GCSE MARKING SCHEME

ADDITIONAL APPLIED SCIENCE

SUMMER 2014

INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2014 examination in GCSE ADDITIONAL APPLIED SCIENCE. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

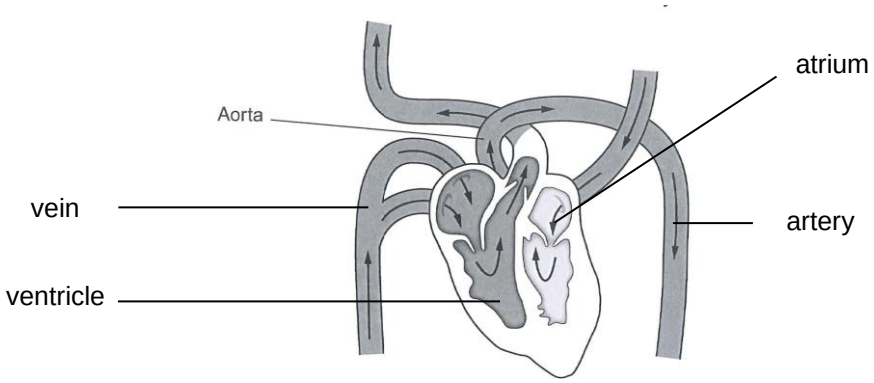
WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

GCSE ADDITIONAL APPLIED SCIENCE

SUMMER 2014 MARK SCHEME

FOUNDATION TIER

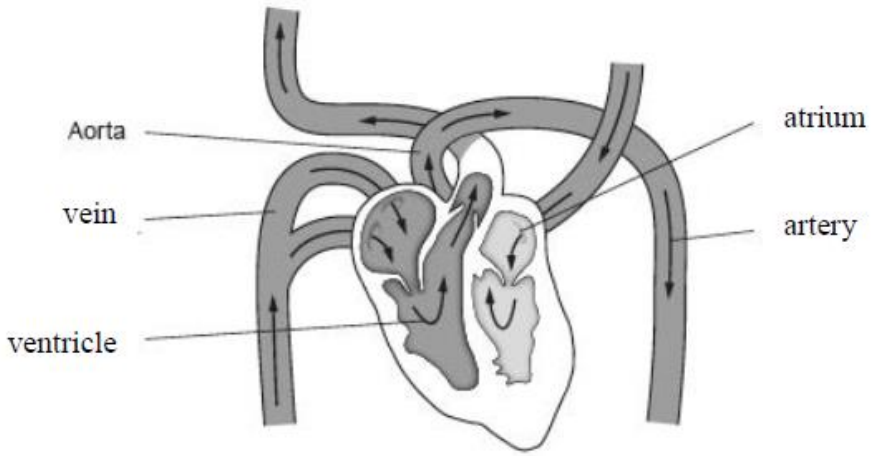
Question			Marking point	Marks
1.	(a)	(i)	Suitable / warm / room temperature [1] and moisture [1]	**2**
		(ii)	Any **two** of: refrigeration, freezing, drying, salting, smoking, pickling, heating	**2**
		(iii)	Food poisoning / sickness / diarrhoea / stomach ache	**1**
2.	(a)	(i)	Positive	**1**
		(ii)	Strong	**1**
		(iii)	Electrostatic	**1**
		(iv)	Higher than 100ºC	**1**
	(b)	(i)	Strong covalent bond	**2**
		(ii)	Weak force between molecules	
3.		(i)	Seeds will not germinate unless stored at cold temperature [1] the longer seeds are stored the more of them germinate [1] and the sooner they germinate [1]	**3**
		(ii)	Burning gas increases CO_2 concentration / increases temperature [1] artificial lighting increases light intensity [1] which increases the rate of photosynthesis [1] Points must be coherently and correctly linked for 3 marks	**3**
4.	(a)	(i)	Biceps contracted (NOT: tighter) [1] triceps relaxed [1]	**2**
		(ii)	The biceps must relax [1] and the triceps contract [1]	**2**
	(b)	(i)	(50 N) x 40 [1] answer = 2 000 Ncm [1]	**2**
		(ii)	I Closer to the elbow / perpendicular distance is less[1] II 400 N circled [1]	**1** **1**
5.	(a)	(i)	14	**1**
		(ii)	Alkali (Allow error carried forward)	**1**
		(iii)	7	**1**

Question			Marking point	Marks
		(iv)	Acid (Allow error carried forward)	**1**
		(v)	25 (cm^3)	**1**
	(b)		$= \frac{0.50 \times 25}{20}$ [1]	**3**
			0.625 [1]	
			0.63 (to 2nd decimal places) (not 0.62) [1]	
6		(i)	All correct 3 marks; 2 or 3 correct 2 marks; 1 correct 1 mark 	**3**

Question	Marking point	Marks
(ii)	**Indicative content:** • Aerobic respiration requires oxygen and glucose. • The cardiovascular system transports oxygen from the lungs to muscle cells. • It also transports glucose that is absorbed by blood across the walls of the small intestine. • The products of aerobic respiration are carbon dioxide, water and energy. Carbon dioxide is transported back to the lungs by the cardiovascular system. • Water is used by the body, to dissolve a range of solutes, or is removed via the kidneys and bladder. **Mark Bands** **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.	**6QWC**

Question			Marking point	Marks
7.	(a)		Any **two** from: temperature, blood pressure, height, body mass / weight / BMI, lung capacity, waist line measurement, body fat, breathing rate	**2**
	(b)	(i)	Rest line at 80 beats [1] Line showing increase to 140 beats [1] Line returns to 80 beats with longer recovery time than fit person [1]	**3**
		(ii)	**Fit person:** has a slower resting pulse rate [1] pulse rate will increase less [1] and take shorter to return to the resting rate after exercise [1] than for a unfit person If unfit person is compared then this must be clearly stated by candidate to award marks	**3**
	(c)	(i)	Aerobic exercise or a named aerobic exercise (Accept: cardiovascular exercise)	**1**
		(ii)	Strengthens heart muscles / heart muscles become more effective / healthy	**1**
8.	(a)	(i)	12 cm^3	**1**
		(ii)	Subs in both numbers [1] answer = 2 g/cm^3 [1] Allow ecf	**2**
	(b)	(i)	Aluminium weaker than bone [1] but titanium is strong<u>est</u> [1] and light<u>er</u> than stainless steel [1] Points must be coherently and correctly linked for 3 marks	**3**
		(ii)	Not strong enough [1] brittle / may break in the body [1]	**2**

HIGHER TIER

Answer			Marking Point	Marks
1.	(a)	(i)	4 x1  	**4**
		(ii)	**Indicative content:** • Aerobic respiration requires oxygen and glucose. • The cardiovascular system transports oxygen from the lungs to muscle cells. • It also transports glucose that is absorbed by the blood across the walls of the small intestine. • The products of aerobic respiration are carbon dioxide, water and energy. Carbon dioxide is transported back to the lungs by the cardiovascular system. • Water is used by the body, to dissolve a range of solutes, or is removed via the kidneys and bladder. **Mark Bands** **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows essential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.	**6QWC**

Answer			Marking Point	Marks
			3-4 marks The candidates constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.	
2.	***(a)***	(i)	*Metals form positive ions; non-metals form negative ions [1] which allows (electrostatic) forces of attraction between oppositely charged ions. [1]* *Two points must be coherently and correctly linked for 2 marks*	***2***
		(ii)	Ionic bonds are very strong [1] and therefore a lot of energy is needed to break them. [1] Two points must be coherently and correctly linked for 2 marks	***2***
		(iii)	Ions are charged particles [1], but ionic compounds can only conduct electricity if their ions are free to move [1] Two points must be coherently and correctly linked for 2 marks	**2**
	(b)		Strong covalent bonds between atoms (in molecules) [1] Weak forces (accept: bonds) / weak hydrogen bonds between molecules [1]	**2**

Answer			Marking Point	Marks
3.	(a)		Any **two** from: temperature, blood pressure, height, body mass / weight / BMI, lung capacity, waist line measurement, body fat, breathing rate	**2**
	(b)	(i)	Rest line at 80 beats [1] Line showing increase to 140 beats [1] Line returns to 80 beats with longer recovery time than fit person [1]	**3**
		(ii)	**Fit person:** has a slower resting pulse rate [1] pulse rate will increase less [1] and take shorter to return to the resting rate after exercise [1] than for a unfit person If unfit person is compared then this must be clearly stated by candidate to award marks	**3**
	(c)	(i)	Aerobic exercise or a named aerobic exercise (Accept: cardiovascular exercise)	**1**
		(ii)	Strengthens heart muscles / heart muscles become more efficient / healthy	**1**
4.	(a)	(i)	12 cm^3	**1**
		(ii)	Subs in both numbers [1] ans = 2 g/cm^3 [1]	**2**
	(b)	(i)	Aluminium weaker than bone [1] but titanium is strongest [1] and lighter than stainless steel [1] Points must be coherently and correctly linked for 3 marks	**3**
		(ii)	Not strong enough [1] brittle / may break in the body [1]	**2**

<table>
<tr><th colspan="3">Answer</th><th>Marking Point</th><th>Marks</th></tr>
<tr><td>5.</td><td></td><td>(i)</td><td>Seeds will not germinate unless stratified [1] the longer seeds are stratified the more of them germinate [1] and the sooner they germinate [1]</td><td>3</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Can increase CO_2 concentration [1] can use artificial lighting to increase light intensity [1] can increase temperature [1] all of which increase the rate of photosynthesis [1]
Pest kept to a minimum (1) so more plants survive (1)
Protected from adverse weather (1) so less damage to plants (1)
Can control the nutrients (1) for healthy growth (1)

Points must be coherently and correctly connected for 4 marks</td><td>4</td></tr>
<tr><td>6</td><td></td><td>(i)</td><td>Bacterial/fungal <u>growth</u> [1] which increases with a suitable / warm / room temperature [1] and moisture [1]</td><td>3</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Suitable method – refrigeration/freezing/drying/salting/smoking/pickling/heating/ [1] which slow down/stop bacteria growth [1]
Two points must be coherently and correctly linked for 2 marks</td><td>2</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>3 x [1] Correct answers in bold
<table>
<tr><th colspan="2"></th><th>E.coli</th><th>Coliforms</th></tr>
<tr><td rowspan="4">Number of colonies in grid section</td><td>1</td><td>0</td><td>2</td></tr>
<tr><td>2</td><td>1</td><td>1</td></tr>
<tr><td>3</td><td>1</td><td>1</td></tr>
<tr><td>4</td><td>0</td><td>1</td></tr>
<tr><td colspan="2">Mean (colonies per cm²)</td><td>0.5</td><td>1.25</td></tr>
<tr><td colspan="2">Mean colonies per plate</td><td>28.7</td><td>71.75 Allow ecf</td></tr>
<tr><td colspan="2">Sample volume (cm³)</td><td>2.5</td><td>2.5</td></tr>
<tr><td colspan="2">Colony-forming units estimate (mean number per 100 cm³)</td><td>1148</td><td>2 870 Allow ecf</td></tr>
</table></td><td>3</td></tr>
</table>

Answer			Marking Point	Marks
7.		(i)	**Indicative content:** • The solution of unknown concentration was a strong alkali/base. • The standard solution was a strong acid. This can be deduced from the graph by noting the change in pH as the standard solution is added to the unknown solution. • The graph begins at a pH of 14 which means the solution was a strong alkali. The pH reduces as the standard solution is added so it must be acid. • Since the mixed solution ends up at a pH of near zero, then the solution must have been a strong acid. • The equivalence point was reached after adding 25 cm^3 of acid. This is the volume of acid needed to neutralise the unknown solution. **Mark Bands** **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant point, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.	**6QWC**
		(ii)	$C_{HCl} = \frac{C_{NaOH} \times V_{NaOH}}{V_{HCl}}$ [1] $= \frac{0.50 \times 25}{20}$ [1] $= 0.625$ [1]	**3**

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