



**GCSE**

**Additional Applied Science**

**Higher Tier**

**Unit 1 (Science at Work)**

**SPECIMEN MARK SCHEME**

**Version 1.0**

## Quality of Written Communication and levels marking

In Question 4(a)(i) candidates are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Candidates will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

### Level 1: basic

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

### Level 2: clear

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

### Level 3: detailed

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

In order to attain a mark within a certain level, **both** the science **and** the QWC must be of a standard appropriate to that level.

**COMPONENT NUMBER: Unit 1H (Science at Work)**

**COMPONENT NAME: Additional Applied Science**

**STATUS: Specimen V1.0**

question	answer	extra information	mark
1(a)(i)	the normal		1
1(a)(ii)	correct angles		1
	$R_f = \sin 45 / \sin 30$		1
	= 1.414		1
	fits in the range for headlamps from table		1
1(b)(i)	as the temperature of the liquid changes, so does its refractive index		1
	this means that when the refractive index of liquid and glass is the same the glass 'disappears'	allow because there is no refraction of light	1
1(b)(ii)	acts as a check on results		1
	can calculate a mean		1
	can lead to reduction in effect of random errors		1
<b>Total</b>			<b>10</b>

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question	answer	extra information	mark
<b>2(a)</b>	pencil is insoluble and ink is soluble so dots will not run into the solvent		1
			1
<b>2(b)</b>	because the colours / components have different solubilities or have different attractions (from the solvent) as the solvent moves up the paper the colours / components will move at different rates		1
			1
			1
<b>2(c)(i)</b>	$R_f = \frac{\text{distance travelled by substance}}{\text{distance travelled by solvent}}$ distance moved by spot B = 3.0 cm, distance moved by solvent front = 3.5 cm <b>or</b> $R_f = 3.0 / 3.5$ $= 0.86$	correct measurements taken from diagram. Both needed for the mark.  allow ecf from candidate's measurements.  correct answer with or without working = <b>2</b> marks	1
			1
<b>2(c)(ii)</b>	contain different number of spots $R_f$ values of spots A and B are different		1
			1
<b>Total</b>			<b>9</b>

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question	answer	extra information	mark
3(a)	compression / tension		1
3(b)	flexibility		1
3(c)(i)	0–1400 N		1
3(c)(ii)	Stress = $1600 / 2 = 800$	correct answer with or without working = <b>2</b> marks	1
	N / mm <sup>2</sup>		1
3(c)(iii)	line C	must have reference to both cost and diameter for the mark	1
	diameter 0.20 mm		1
	because it is the cheapest and thinnest line		1
	with a breaking strain above the weight of the fish		1
<b>Total</b>			<b>9</b>

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question	answer	extra information	mark
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**4(a)(i)**  
 Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 2.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content.	There is a brief description of a procedure for comparing the two fertilisers. The answer may not necessarily lead to a successful comparison of the fertilisers.	There is a description of the controlled procedure for comparing the two fertilisers that could easily be followed by another person. The answer <b>must</b> enable a basic comparison of the fertilisers.	There is a clear, detailed description of the controlled procedure for comparing the two fertilisers that could easily be followed by another person. The answer <b>must</b> enable a detailed comparison of the fertilisers.

<p><b>examples of the points made in the response:</b></p> <ul style="list-style-type: none"> <li>• two samples of the same type of seed</li> <li>• two samples containing the same amount of seed</li> <li>• allow seed to germinate / start to grow</li> <li>• in a suitable controlled environment</li> </ul> <ul style="list-style-type: none"> <li>• add one type of fertiliser to one sample and the other type to the second sample</li> <li>• add equal amounts of each fertiliser</li> <li>• when plants finish growing, weigh the wheat</li> </ul>	<p><b>extra information</b></p> <p>Examples of a suitable controlled environment include:</p> <ul style="list-style-type: none"> <li>• light</li> <li>• temperature</li> <li>• moisture</li> <li>• carbon dioxide</li> <li>• density of planting</li> <li>• type of growing medium</li> </ul>
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question	answer	extra information	mark
4(a)(ii)	compare the mass of crop yield grown in A with that grown in B. If A > B then hypothesis is correct	owtte	1
4(b)(i)	$N_2 + 3H_2 \rightleftharpoons 2NH_3$	1 mark for correct formulae 1 mark for balancing <b>and</b> $\rightleftharpoons$	Max. 2
4(b)(ii)	less ammonia produced		1
4(b)(iii)	more ammonia produced		1
4(c)(i)	85 000 / 120 000 x 100 70.8%	accept full calculator display correct answer alone gets <b>2</b> marks	1 1
4(c)(ii)	incomplete reaction		1
<b>Total</b>			<b>14</b>

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question	answer	extra information	mark																		
<p><b>5(a)</b></p>	<p>Man <b>B</b></p> <p>child gets DNA / bars / lines from mother and father / both parents</p> <p>(child has) no matches with man <b>A</b>, so man <b>A</b> is not the father</p> <p>(child has) man <b>B</b>'s 10 / 12 / 13 / 14 or child gets 18 / 20 / 21 / 23 from man <b>B</b></p>	<p>ignore genes / chromosomes</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding-right: 20px;">Man B</td> <td>Child</td> </tr> <tr> <td></td> <td>17</td> </tr> <tr> <td>10 ———</td> <td>18</td> </tr> <tr> <td></td> <td>19</td> </tr> <tr> <td>12 ———</td> <td>20</td> </tr> <tr> <td>13 ———</td> <td>21</td> </tr> <tr> <td></td> <td>22</td> </tr> <tr> <td>14 ———</td> <td>23</td> </tr> <tr> <td></td> <td>24</td> </tr> </table> <p>ignore reference to mother's DNA</p>	Man B	Child		17	10 ———	18		19	12 ———	20	13 ———	21		22	14 ———	23		24	<p>1</p> <p>1</p> <p>1</p> <p>1</p>
Man B	Child																				
	17																				
10 ———	18																				
	19																				
12 ———	20																				
13 ———	21																				
	22																				
14 ———	23																				
	24																				
<p><b>5(b)</b></p>	<p>DNA has negative charge (when in alkaline solution)</p> <p>so the fragments will move towards positive electrode</p> <p>because smaller DNA fragments move faster / further (than large ones)</p> <p>the particles will be separated by size</p>		<p>1</p> <p>1</p> <p>1</p> <p>1</p>																		
<p><b>Total</b></p>			<p><b>8</b></p>																		



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question	answer	extra information	mark
<b>6(a)(i)</b>	Moment = force × perpendicular distance to pivot		1
	distance = 32 cm <b>or</b> 0.32 m		1
	force = $2.88 / 0.32 = 9$ <b>or</b> $288 / 32 = 9$	accept $2.88 / 32 = 0.09$ for <b>1</b> mark accept $2.88 / 32 = 0.09$ N for <b>2</b> marks	1
	N	correct answer with or without working = <b>3</b> marks	
<b>6(a)(ii)</b>	Biceps		1
<b>6(a)(iii)</b>	Triceps		1
<b>6(a)(iv)</b>	Tendon		1
<b>6(b)</b>	<b>A</b>		
	cartilage		1
	to reduce friction		1
	<b>B</b>		
synovial membrane		1	
to provide synovial fluid to lubricate the joint		1	
<b>Total</b>			<b>10</b>