

Cambridge National

Science

Unit **R075/02**: How Scientific Data is Used

Level 2

Mark Scheme for June 2014

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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.

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1. 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:

	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
	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
L1 , L2 , L3	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

2. 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		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

- 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)	(Stationary) – paper (1); (Mobile) – solvent (1)	2	
	(b) (i)	Any THREE from: Drink 1 fructose (1); another sugar (1) Drink 2 Fructose (1); (may be) another sugar (1)	3	Allow another substance / two types of sugar
	(b) (ii)	known sugar/value (1); for comparison (1)	2	
	(b) (iii)	3.0/10 (1); 0.3 (1)	2	Allow 0.28 to 0.32 0.3 without working gets 2 marks
	(b) (iv)	galactose (1); matches exactly 0.3 (1); but could be glucose (1); as spot covers a range of values up to R_f 0.32 (1)	4	
	(c) (i)	Edward (1): Comment about why Edward is correct eg. another sugar present (with similar R_f / R_f of about 0.3) (1)	2	Do NOT allow Philip or Ann Allow answer saying why Philip AND Ann are wrong
	(c) (ii)	gas chromatography /GC / HPLC / mass spectrometer (1); more sensitive (1)	2	Allow clinisticks/clinistix Allow precise / accurate / gives more evidence / less human error
Total			17	

Question			Answer	Marks	Guidance
2	(a)		Bag 1 – carbonate (1); Bag 2 – chloride (1)	2	
	(b)	(i)	Barium Calcium Potassium ✓ Sodium	1	
	(b)	(ii)	avoid contamination / make loop clean;	1	Allow so powder will stick to loop
	(b)	(iii)	qualitative (1); repeatable (1)	2	Allow reliable / consistent Do not allow reproducible

Question		Answer	Marks	Guidance
2	(c)	<p>[Level 3] Gives most advantages AND disadvantages of mass spectrometry AND flame tests. No significant errors in science or use of scientific terms. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Gives some advantages AND disadvantages of mass spectrometry and flame tests. There are some errors in the science. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Gives an advantage OR a disadvantage of mass spectrometry and flame tests. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] 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>Indicative scientific points may include:</p> <ul style="list-style-type: none"> • further evidence to help make a conclusion • use of more than one technique to obtain answer • colour may be masked by intense yellow <p>Flame test:</p> <p>Advantages</p> <ul style="list-style-type: none"> • quick • readily available in lab • easy to perform <p>Disadvantages:</p> <ul style="list-style-type: none"> • qualitative only • relies on eyesight – subjective • some colours masked by others • does not detect all cations <p>Mass Spectrometer:</p> <p>Advantages</p> <ul style="list-style-type: none"> • very sensitive • very accurate • detects all cations present • quantitative • not subjective <p>Disadvantages:</p> <ul style="list-style-type: none"> • expensive • difficult to use – needs trained operator • takes time to get result <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
Total			12	

Question			Answer	Marks	
3	(a)	(i)	phenolphthalein	1	
	(a)	(ii)	colour becomes pink	1	Allow colour <u>change</u> Allow ecf from part (i)
	(b)		25ml C V D V I V N V √ 100ml √ mass √ repeating √ volume √	5	

Question	Answer	Marks	Guidance
3 (c)	<p>[Level 3] Calculates means & ranges for other two outlets (without outlier for Crinkles), AND gives correctly reasoned conclusions for all outlets. No significant errors in science. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Calculates means & range for other two outlets (with outlier for Crinkles) AND gives correctly reasoned conclusions for some outlets. Some errors in the use of scientific terms. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] EITHER calculates means and ranges for other two outlets OR gives correctly reasoned conclusion for an outlet. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] 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>Indicative scientific points may include:</p> <p>Mean & Range, quality:</p> <ul style="list-style-type: none"> • Allgoods: (20.3, 0.7), poor • Bests: 17.9/17.85, 0.3, good • Crinkles: All results: 22.6, 10.2, (very) poor • Crinkles: Without test 2: 25.1, 0.2, excellent • Test 2 for Crinkles outlier, not used <p>Watered down:</p> <ul style="list-style-type: none"> • Allgoods above 4.0 but poor quality so not much confidence in result • Bests below 4.0, good quality, certainly too much water • Crinkles not too much water, without outlier certain of result above 4.0 <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
	Total	13	

Question		Answer	Marks	Guidance
4	(a)	<p>Task</p> <p>count the number of hairs on the piece of cloth</p> <p>measure the width of one hair</p> <p>view the internal structure of a hair</p> <p>Apparatus</p> <p>electron microscope</p> <p>magnifying glass</p> <p>light microscope</p>	2	All correct 2 marks 1 line correct 1 mark
	(b) (i)	to focus (on specimen)	1	
	(b) (ii)	(to provide) different magnification/size of image	1	
	(c)	28/1.4 (1); 20 (1)	2	Allow 26/14 to 30/14 Allow 19 to 21 Correct answer (19 to 21) without working gets 2 marks Allow any value /1.4 1mark
	(d)	Adv – quick / easy to use / can look at living things / cheap / in colour / portable (1); Dis – low magnification / not 3D / low resolution / need light source	2	Allow instant results, does not need electricity, doesn't take up much room Allow less detail
Total			8	

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