pulling names out of a hat/random number generator [1]</li> </ul> <b>or</b> <ul style="list-style-type: none"> <li>• Systematic way [1]</li> <li>• e.g. alternate names on a list [1]</li> </ul> <b>or</b> <ul style="list-style-type: none"> <li>• Matching groups [1]</li> <li>• On basis of gender / age / relevant named variable</li> </ul>	Accept two examples for 2 marks  Accept two methods for 2 marks	2 (AO3)				
5(c)(iii)	Two of: <ul style="list-style-type: none"> <li>• to compare results</li> <li>• groups can contain different numbers of people</li> <li>• percentages can be transferred to other data sets</li> <li>• results easier to interpret / understand (at a glance)</li> </ul>		2 (AO3)  Max 2				
<b>Total</b>			<b>9</b>				

Question	Answers	Additional Comments/Guidance	Mark
6(a)	4.0–6.5 mmol/litre	Correct answer only	1 (AO1)
6(b)	Dipstick test / Blood test		1 (AO1)
	Cholesterol meter		1 (AO1)
6(c)			5 (AO2)
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, punctuation and grammar			
<b>examples of the points made in the response</b> <ul style="list-style-type: none"> <li>• Long-term high cholesterol can lead to increased atheroma / plaque formation</li> <li>• (and) damage to the endothelium / lining of the coronary artery.</li> <li>• Fatty deposits may increase in the <b>wall</b> of the artery leading to thrombosis or blood clot.</li> <li>• These blockages can cause heart attacks / myocardial infarction by blocking the coronary artery completely.</li> <li>• This reduces blood flow and therefore oxygen and glucose to the heart muscle thus inhibiting respiration.</li> <li>• This could also lead to angina.</li> </ul>		<b>extra information</b>	



6(d)	Two of: <ul style="list-style-type: none"><li>• increase exercise</li><li>• weight loss</li><li>• reduce saturated fat intake / example</li><li>• increase unsaturated fat/vegetable/plant oil intake</li></ul>	accept reduce alcohol accept stop smoking	Max 2 (AO1)
<b>Total</b>			<b>10</b>

Question	Answers	Additional Comments/Guidance	Mark
7(a)	<ul style="list-style-type: none"> <li>Dipstick</li> <li>Compare colour to chart</li> </ul>		1 (AO1) 1 (AO1)
7(b)(i)	To provide a baseline / give a comparison		1 (AO3)
7(b)(ii)	Two of: <ul style="list-style-type: none"> <li>(the mean blood glucose) is lower (than the processed food diet)</li> <li>(the mean blood glucose) is within normal range</li> <li>less significant peaks on new diet/relevant <b>or</b> figures used</li> </ul>	allow description of the more stable blood glucose concentration, i.e. the peaks and troughs are not as pronounced	1 (AO3) 1 (AO3) 1 (AO3) Max 2
7(b)(iii)	Two of: <ul style="list-style-type: none"> <li>low carbohydrate keeps blood sugar low</li> <li>high fibre diet slows absorption of carbohydrates</li> <li>no processed foods (in the diet), so less sugar (which helps to keep blood glucose stable)</li> </ul>	allow starch for carbohydrate	Max 2 (AO3)
7(b)(iv)	Two of: <ul style="list-style-type: none"> <li>don't know the age / gender of the groups</li> <li>the exact content of the original / new diet was not controlled</li> <li>doesn't state if type 1 or type 2 diabetic volunteers or don't know the severity of the diabetes</li> <li>don't know the sample size</li> <li>only carried out over 5 weeks <b>or</b> blood sugar only measured for 24 hours</li> </ul>		Max 2 (AO3)
<b>Total</b>			<b>9</b>

Question	Answers	Additional Comments/Guidance	Mark
8(a)(i)	<ul style="list-style-type: none"> <li>Mucus traps harmful bacteria</li> <li>Mucus acts as a habitat for harmful bacteria</li> </ul>	Accept 'difficult to remove'	1 (AO2) 1 (AO2)
8(a)(ii)	Two of: <ul style="list-style-type: none"> <li>enzymes secreted by the gut do not reach ingested food</li> <li>less digested food is absorbed</li> <li>can absorb less of the high energy food / very nutritious food but still meet daily (energy / vitamin / mineral) requirements</li> </ul>		Max 2 (AO2)
8(b)(i)	Two of: <ul style="list-style-type: none"> <li>(thick muscle) has high rate of respiration</li> <li>heart muscle fatigues / cramps / lactic acid builds up</li> <li>uses more oxygen / glucose</li> <li>coronary arteries cannot supply enough oxygen / glucose</li> </ul>		Max 2 (AO2)
8(b)(ii)	(Less blood leaving the heart/lower stroke volume because) <ul style="list-style-type: none"> <li>ventricle lumen smaller <b>or</b> filled ventricle contains less blood</li> <li>some blood passes back from the ventricle to the atrium through leaky atrioventricular valves <b>or</b> backflow of blood from the ventricle</li> <li>narrowed opening of the aorta may reduce the amount of blood entering it <b>or</b> leaving the ventricle</li> </ul>		1 (AO2) 1 (AO2) 1 (AO2)
8(c)	<ul style="list-style-type: none"> <li>(In CVD) the heart <b>muscle</b> has a poor oxygen supply</li> <li>Emphysema reduces the efficiency of gaseous exchange / uptake of oxygen</li> <li>results in less oxygen in the blood</li> <li>so people with CVD are more likely to have a myocardial infarction / heart attack</li> </ul>		1 (AO2) 1 (AO2) 1 (AO2)
<b>Total</b>			<b>11</b>