Version 1.0: 0310

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Applied Science 8771/8773/8776/8777/8779

SC14 The Healthy Body

Mark Scheme

2010 examination – January series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' 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.

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334).
Registered address: AQA, Devas Street, Manchester M15 6EX
Dr Michael Cresswell Director General

Question 1

(a)(i)	X = Nasal cavity/passage Y = oesophagus/gullet/accept larynx Z = trachea/windpipe/cartilage ring	(1) AO1 (1) AO1 (1) AO1	**3**
(ii)	Swallowing promotes peristalsis/or description involving muscle action (which moves the tube) Water helps to lubricate/EW (the movement of the tube) Swallowing closes entrance to windpipe/EW	(1) AO2 (1) AO2 (1) AO2	**Max 2**

<table>
<tr>
<td>(b)</td>
<td>
The marking scheme for this part of the question includes an assessment of the Quality of Written Communication (QWC). There are no discrete marks for the assessment of written communication but QWC will be one of the criteria used to assign the answer to an appropriate level below.
<table>
<tr><th>Level</th><th>Mark</th><th>Descriptor
an answer will be expected to meet most of the criteria in the level descriptor</th></tr>
<tr><td>3</td><td>4-5</td><td>-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 minimal repetition or irrelevant points
-accurate and clear expression of ideas with only minor errors in the use of technical terms, spelling, punctuation and grammar</td></tr>
<tr><td>2</td><td>2-3</td><td>-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</td></tr>
<tr><td>1</td><td>0-1</td><td>-answer is largely incomplete, it may contain some 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</td></tr>
<tr><td></td><td></td><td>Possible biological valid points would include
1. Mechanical digestion would be less effective/tongue moves food around the mouth/ food not broken down as much;
2. Would reduce ability of tongue to form the food into a bolus ready for swallowing;
3. As food would not be moved between the teeth properly
4. Less mixture with amylase so starch digestion reduced;
5. Surface area of poorly chewed food greatly reduced;
6. Enzyme activity less effective;
7. Food not fully digested/more undigested food egested;
8. Less digested food available for absorption;
9. Would not be able to eat as much</td></tr>
</table>
</td>
<td>(5) AO2</td>
<td>Max 5</td>
</tr>
</table>

(b)	An example of a Level 3 answer might be: Weakness of the muscles in the tongue and jaw would result in mechanical digestion being less effective due to the inability of the tongue to move food around the mouth and between the teeth. This would result in the surface area of the food being smaller than necessary when mixed with digestive enzymes in the mouth and stomach, so that within the time available the food would not be fully digested. This in turn would result in less digested food being available for absorption in the small intestine and a greater proportion of undigested foood being egested in the faeces. Poor nutrition would result from this lack of nutrient uptake.		

Total Mark: 10

Question 2

(a)	Lines join the boxes to produce the following relationships. Mark not valid if more than one box joined. **Food group** / Grains/ starches / Milk & dairy products / Fats & sugars **Proportion of diet (%)** / 45-65 / 20 / 8 Allow 1 mark if one box correctly linked	(2) AO1	**2**
(b)	Carbohydrate/grains and starches/sugars/glucose (fats neutral) to increase energy availability Protein/milk to help increase muscle (mass) Both groups stated but explanations not given = 1 mark	(1) AO2 (1) AO2	**2**
(c)(i)	1 mark for each side of the equation correctly written in all respects (ATP,energy = neutral)	(2) AO1	**2**
(ii)	Glycolysis (Breaks down) glucose into pyruvic acid Link reaction produces reduced NAD (Pyruvate enters) Kreb's cycle (To produce) ATP Electron transport system (produces ATP)	(1) AO1 (1) AO1 (1) AO1 (1) AO1 (1) AO1 (1) AO1	**Max 3**
2(d)	Any 2 of: Training increases their pulmonary efficiency/EW And cardiac efficiency Allowing more oxygen/glucose to be available to the muscles So aerobic respiration predominates/anaerobic less likely/oxygen debt less likely plus Aerobic respiration generates more ATP than anaerobic	(1) AO2 (1) AO2 (1) AO2 (1) AO2 (1) AO1	**3**

Total Mark: 12

Question 3

(a)(i)	Haematocrit	(1) AO1	**1**
(ii)	Body will produce (more RBCs) Needed to/in order to take up/carry/deliver adequate oxygen "to get oxygen" does not gain this mark	(1) AO2 (1) AO2	**2**
(b)	This illness could be regarded as self-inflicted/EW (cheating in competition does not gain this mark) treating her would use resources that could be being used for people who were ill through no fault of their own/other valid points also gain the mark	(2) AO2 (synoptic marks)	**2**
(c)(i)	Pumps deoxygenated blood/description/ in order to pick up oxygen to the lungs	(1) AO1 (1) AO1	**2**
(ii)	Site of (gas) exchange/diffusion with (respiring) tissues/cells OR gas exchange at the alveoli/lungs	(1) AO1	**1**
(d)(i)	Prevention of back flow into the (left) **ventricle** (after contraction)	(1) AO1	**1**
(ii)	Obstruction prevents enough blood/blood at high enough pressure (leaving the left ventricle) Reduced supply of blood/oxygen to the brain (causes fainting)	(1) AO2 (1) AO2	**2**
(e)	432000 cm^3 (correct value plus correct volumetric unit gains full marks) Allow one mark for 4800 beats in one hour/7200cm^3 in one minute	(2) AO2	**2**

Total Mark: 13

Question 4

(a)	Aldosterone; multiple hormones named: apply list rule	(1) AO1	**1**
(b)	Aldosterone is released from the adrenal glands Increases permeablility of DCT/kidney/tubule to sodium ions Released when plasma sodium levels are low (Aldosterone) levels fall when plasma sodium rises/negative feedback	(1) AO1 (1) AO1 (1) AO1 (1) AO1	**Max 3**
(c)	Hypothalmus would detect blood water potential too high ADH named in correct context (ADH) production would stop Water reabsorption by kidney would stop Large volume of urine would be produced Water potential returns to correct level as surplus water lost	(1) AO2 (1) AO2 (1) AO2 (1) AO2 (1) AO2 (1) AO2	**Max 3**
(d)(i)	41.66/41.7/42 (answers rounded to 40% do not gain credit)	(1) AO2	**1**
(ii)	48.75	(1) AO2	**1**
(iii)	Protein content too low for main meal of the day; Salt content is almost half daily allowance/too high;	(1) AO2 (1) AO2	**Max 1**

Total Mark: 10

Question 5

<table>
<tr><td>(a)</td><td>Mouth/Small intestine/duodenum</td><td>(1) AO1</td><td>1</td></tr>
<tr><td>(b)(i)</td><td>Amylase breaks bonds between glucose units; do not credit “breaks down starch”
Forming maltose;</td><td>(1) AO1
(1) AO1</td><td>2</td></tr>
<tr><td>(ii)</td><td>Enzymes are specific/EW/correct reference to lock and key/protein would not fit into active site of amylase;
This mark needs the idea of substrate and enzyme fitting together</td><td>(1) AO1</td><td>1</td></tr>
<tr><td>(c)(i)</td><td>As the temperature rises, the rate of reaction increases/the mean time after which the mixture stopped turning black decreases;
Effect greater from 10-25^{O}C than from 25^{O}C onwards;
At 40^{O}C time increases;</td><td>(1) AO3
(1) AO3
(1) AO3</td><td>Max 2</td></tr>
<tr><td>(ii)</td><td>The samples would eventually not turn the iodine black;
because low temperatures only slow down enzymes/enzymes are not denatured by low temperatures</td><td>(1) AO3
(1) AO3</td><td>2</td></tr>
<tr><td>(iii)</td><td>35^{O}C</td><td>(1) AO3</td><td>1</td></tr>
<tr><td>(iv)</td><td>The marking scheme for this part of the question includes an assessment of the Quality of Written Communication (QWC). There are no discrete marks for the assessment of written communication but QWC will be one of the criteria used to assign the answer to an appropriate level below.
<table>
<tr><th>Level</th><th>Mark</th><th>Descriptor
an answer will be expected to meet most of the criteria in the level descriptor</th></tr>
<tr><td>3</td><td>4-5</td><td>-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 minimal repetition or irrelevant points
-accurate and clear expression of ideas with only minor errors in the use of technical terms, spelling, punctuation and grammar</td></tr>
<tr><td>2</td><td>2-3</td><td>-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</td></tr>
<tr><td>1</td><td>0-1</td><td>-answer is largely incomplete, it may contain some 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</td></tr>
</table></td><td>(5) AO3</td><td>Max 5</td></tr>
</table>

		Possible biological valid points would include 1. Different sized drops/concentrations of iodine would make results inaccurate; 2. Volumes of withdrawn samples may have been different so reacting volumes would be different; 3. Samples may become contaminated by not properly rinsing the pipette between each sample; 4. She did not allow the tubes to equilibrate at their incubation temperatures; For each of the above, a sensible, plausible suggestion to overcome the source of error gains credit.		**Max 5**

An example of a Level 3 answer might be:
The volume or concentration of iodine solution in the testing drops would have a significant effect on the black colour obtained and therefore the iodine solution should be obtained from the same source bottle and measured out using a small sample pipette or syringe. If the enzyme and substrate were mixed at room temperature before they had reached incubation temperature, this would be another significant source of error. The enzyme and starch should be brought up to the incubation temperature separately before being mixed together. As she removed the samples she should have made sure the apparatus used to do this was clean or cross contamination could occur and this too would lead to error in the results.

Total Mark: 14

Question 6

(a)(i)	7.35 – 7.45 (both values must be given to gain full marks) Single value within range gains one mark. One value correct gains one mark, even if second value is incorrect;	(2) AO1	**2**
(ii)	Acidosis/pH too low (as is common in untreated diabetes) accept acidic	(1) AO1	**1**
(iii)	Blood is <u>buffered</u>; Haemoglobin accepts hydrogen ions; Which prevents drop/fall in blood pH/increase in acidity Fall in blood pH detected by chemoreceptors; stimulates increase in breathing rate/description; Which clears carbon dioxide from the system (more quickly);	(1) AO1 (1) AO1 (1) AO1 (1) AO1 (1) AO1 (1) AO1	**Max 3**
(b)	He should eat small meals at regular intervals; His carbohydrate intake should be closely controlled; He should eat mainly slow-release/complex/named food carbohydrate; He should avoid sugary foods/examples given; Ignore references to fizzy drinks unless linked to sugar idea	(1) AO2 (1) AO2 (1) AO2 (1) AO2	**Max 3**
(c)	Pale; cold; tired; confused; faint/wobbly; loss of consciousness; headache; apply list rule to symptoms	(2) AO2	**Max 2**

Total Mark: 11

Question 7

(a)	Chewing gum stimulates flow of saliva Saliva has bactericidal properties Which reduces conversion of sugar to acid Acid erodes tooth enamel	(1) AO2 (1) AO2 (1) AO2 (1) AO2	**Max 3**
(b)	(Supasweet would not provide calories for the diet) so avoid weight gain (Bacteria could not respire Supasweet so) the bacterial action in the mouth would be reduced/less bacteria in the mouth/bacteria produce less acid	(1) AO2 (1) AO2	**2**
(c)(i)	Group with Supasweet: 9%,Group with ordinary gum:11%; Difference 2% Percentages calculated correctly but not subtracted gains 1 mark	(1) AO2 (1) AO2	**2**
(ii)	Not enough difference between the groups Although group with Supasweet had had some reduction in decay Scientific claims such as this need more data Amount of decay not quantified	(1) AO2 (1) AO2 (1) AO2 (1) AO2	**4**

Total Mark: 10