Version 1.0

General Certificate of Education (A-level) Applied
June 2012

Applied Science SC14

(Specification 8771/8773/8776/8777/8779)

Unit 14: The Healthy Body

Final

Mark Scheme

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 events which all examiners 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 examiner understands and applies it in the same correct way. As preparation for standardisation each examiner 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, examiners encounter unusual answers which have not been raised 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 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	Part	Subpart	Marking Guidance		Mark	Comment
1	a		Ventricle thicker wall/ more muscle/ muscle contracts more (forcefully)/more (strongly)/muscles in left ventricle are stronger;	AO1	**1**	Accept 'the left ventricle is stronger'
1	b		Stretches (with surge); (Then) recoils/returns (to original);	AO1	**2**	Allow 'expands'. Ignore 'dilate' 'Contract and relax' is incorrect so gains 0 'Contract' – ignore 'Relax' – accept
1	c		Prevents backflow; from the ventricles/ to the atria/between the atria and the ventricles;	AO2	**2**	
1	d		In left atrium; through AV valves/ bicuspid; to left ventricle; out via aorta round body and back via vena cava; to right atrium: through AV valve/tricuspid valve; to right ventricle; out to lungs via pulmonary artery; from lungs to left atrium; through the pulmonary vein; accept atria/ventricles only once. Allow 1 mark for general statement about arteries away and veins towards the heart.	AO1	**4**	Accept atria/ventricles only once Accept valves only once Order has to be correct Don't follow the 'last principle' strictly but don't award marks for random correct answers in completely incorrect contexts.
1	e		• Increased CO_2 • Carbonic acid/lower pH/lactic acid detected by chemoreceptors; • Impulses to medulla / cardiovascular centre; • Increased frequency of impulses; • Impulses to the SAN; • Increased contractions of the heart. • = separate mark point	AO1	**3**	

2	a	i	4.0mmol/litre	AO1	**1**	

2	a	ii	Increased cardiovascular disease; increased atherosclerosis; narrowed arteries; increased stroke; increased type II diabetes; increased hypertension; increased osteoarthritis; painful joints; decreased life expectancy.	AO2	**3**	'Decreased mobility' is insufficient 'Fat blockages' insufficient as doesn't say where

2	b		urine test / dipstick / clinistick; compare colour change; accept similar for blood and fingerprick test.	AO1	**2**	

2	c		8100/100 × 30 =<u>2430</u>; /37.8 = 64.285 /64.3 /64	AO2	**2**	Accept 64.3 or 64 Correct answer with no working full marks. 1 mark for (8100 / 100) × 30 and wrong answer 1 compensation mark for correct substitution.

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<td>2</td>
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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>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>-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
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<td>AO2</td>
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			A typical answer that would score full marks would be: She will need to increase her energy intake slightly to meet the metabolic demands of pregnancy. She should increase her calcium intake, as this will contribute to growth of the fetal skeleton. Her protein intake should be increased as this will also provide amino acids (or molecules) for growth. Her iron intake should increase, as this will prevent anaemia. If she drinks alcohol she should stop as this can lead to fetal alcohol syndrome.			
3	a		48.1 – 30.9 = 17.2 × 3.3; = 56.76;	AO2	**2**	Accept 56.8 1 compensation mark for correct calculation and wrong answer.
3	b		• 100% saturation not reached • How readily haemoglobin loads and unloads oxygen • As partial pressure increases, so does one saturation of haemoglobin with oxygen • Oxygen unloaded/dissociated most where curve is sharpest	AO2	**2**	Accept 'unloads'
3	c	i	Affinity for saturation of oxygen is higher, so O_2 transfers from mother to fetus;	AO2	**1**	Key idea is O_2 transferred from mother's haemoglobin to fetus's haemoglobin
3	c	ii	More O_2 dissociates (at respiring muscles);	AO2	**1**	Accept 'unloads' or 'more oxygen in blood'
4	a	i	Fast 12 hours; In sealed chamber; Water running through walls; Resting (but awake); Difference in temperature entering and leaving measured Set period multiplied up to 24 hours (to give energy produced)/carried out for 24 hours	AO1	**4**	Ignore 'sleeping'
4	a	ii	Not in one room, could be done at home;	AO2	**1**	Allow 'can be done in a shorter time'

4	b	i	As a baseline/control/ to see effect of no exercise;	AO3	**1**	Ignore 'to make it a fair test'

4	b	ii	Correct scale; correct plotting; correct line of best fit with peak at/after 142.	AO2	**3**	Large, even, correct scales (if scales reversed, 2nd mark cancelled. Therefore can still gain 2 marks)

4	b	iii	• Rise and then fall after 5 mins **or** levels out after 6 mins Any <u>one</u> of: • heart rate increases with increased oxygen demand by muscles; • heart has to pump faster to meet oxygen demands; • falls later on as anaerobic exercise takes place; • falls later as volunteers get tired	AO2	**2 MAX**	1st mark descriptive 2nd mark explanation

4	c	i	age; sex; fitness level; weight; (accept health as alternative to fitness)	AO3	**2 MAX**	

4	c	ii	same diet; same hydration levels; temperature of room where test is taking place; same jogging pace/elevation/settings on treadmill. (2 max)	AO3	**2 MAX**	Ignore 'time'

5	a		<table><tr><td>Enzyme</td><td>Where active</td><td>Substrate</td><td>Product</td></tr><tr><td>Pepsin</td><td>***Stomach***</td><td>Protein</td><td>Small peptides</td></tr><tr><td>***(Salivary) amylase***</td><td>Mouth</td><td>starch</td><td>maltose</td></tr><tr><td>Lipase</td><td>Small intestine</td><td>triglycerides</td><td>***Fatty acids/ glycerol***</td></tr></table>	AO1	**3**	

5	b		Emulsifies fats; larger surface area for fat digestion; neutralises stomach acid.	AO1	**3**	

5	c		Tongue moves food/bolus around mouth; teeth shreds and grinds food/increases surface area of food; saliva moistens/softens food/ contains salivary amylase;	AO1	**3**	'breaks down' food is not sufficient for teeth
5	d		**For tooth decay:** Bacteria feed on debris/food in teeth; **For cavities:** Bacteria (produce acid which) dissolves enamel/tooth; **For gingivitis:** Bacteria and food debris cause plaque; **OR** Plaque weakens gums / causes bleeding;	AO2	**1** **1** **1**	Need reference to plaque
5	e		25p per 5000, 50p per 10,000 , 51.25 per 10,250; 51.25 per day × 365 = 18.706p or £187.06.	AO2	**2**	Correct working out but wrong answer = 1 mark £18706 gains 1 mark Cost for 1 day $\frac{25 \times 10250}{5000}$ = 1 mark Or cost for 5000 for 1 year =25 × 365 = 1 mark
6	a		Tidal vol × breaths per 30 secs; (1 mark for correct vol but wrong value) 5.25 (accept 5 – 5.6) (dm^3) for 2 marks	AO2	**2**	1 mark compensation for (tidal volume) between 1 and 1.05 **or** number of breaths as 2-3 (per 15 secs) or 4-6 (per 30 secs)
6	b	i	risks not understood / unacceptable level of risk payment may attract unsuitable / poorer/ against religious belief / safety concerns as only tested on animals	AO1	**1**	Ignore unsupported words like 'religion', 'safety', 'payment' etc.
6	b	ii	Helps prevent harm / abuse; objective / no bias;	AO1	**2**	

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			A typical answer that would score full marks would be: Surface area of the lungs decreases but at the same time there are fewer alveolar walls, leading to an increased diffusion pathway. Less O_2 enters the bloodstream and less CO_2 is removed. There is an increased chance of lung infection with main symptoms being breathlessness and tiredness. Eventually the lungs may collapse. Stopping smoking could prevent the condition becoming worse.			
6	d		Decreased surface area (to volume ratio); thickens the membrane/longer diffusion pathway	AO2	**2**	
7	a		$6O_2 \rightarrow 6H_2O + 6CO_2$	AO1	**1**	Ignore ATP/ energy reference if incorrect (products in either order). Symbols must be correct i.e. O_2 not O^2.
7	b		One mark for each correct row. In mitochondria: Krebs ✓, Electron Transport System ✓ In anaerobic respiration: Glycolysis ✓ CO_2 produced: Krebs ✓	AO1	**3**	
7	c	i	• Enters Krebs; • once de-amination of amino acids has occurred.	AO1	**2**	Wrong stage in addition to Krebs negates mark

7	c	ii	• Heart made of protein; • used as a respiratory substrate in the absence of fats/carbohydrates/glucose/lipids; • Heart muscle is broken down/heart muscle used as energy source. (Accept 'protein' for 'muscle').	AO2	**2 Max**	'Body eats heart muscle' is insufficient