



**General Certificate of Education (A-level) Applied  
January 2012**

**Applied Science**

**SC14**

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

**Unit 14: The Healthy Body**

**Final**

***Mark Scheme***

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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.

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Question	Part	Sub Part	Marking guidance	AO	Mark	Comment
1	(a)	(i)	<ul style="list-style-type: none"> <li>• (Pulse) oximeter c.a.o.</li> <li>• Non-invasive ALLOW 'instant reading'</li> </ul>	AO1	2	Allow second mark <u>only</u> if oximeter stated OR how device is used is described correctly.
1	(a)	(ii)	No unit / as a percentage (SaO <sub>2</sub> %)	AO1	1	
1	(a)	(iii)	4 (x O <sub>2</sub> ) ALLOW 8 atoms	AO1	1	
1	(b)		Barrier for oxygen to diffuse across / longer diffusion pathway; Reduces the amount of oxygen getting into the blood;	AO2	2	Allow: Its harder for oxygen to get into the blood OR diffusion is more difficult
1	(c)	(i)	7.35 to 7.45 c.a.o.	AO1	1	
1	(c)	(ii)	CO <sub>2</sub> from respiration; CO <sub>2</sub> lowers pH / CO <sub>2</sub> makes pH more acidic; CO <sub>2</sub> causes increased concentration of H <sup>+</sup> in the blood / carbonic acid produced	AO1	2 Max	Allow sequence of points related to anaerobic respiration <ul style="list-style-type: none"> <li>• Respires anaerobically</li> <li>• Lactic acid formed lowers pH</li> </ul>
1	(c)	(iii)	Lung disease / copd / emphysema / asthma / cystic fibrosis / bronchitis	AO2	1	
<b>Total Marks: 10</b>						
2	(a)	(i)	Bones bent / Bones soften	AO1	1	'brittle' negates Ignore 'weak/ fragile' bones
2	(a)	(ii)	5 micrograms/200 iu (4-6 or 180 to 220 allowed)	AO1	1	
2	(a)	(iii)	blood sample Chromatography/immunoassay	AO1	2	
2	(a)	(iv)	Butter/eggs/fish oil/oily fish such as mackerel, salmon, tuna, herring/margarine/dairy;	AO1	2	Ignore 'sun' or 'supplements / tables'

2	(a)	(v)	Exposure to sunlight; accept uV	AO1	1	
2	(b)	(i)	9930 – 4226 = 5704 (kJ) c.a.o.	AO2	1	
2	(b)	(ii)	total fat is 48.1g (no mark) $48.1 \times 35 = 1683.5$ kJ; $\frac{1683.5}{4226} \times 100 = 39.83\%$ allow 39.8%–40%; 2 marks for correct answer. 1 compensation mark for calculation OR $48.1 \times 35 = 1683.5$	AO2	2	16835.5 gains 1 mark
2	(b)	(iii)	(teenagers) Growing (elderly aren't); Need proteins for new tissue/bone/cells;	AO1	2	Protein needed for growth is insufficient for 2 <sup>nd</sup> mark.
<b>Total Marks: 12</b>						
3	(a)	(i)	Beta cells (of pancreas) Converts glucose to glycogen Alpha cells (of pancreas) Converts glycogen to glucose 2 or 3 points correct for 1 mark. All four correct for 2 marks.	AO2	2	Ignore reference to other organs.
3	(a)	(ii)	Protein digested (in the stomach);	AO1	1	
3	(a)	(iii)	(Excessive) thirst; Frequent urination; Weight loss; Tiredness; (allow lack of energy) Ketosis; 2 marks max	AO1	2 Max	Every incorrect answer negates a correct answer. Ignore reference to sugar in the urine or blood.
3	(b)	(i)	<ul style="list-style-type: none"> <li>• Rose and fell</li> <li>• Returned to normal in a short time</li> </ul>	AO2	2	

3	(b)	(ii)	Glucose from digestion is absorbed/enters the blood / blood glucose rises; Decrease as used up/stored / converted to glycogen	AO2	2	
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3	(b)	(iii)	The marking scheme for this part of the question includes an assessment for the Quality of Written Communication (QWC) .There are no discrete marks for the assessment of quality of written communication but QWC will be one of the criteria used to assign the answer to an appropriate level below:	AO2	5										
			<table border="1"> <thead> <tr> <th>Level</th> <th>Marks</th> <th>Descriptor</th> </tr> </thead> <tbody> <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 minimum repetition or irrelevant points - accurate and clear expression of ideas with only minor errors in the use of technical terms, spelling and 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> </tbody> </table>				Level	Marks	Descriptor	3	4-5	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 and punctuation and grammar	2	2-3	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
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**Total Marks: 14**

			<table border="1"> <tr> <td>1</td> <td>1-2</td> <td> <p>Answer is largely incomplete. It may contain valid points which are not clearly linked to an argument structure.</p> <p>Unstructured answer</p> <p>Errors in the use of technical terms, spelling, punctuation and grammar or lack of fluency</p> </td> </tr> </table> <p><i>A typical answer would include:</i></p> <p>An explanation as to why sugary food should be limited and why starchy carbohydrates are more suitable for Type II diabetics.</p> <p>An explanation of why more cardiovascular exercise would be beneficial to Type II diabetics</p> <p>E.g. sugary foods are composed of mono and disaccharides. These are quickly digested, leading to a sharp increase in blood glucose concentration. This is not brought back to normal by sufferers of Type II diabetes and can lead to hyperglycaemia. Starch based carbohydrates are polysaccharides. These are digested to release glucose slowly and blood glucose levels stay low. More exercise should be taken as glucose is used by the body during respiration to produce ATP energy. More energy is needed during exercise and excess glucose in the blood would be used up in generating the extra ATP.</p> <p style="text-align: right;">5 marks</p>	1	1-2	<p>Answer is largely incomplete. It may contain valid points which are not clearly linked to an argument structure.</p> <p>Unstructured answer</p> <p>Errors in the use of technical terms, spelling, punctuation and grammar or lack of fluency</p>			
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4	(a)	(i)	<p>Correct and appropriate scale; (allow – pre scale starting from 0)</p> <p>Points plotted correctly;</p> <p>Appropriate smooth curve;</p>	AO2	3				
4	(a)	(ii)	<ul style="list-style-type: none"> <li>• There is an optimum pH value;</li> <li>• Denatured (allow much less effective) (either side of the optimum) / Value of optimum</li> </ul>	AO2	2				

4	(b)	(i)	Range of temperatures; Use of water-bath/thermometer; Measure product formed/reactant used up; Record / graph / analyse	AO3	4	
4	(b)	(ii)	Repeat experiment; • One appropriate variable controlled • Further appropriate variable(s) controlled Use correct sizes for equipment; Max 3	AO3	3 Max	
4	(c)		Emulsifies fats; Increased surface area for digestion of fats; Allow - neutralises stomach acid / reduced acidity 2 marks max	AO1	2	

**Total Marks: 14**

5	(a)		Diaphragm doesn't move down / flatten / contract; Thoracic cavity / lung volume not increased / (thoracic) pressure doesn't decrease	AO2	2	
5	(b)		Large intestine / colon;	AO1	1	
5	(c)		ADH / antidiuretic hormone and two of the following; Produced when body losing too much water/to maintain water potential; Increases permeability of collecting duct; More water is reabsorbed (so smaller volume of concentrated urine)	AO2	3	
5	(d)	(i)	Lungs won't inflate/deflate fully/reduces lung capacity;	AO2	1	
5	(d)	(ii)	More tissue to penetrate/increased diffusion pathway; Reduced surface area (of alveoli);	AO2	2	

5	(e)	(i)	Not remembered exposure; Exposed to other factors; Not known exposed; Died of something else;	AO2	1	Long time between exposure and disease is insufficient
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5	(e)	(ii)	Smoking/genetic factors/pollution/specific industrial source	AO2	1	'poor diet' is insufficient
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**Total Marks: 11**

6	(a)	(i)	4.0 – 6.5 (mmol/litre)	AO1	1	
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6	(a)	(ii)	Digital display/dipstick subjective (as analogue) / no human error in reading Quantitative measurement / specific reading	AO1	2	
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6	(b)		Increases risk of heart damage; Increases risk of arterial damage; Increases risk of stroke; Increased risk of hypertension 2 marks max	AO1	2 Max	
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**Total Marks: 5**

7	(a)		$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O (+ 38ATP)$ 1 mark compensation for either LHS or RHS correct	AO1	2	Max 1 mark if used instead of →
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7	(b)	(i)	Krebs cycle/TCA cycle/Citric acid cycle; Oxidative phosphorylation/electron transport chain;	AO1	2	Glycolysis and other incorrect responses negate. Ignore 'link'
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7	(b)	(ii)	2	AO1	1	
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7	(c)	(i)	The amount of energy released (per unit time) at rest;	AO1	1	
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7	(c)	(ii)	Muscles have a higher BMR than fat; Males have more muscle; (accept converse) 1 mark max	AO2	1 max										
7	(c)	(iii)	$3/8=0.375\text{dm}^3$ per min x 60 per hour=22.5; $22.5 \times 20.17 = 453.825 \text{ kJ hr}^{-1}$ Allow (450 – 455) One mark compensation for $3/8 \times 60$ Or $3/8 \times 20.17$	AO2	2										
7	(d)		<p>The marking scheme for this part of the question includes an assessment for the Quality of Written Communication (QWC). There are no discrete marks for the assessment of quality of written communication but QWC will be one of the criteria used to assign the answer to an appropriate level below:</p> <table border="1"> <thead> <tr> <th>Level</th> <th>Marks</th> <th>Descriptor</th> </tr> </thead> <tbody> <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 minimum repetition or irrelevant points                      - accurate and clear expression of ideas with only minor errors in the use of technical terms, spelling and 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> </tbody> </table>	Level	Marks	Descriptor	3	4-5	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 and punctuation and grammar	2	2-3	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	QWC	5	
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**Total Marks: 14**