ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Applied Science 8771/8773/8776/8779

SC14 The Healthy Body

Mark Scheme

Specimen Paper

2010 examination onwards

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.

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Dr Michael Cresswell Director General

Question 1

<table>
<tr><td>(a)(i)</td><td>It/ATP is broken down/phosphate bonds broken
Releasing/providing/supplying/EW energy
reject making/creating energy</td><td>(1) (AO1)
(1) (AO1)</td><td>2</td></tr>
<tr><td>(ii)</td><td>$C_6H_{12}O_6 + 6O_2$ on LHS of arrow
$6CO_2 + 6H_2O$ on RHS of arrow</td><td>(1) (AO1)
(1) (AO1)</td><td>2</td></tr>
<tr><td>(iii)</td><td>Aerobic yields (much) more (than anaerobic) / accept converse</td><td>(1) (AO2)</td><td>1</td></tr>
<tr><td>(b)</td><td>
<table>
<tr><th>Pathway / Process</th><th>Glycolysis</th><th>Krebs cycle</th><th>Electron transport system</th></tr>
<tr><td>ATP used</td><td>√</td><td>x</td><td>x</td></tr>
<tr><td>Carbon dioxide produced</td><td>x</td><td>√</td><td>x</td></tr>
<tr><td>ATP generated</td><td>√</td><td>√</td><td>√</td></tr>
</table>
If boxes are left blank they are assumed to be x
Marks are gained by ticks in the correct boxes</td><td>(1) (AO1)
(1) (AO1)
(1) (AO1)</td><td>3</td></tr>
<tr><td>(c) (i)</td><td>
The mark 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.
<table>
<tr><th>Level</th><th>Marks</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>-The answer:
• Is full and detailed and is supported by an appropriate range of relevant points such as those given in the example below.
• Is well structured with minimal repetition or irrelevant points. There is an accurate, fluent and clear expression of ideas.
• Contains only minor errors in the use of technical terms, spelling, punctuation and grammar.</td></tr>
<tr><td>2</td><td>2-3</td><td>The answer:
• Has some omissions but is generally supported by some of the relevant points given in the example below.
• Shows some attempt at structuring, the ideas are expressed with reasonable fluency and clarity.
• Contains a few errors in the use of technical terms spelling, punctuation and grammar.</td></tr>
</table>
</td><td></td><td>5</td></tr>
</table>

	1	0-1	The answer: • Is largely incomplete, it may contain some valid points which are not clearly structured. • Is unstructured with a lack of fluency and/or clarity. • Contains errors in the use of technical terms, spelling, punctuation and grammar.	(5) (AO2)	
			An example of a Level 3 type of answer that may be produced would be: The heart is mainly composed of muscle tissue, which has a high proportion of protein. Although not a principal respiratory substrate, under conditions of prolonged starvation protein will enter the respiratory pathways and be broken down to release a small amount of energy. In sufferers of anorexia nervosa the continued absence of fat and carbohydrate from the diet causes the depletion of muscle tissue. The other muscles may be broken down initially but at the end heart muscle is the only source of respiratory substrate available. At the end there is insufficient muscle tissue available to generate the force required to pump blood out of the ventricles. The heart action fails and death follows.		
(c) (ii)			Any **two** from: The state of mental competence of the patient/abilty to make a decision The wishes of the patient/relatives The advantages and disadvantages of feeding the patient at a late stage in their illness Whether it would be medically appropriate to impose feeding (nutrition) again Whether the course of action would benefit the patient.	2 (AO2)	**2**

Total Mark: 15

Question 2

(a)(i)	The healthy child has more villi / accept converse The healthy child's villi are longer / bigger / accept converse Patient's villi are not properly formed (Max 2)	(1) (AO2) (1) (AO2) (1) (AO2)	**2**
(a)(ii)	Large surface area; more food can be absorbed (in a given time) Well vasculated/EW; diffusion gradients maintained Muscular walls / peristalsis; ensure all contents come into contact with villi/absorptive surface/epithelium; Short diffusion pathway; movement into blood is easier Description & explanation must correspond for both marks (Max 4)	(AO2) (2) (AO2) (AO2) (2) (AO2)	**4**
(a)(iii)	Less surface / inadequate area over which to absorb nutrients	(1) (AO2)	**1**
(b)	Enzymes are specific / other proteins are digested by other enzymes; Idea of enzyme and substrate joining together Shape of active site must correspond to shape of substrate / « lock and key » gains this mark Each protein is a different shape / structure / polymer / made of different amino acids (Max 3)	(1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2)	**3**

Total Mark: 10

Question 3

(a)	pH of tube C / contents named fell faster (during the first 20 minutes) Than tube B (where bile salts had been replaced with water)	(1) (AO3) (1) (AO3)	**2**
(b)	Control / for comparison / shows bile salts alone have no effect / what happens when no lipase is present;	(1) (AO3)	**1**
(c)	Low pH had inactivated the lipase (denatured acceptable in correct context) The substrate had been used up	(1) (AO3) (1) (AO3)	**2**
(d)(i)	Check pH more frequently / more intepolated results Measure pH with electronic probe to 2d.p. / other digital device Use more accurate / named equipment to measure volumes; repeat and take <u>average</u> of results	(1) (AO3) (1) (AO3) (1) (AO3)	**3**
(ii)	More repeats for each condition Ensure substrate is not rate-limiting (e.g. by replacing milk with oil / use more milk) Reject generalised statements such as "use more accurate equipment" or "take more care"	(1) (AO3) (1) (AO3)	**2**

Total Mark: 10

Question 4

(a)(i)	The saturation (at every partial pressure) is low(er) in c.f. sufferer / accept converse; The rate of saturation is slower in c.f.sufferer / accept converse	(1) (AO2) (1) (AO2)	**2**
(ii)	(0.64 x 20 =) 12.8(cm^3) Answer partly correct, correct identification of 64% saturation = 1 mark	(2) (AO2) (1) (AO2)	**2**
(b)	Mucus blocks ducts of (enzyme producing) glands Preventing enzymes from mixing correctly with food Large molecules therefore not broken down Food cannot be properly absorbed / pass into blood / pass into body As molecules too large to pass through gut wall (Max 2)	(1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2)	**2**
(c)	Irregular heart rhythm (accept heart disease) (Electrolyte imbalance can lead to body going into) shock Muscle cramp Excessive dehydration in hot weather Any other known effect e.g. lowered blood pressure reject: thirsty (Max 3)	(1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2)	**3**

Total Mark: 9

Question 5

(a)(i)	Number of alveoli is fewer (with emphysema) Size of alveoli is larger (with emphysema)	(1) (AO2) (1) (AO2)	**2**
(ii)	Reduce surface area available for gas exchange Less diffusion can take place From alveoli into blood / EW giving direction of movement (Max 2)	(1) (AO1) (1) (AO1) (1) (AO1)	**2**
(b)(i)	74.5(%) correct answer gains both marks answer derived from difference / original gains one mark / or alternative calculation e.g. 30 / 118 gains one mark / 118-30 gains one mark	(2) (AO2)	**2**
(ii)	The mark 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.		**5**

Level	Marks	Descriptor an answer will be expected to meet most of the criteria in the level descriptor
3	4-5	The answer: • Is full and detailed and is supported by an appropriate range of relevant points such as those given in the example below. • Is well structured with minimal

			repetition or irrelevant points. There is an accurate, fluent and clear expression of ideas. • Contains only minor errors in the use of technical terms, spelling, punctuation and grammar.	(5) (AO2)	
	2	2-3	The answer: • Has some omissions but is generally supported by some of the relevant points given in the example below. • Shows some attempt at structuring, the ideas are expressed with reasonable fluency and clarity. • Contains a few errors in the use of technical terms spelling, punctuation and grammar.		
	1	0-1	The answer: • Is largely incomplete, it may contain some valid points which are not clearly structured. • Is unstructured with a lack of fluency and/or clarity. • Contains errors in the use of technical terms, spelling, punctuation and grammar.		
			An example of a Level 3 type of answer that may be produced would be: The data table shows that because of the breakdown of the structure of the alveoli the lung mass decreases and the lung volume increases. This reduction means that there is less diffusion surface available so the movement of oxygen into the blood stream is reduced and the ability of carbon dioxide to move out of the blood and into the alveolus is also reduced. The changes in the alveoli also make the lung tissue less elastic so that the emptying of the alveoli by elastic recoil is less effective and patients often need to develop specific breathing movements in order to exhale. In some extreme cases the damage causes the lung to collapse and stop functioning completely. As a result the tidal volume of the patient decreases. They also show a much reduced resistance to lung infection and an intolerance of dry atmospheres.		

Total Mark: 11

Question 6

(a)(i)	Any **two** of (loss by) sweating / (gain by) metabolism / (loss by) exhalation	(2) (AO2)	**2**
(ii)	0.6/(24 x 3) = 0.0083 (dm^3 h^{-1} m^{-2}) Correct answer scores two marks Part of calculation correct / 0.6 on top of fraction / 24 x 3 on bottom but arithmetic error gains one mark	(2) (AO2)	**2**
(iii)	That all areas of skin sweat an equal amount / EW / allow specific examples e.g. no open wounds	(1) (AO2)	**1**
(b)	1. ADH/antidiuretic hormone 2. Hormone/ADH/this chemical is produced when the body is losing too much water as in exercise / produced in order to maintain blood water potential 3. Increases permeability of collecting ducts of kidney/aqaporins open 4. Thus reabsorbing more water back into the blood 5. Resulting in a smaller volume of urine 6. Aldosterone increases reabsorption of salt 7. Causing water to follow by osmosis (Max 3)	(1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2)	**4**

Total Mark: 9

Question 7

(a)(i)	Intake of energy food / named food / carbohydrate / lipid should be increased Intake of iron should be increased Folic acid intake increased to aid iron uptake Vitamin C intake increased to aid iron uptake Reject the last two points unless qualified to aid iron uptake	(1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2)	**2**
(ii)	Levels of calcium (found in milk/yoghurt) are high But energy levels are low, hence low fat Levels of vitamins A and / or C (found in fruit) are high Protein is high, from milk / yogurt (Max 2)	(1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2)	**2**
(iii)	In summer sufficient vitamin D is synthesised by the skin / or converse. Answer should establish link between sun and Vitamin D Reject "its less sunny in winter" or similar	(1) (AO2)	**1**
(b)(i)	A small sample of blood would be taken (The level of) haemoglobin measured Packed cell volume measured	(1) (AO1) (1) (AO1) (1) (AO1)	**3**
(ii)	(This is lower than the normal value, which is) 12-15g dl^{-1} Accept values within 2 of upper or lower limit	(1) (AO1)	**1**
(iii)	Anaemia	(1) (AO1)	**1**

Total Mark: 10

Question 8

(a)	1. Decay is caused by bacterial action on sugar 2. This causes production of acids 3. Which erode tooth enamel 4. Regular brushing (removes sugary deposits) 5. (And) prevents build-up of plaque (in which bacteria live) 6. Flossing (between teeth removes plaque that brushing cannot) 7. Use of disclosing tablets (to show areas of plaque) (Max 2)	(1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1)	**3**
(b)	Chewing / grinding / EW breaks food down into smaller pieces Which increases surface area of food Making enzyme action/digestion more efficient If digestion is not completed, food particles are too large to be absorbed / EW (Max 3)	(1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1)	**3**

Total Mark: 6

Mark Breakdown

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	TOTAL
AO1	7	0	0	0	2	0	5	6	30
AO2	8	10	0	9	9	9	5	0	40
AO3	0	0	10	0	0	0	0	0	10
Total	15	10	10	9	11	9	10	6	80