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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Applied Science 8771/8773/8776/8779

SC14 The Healthy Body

Mark Scheme

2008 examination – June 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.

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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) (AO1)</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>Lipids enter as 2C/ acetyl groups
Lipids enter Krebs cycle
Proteins enter Krebs cycle
After deamination of amino acids (Max 2)</td><td>(1) (AO1)
(1) (AO1)
(1) (AO1)
(1) (AO1)</td><td>2</td></tr>
<tr><td>(ii)</td><td>Heart is made of muscle/protein
which may be used (as respiratory substrate / broken down/EW) during starvation
Reject “wasting away”, but mark needs the idea of muscle mass diminishing as it is used up. Simply “to supply energy” doesn’t gain this mark</td><td>(1) (AO2)
(1) (AO2)</td><td>2</td></tr>
</table>

Total Mark: 12

Question 2

<table>
<tr><td>(i)</td><td>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)</td><td>(1) (AO2)
(1) (AO2)
(1) (AO2)</td><td>2</td></tr>
<tr><td>(iii)</td><td>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)</td><td>(2) (AO1)
(2) (AO1)
(2) (AO1)
(2) (AO1)</td><td>4</td></tr>
<tr><td>(iii)</td><td>Less surface / inadequate area over which to absorb nutrients</td><td>(1) (AO2)</td><td>1</td></tr>
</table>

(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	(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) (1) (AO2)	**2**
(ii)	1. Lung mass decreases 2. Lung volume increases 3. Showing resistance to deflation 4. Reduced ability to move oxygen into bloodstream 5. Reduced ability to move carbon dioxide out of bloodstream 6. Impaired gas exchange (if neither point above given) 7. Increased susceptibility to respiratory infection 8. Tidal volume reduced 9. Reduced tolerance of dry atmosphere 10. Need to develop specific breathing movements 11. Lungs may collapse (Max 4) 12. One mark awarded specifically for correct reference to data 13. Allow reference to reduced surface area if that mark has not been gained in (a)(ii)	(1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2)	**5**

Total Mark: 11

Question 6

(a)(i)	Any **two** of (loss by) sweating / (gain by) metabolism / (loss by) exhalation	(2) (AO2)	**2**
(ii)	$0.6/(24 \times 3) = 0.0083 dm^3 = 0.83 cm^3$ Correct answer scores two marks Part of calculation correct / 0.6 on top of fraction / 24 x 3 on bottom but arithmetic error Units correct $dm^3h^{-1}m^{-2}$ OR $cm^3h^{-1}m^{-2}$	(2) (AO2) (1) (AO2) (1) (AO2)	**3**
(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: 10

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**
(c)	(Continuous production of) saliva Which has antiseptic properties (But not enough to deal with) modern diet high in sugar / processed food / acidic fizzy drinks / EW (Max 2)	(1) (AO2) (1) (AO2) (1) (AO2)	**2**

Total Mark: 8