

## **Cambridge National**

### **Science**

Unit **R075/01**: How Scientific Data is Used

Level 1

## **Mark Scheme for January 2016**

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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## Annotations

Used in the detailed Mark Scheme:

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
(1)	separates marking points
not/reject	answers which are not worthy of credit
ignore	statements which are irrelevant - applies to neutral answers
allow/accept	answers that can be accepted
(words)	words which are not essential to gain credit
<u>words</u>	underlined words must be present in answer to score a mark
ecf	error carried forward
AW/owtte	credit alternative wording / or words to that effect
ORA	or reverse argument

Available in scoris to annotate scripts:

	indicate uncertainty or ambiguity
	benefit of doubt
	contradiction
	incorrect response
	error carried forward
	draw attention to particular part of candidate's response
	no benefit of doubt
	reject
	correct response

	draw attention to particular part of candidate's response
	information omitted
	indicate uncertainty or ambiguity
	benefit of doubt
	contradiction
	incorrect response
	error carried forward
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	no benefit of doubt
	reject
	correct response
	draw attention to particular part of candidate's response
	information omitted

**Subject-specific Marking Instructions**

- a. Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).
- b. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

*e.g. for a one-mark question where ticks in the third and fourth boxes are required for the mark:*

✗
✗

*This would be worth  
1 mark.*

✓
✗

*This would be worth  
0 marks.*

✗
✗
✓
✓

*This would be worth  
1 mark.*

- c. The list principle:  
If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, e.g. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

## d. Marking method for tick-box questions:

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.

If there is at least one tick, ignore crosses and other markings. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses. Credit should be given according to the instructions given in the guidance column for the question. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

e.g. if a question requires candidates to identify cities in England:

Edinburgh	<input type="checkbox"/>
Manchester	<input type="checkbox"/>
Paris	<input type="checkbox"/>
Southampton	<input type="checkbox"/>

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
<b>Score:</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>NR</b>

## e. For answers marked by levels of response:

- i. **Read through the whole answer from start to finish**
- ii. **Decide the level that best fits** the answer – match the quality of the answer to the closest level descriptor
- iii. **To determine the mark within the level**, consider the following:

Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

- iv. Use the **L1**, **L2**, **L3** annotations in Scoris to show your decision; do not use ticks.

Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

Question		Answer	Marks	Guidance					
1	(a)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="text-align: center;"><i>D</i></td> <td style="text-align: center;"><i>A</i></td> <td style="text-align: center;"><b>B</b></td> <td style="text-align: center;"><i>E</i></td> <td style="text-align: center;"><i>C</i></td> </tr> </table>	<i>D</i>	<i>A</i>	<b>B</b>	<i>E</i>	<i>C</i>	<b>3</b>	All 4 boxes correct 3 marks If not all correct: D and A before B 1 mark; C last box 1 mark
<i>D</i>	<i>A</i>	<b>B</b>	<i>E</i>	<i>C</i>					
	(b)	check for error / take mean / check it's correct / more reliable	<b>1</b>	<b>Ignore</b> accurate, reproducible, repeatable					
	(c)	see colour change differently (OWTTE)	<b>1</b>						
	(d)	pH meter / pH probe / autotitration	<b>1</b>	<b>Allow</b> datalogging					
<b>Total</b>			<b>6</b>						

Question			Answer	Marks	Guidance
2	(a)	(i)	It gives as many spots as possible. <input type="checkbox"/> It shows the strongest pigment. <input type="checkbox"/> It separates the spots as much as possible. <input checked="" type="checkbox"/>	1	
		(ii)	(qualitative)  no numbers (ORA) / subjective / colour differs for people	1	no mark for qualitative alone; quantitative initial answer – no credit for question <b>Allow</b> describing what it looks like
		(iii)	spots at same height / 2 spots with same $R_f$ value (of 0.65/0.66)	1	<b>Allow</b> 2 spots line up
		(iv)	Xanthophyll (3 <sup>rd</sup> answer) (1);  Chlorophyll (4 <sup>th</sup> answer) (1)	2	If more than two ringed use list principle 12c page 6
		(v)	spot at/near 0.94	1	
	(b)	(i)	makes his conclusion more secure / gets same conclusion	1	<b>Ignore</b> reliable and accurate

Question			Answer	Marks	Guidance
2	(b)	(ii)	<p><b>[Level 3]</b> States that three pigments are present and identifies chlorophyll and carotene. Gives evidence for these and explains why third cannot be identified. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p><b>[Level 2]</b> Identifies chlorophyll and carotene <b>AND</b> gives evidence for these <b>OR</b> states three pigments present and identifies chlorophyll and carotene <b>OR</b> identifies chlorophyll and carotene <b>AND</b> comments on their abundance <b>or</b> identifies not phaeophytin and xanthophyll with evidence. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p><b>[Level 1]</b> Identifies chlorophyll and carotene <b>OR</b> identifies either chlorophyll or carotene and comments on its abundance <b>OR</b> identifies chlorophyll or carotene and gives evidence <b>OR</b> identifies not phaeophytin and xanthophyll. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p><b>[Level 0]</b> Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to D</p> <p><b>Indicative scientific points may include:</b></p> <p><b>Pigments:</b></p> <ul style="list-style-type: none"> <li>• chlorophyll</li> <li>• carotene</li> <li>• three lines on graph indicate three pigments</li> <li>• not phaeophytin and xanthophyll</li> </ul> <p><b>Evidence:</b></p> <ul style="list-style-type: none"> <li>• chlorophyll line at 430</li> <li>• carotene line at 450</li> <li>• another line at about 454 shows another pigment</li> <li>• no data in table for 454</li> <li>• no lines at 410 and 494</li> </ul> <p><b>Abundance:</b></p> <ul style="list-style-type: none"> <li>• chlorophyll - most</li> <li>• carotene – 0.67 as much as chlorophyll</li> <li>• third pigment – smallest 0.2 as much as chlorophyll</li> </ul> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
			<b>Total</b>	<b>13</b>	

Question		Answer	Marks	Guidance																				
3	(a)	<table border="0"> <tr> <td>Location</td> <td>Acidic</td> <td>Neutral</td> <td>Alkaline</td> </tr> <tr> <td>Lake</td> <td></td> <td></td> <td>√</td> </tr> <tr> <td>River</td> <td></td> <td></td> <td>√</td> </tr> <tr> <td>Tap</td> <td>√</td> <td></td> <td></td> </tr> <tr> <td>Well</td> <td></td> <td>√</td> <td></td> </tr> </table>	Location	Acidic	Neutral	Alkaline	Lake			√	River			√	Tap	√			Well		√		3	four ticks correct 3 marks three or two ticks correct 2 marks one tick correct 1 mark
Location	Acidic	Neutral	Alkaline																					
Lake			√																					
River			√																					
Tap	√																							
Well		√																						
	(b)	(i)	pH meter more sensitive / UI gives same colour for range of pH values	1	<b>Ignore</b> accurate																			
		(ii)	quantitative / gives numbers / exact / precise / objective / not subjective / does not rely on human	1	<b>Ignore</b> accurate																			
	(c)	(i)	to make the residue stick to the wire <input type="checkbox"/> to find out what colour the acid gives <input type="checkbox"/> to make the colour stronger <input type="checkbox"/> to clean the wire <input checked="" type="checkbox"/>	1																				
		(ii)	calcium	1	<b>Allow</b> Ca																			

Question		Answer	Marks	Guidance
	(iii)	keep the wire in the Bunsen..... <input type="checkbox"/> dip the wire loop in a different... <input type="checkbox"/> repeat the same test <input checked="" type="checkbox"/> use a different technique <input type="checkbox"/>	1	
	(d)	white (precipitate) (1); white (precipitate) (1)	2	<b>Allow</b> both white for 2 marks
<b>Total</b>			<b>10</b>	

Question	Answer	Marks	Guidance
4	<p><b>[Level 3]</b> Calculates mean and range by ignoring outlier and uses graph to find highest concentration <b>AND</b> makes appropriate comments on value. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p><b>[Level 2]</b> Calculates mean and range by <b>either method AND</b> uses graph to find concentration <b>OR</b> calculates mean and range by <b>either method AND</b> comments on the data.  Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p><b>[Level 1]</b> Calculates mean and range by <b>either method OR</b> comments on the data. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p><b>[Level 0]</b> Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p><b>This question is targeted at grades up to D</b></p> <p><b>Indicative scientific points may include:</b></p> <p><b>Ignoring outlier:</b></p> <ul style="list-style-type: none"> <li>• mean 65</li> <li>• range 62 to 68 / 68 to 62 / 6</li> <li>• mean conc 1.0</li> <li>• range 0.90 to 1.10</li> <li>• mean within recommended values but range outside</li> </ul> <p><b>Including outlier:</b></p> <ul style="list-style-type: none"> <li>• mean 70</li> <li>• range 62 to 85 / 85 to 62 / 23</li> <li>• mean conc 0.85</li> <li>• range 0.40 to 1.10</li> <li>• mean within recommended value but range outside</li> </ul> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
	<b>Total</b>	<b>6</b>	

Question		Answer	Marks	Guidance	
5	(a)	the colour of the specimen	<input checked="" type="checkbox"/>	2	
		the diameter of one cell	<input type="checkbox"/>		
		the size of the specimen	<input checked="" type="checkbox"/>		
		the structure of a cell	<input type="checkbox"/>		
	(b)	Area 2 (2 <sup>nd</sup> answer) (1); Area 3 (3 <sup>rd</sup> answer) (1)		2	If more than two ringed use list principle 12c page 6
	(c)	She adjusts the eyepiece lens.	<input type="checkbox"/>	2	
		She moves the specimen nearer the objective lens.	<input type="checkbox"/>		
		She uses a brighter source of light	<input type="checkbox"/>		
		She uses an electron microscope	<input checked="" type="checkbox"/>		
		She uses a more powerful objective lens.	<input checked="" type="checkbox"/>		
<b>Total</b>				<b>6</b>	

Question			Answer	Marks	
6	(a)	(i)	any <b>TWO</b> from: same ratio of men to women all countries / all places / all teams unbiased / same make up as whole	2	<b>Allow</b> test male and female
		(ii)	Any <b>TWO</b> from: use clean /sterile equipment use gloves keep samples separate seal specimen / put lid on label store correctly	2	<b>Ignore</b> goggles <b>Allow</b> any named equipment eg needle, container
	(b)	(i)	graph for B same as graph for blood without drugs (1);  extra part on graph A / does not match blood without drugs (1)	2	<b>Allow</b> graph A is different (1)
		(ii)	look for graph of extra part (1);  internet / book (1)	2	<b>Allow</b> do experiment on drugs for 1 mark
		(iii)	use a different technique	1	<b>Allow</b> named technique that works <b>Do not allow</b> idea of someone else doing the same test
			<b>Total</b>	<b>9</b>	

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