OCR
Oxford Cambridge and RSA

# Cambridge National

# Science

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

Level 1

## Mark Scheme for June 2015

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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.

**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 |
| words | 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 |
| BOD | benefit of doubt |
| CON | contradiction |
|  | incorrect response |
| ECF | error carried forward |
|  | draw attention to particular part of candidate's response |
| NBOD | no benefit of doubt |
| R | reject |
|  | correct response |

| | |
|---|---|
| L1 , L2 , L3 | draw attention to particular part of candidate's response |
| ^ | information omitted |
| — | 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 |
| ^ | 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 <u>and</u> 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 | |
| Manchester | |
| Paris | |
| Southampton | |

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

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Edinburgh | | | ✓ | | | ✓ | ✓ | ✓ | ✓ | |
| Manchester | ✓ | × | ✓ | ✓ | ✓ | | | | ✓ | |
| Paris | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | |
| Southampton | ✓ | × | | ✓ | | ✓ | ✓ | | ✓ | |
| **Score:** | **2** | **2** | **1** | **1** | **1** | **1** | **0** | **0** | **0** | **NR** |

e. For answers marked by levels of response:

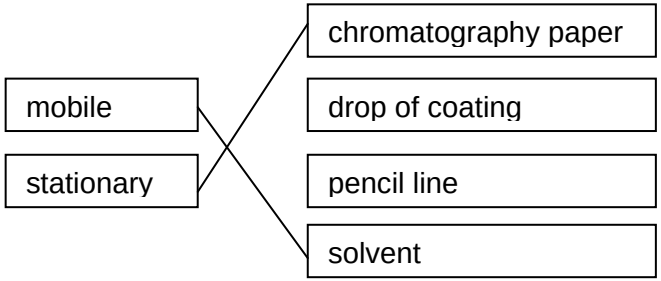
i. **Read through the whole answer from start to finish**
ii. **Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor
iii. **To determine the mark within the level**, consider the following:

| 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) | (i) | B | 1 | |
| | | (ii) | B **and** C | 1 | Both answers needed for mark |
| | | (iii) | D | 1 | |
| | (b) | |  | 2 | |
| | (c) | | use a different solvent √<br>put a larger drop on the pencil line<br>use a longer piece of chromatogram paper<br>use more of the same solvent | 1 | |
| | (d) | | **Lower spot:**<br>reference to $R_f$ 0.30 (1);<br>**Upper spot:**<br>reference to $R_f$ 0.79/0.78 (1);<br>lies between two values in table (0.76 and 0.80) / not exactly on either $R_f$ value(1) | 3 | **Allow** ref to values between $R_f$ 0.76 and 0.80 |

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| 1 | (e) | | **[Level 3]**<br>Gives the steps in the procedure in the correct order **AND** gives method of extracting colour. No significant errors in science or use of scientific terms.<br>Quality of written communication does not impede communication of the science at this level.<br>(5 – 6 marks)<br><br>**[Level 2]**<br>Gives most of the steps in the procedure in the correct order **OR** gives some steps in the procedure **AND** describes how to extract colour.<br>Some errors in science.<br>Quality of written communication partly impedes communication of the science at this level.<br>(3 – 4 marks)<br><br>**[Level 1]**<br>Some steps in the procedure are given but may not be sequenced correctly **OR** describes how to extract colour.<br>Quality of written communication impedes communication of the science at this level.<br>(1 – 2 marks)<br><br>**[Level 0]**<br>Insufficient or irrelevant science. Answer not worthy of credit.<br>(0 marks) | 6 | **This question is targeted at grades up to D**<br><br>**Indicative scientific points may include:**<br>Extracting colour from sweet<br>Either – drop of water on sweet, leave, remove with brush/pipette<br>Or – crush sweet, add small amount of water, remove with brush/pipette<br><br>Procedure:<br>• draw pencil line towards bottom of paper<br>• draw pencil line near top of paper<br>• label sample points<br>• put drop of each colour on pencil line<br>• hang paper in solvent<br>• ensure solvent below pencil line<br>• leave until solvent nearly reaches top of paper<br>• remove from solvent<br>• dry paper<br><br>Labelled diagrams can be used to show indicative points<br><br>**Use the L1, L2, L3 annotations in Scoris; do not use ticks.** |
| | | | **Total** | 15 | |

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th></th></tr>
<tr><td>2</td><td>(a)</td><td>(i)</td><td>avoid contamination</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>to identify container/date</td><td>1</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td>
<table>
<tr><th>Liquid</th><th>Acid</th><th>Alkali</th><th>Cannot tell</th></tr>
<tr><td>W</td><td>√</td><td></td><td></td></tr>
<tr><td>X</td><td></td><td>√</td><td></td></tr>
<tr><td>Y</td><td></td><td></td><td>√</td></tr>
<tr><td>Z</td><td>√</td><td></td><td></td></tr>
</table>
</td><td>2</td><td>mark by COLUMN<br>all 3 columns correct = 2 mark<br>1 or 2 columns correct = 1 mark</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>indicator changes colour (in the titration) (1);<br>changes colour at the end point / neutralisation / when you add enough alkali (1)</td><td>2</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>to get more reliable results / an average / mean</td><td>1</td><td>Allow recognition that first titration gives a rough value<br>Allow (more) accurate</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>Titration 2 28.1</td><td>1</td><td>Allow answer written next to (iii)</td></tr>
<tr><td></td><td></td><td>(iv)</td><td>random error / misread / add incorrect amount of acid at start</td><td>1</td><td></td></tr>
<tr><td></td><td>(d)</td><td></td><td>qualitative: no numbers / description / not measured (1);<br>quantitative: numbers / measured (1)</td><td>2</td><td>Allow named description eg colour<br><br>Allow named measurement eg volume<br>Allow amount / quantity</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>11</td><td></td></tr>
</table>

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| 3 | (a) | (i) | both points plotted correctly | 1 | Within quarter of square |
| | | (ii) | straight line from (0,0) (1);<br>ignores outlier (1) | 2 | Dot to dot line (0)<br>Line of best fit (1) |
| | (b) | (i) | 0.28 to 0.32 | 1 | **Allow** 0.04 |
| | | (ii) | 0.9/3 (1)<br>0.30 (1) | 2 | **Allow** error In total/3 (1)<br>**Allow** 0.3<br>Allow 2 marks for correct answer without working |
| | | (iii) | 0.6 | 1 | Within quarter of square<br>**Allow** ecf from part (ii) |
| | (c) | | book / internet | 1 | **Allow** other people's results |
| | | | **Total** | 8 | |

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| 4 | (a) | | onto mirror √<br>onto specimen<br>through eyepiece | 1 | |
| | (b) | (i) | **C** | 1 | |
| | | (ii) | **B** | 1 | |
| | (c) | | **$\frac{5}{100}$** (1st answer) | 1 | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 4 (d) | **[Level 3]**<br>Makes a correct conclusion with justification for plants X and Y **AND** comments difficulty with Z. No significant errors in science.<br>Quality of written communication does not impede communication of the science at this level.<br>(5 – 6 marks)<br><br>**[Level 2]**<br>Makes a correct conclusion with justification for one plant **OR** makes conclusion for two plants **OR** makes conclusion for one plant **AND** comments on difficulty with Z. Some errors in the use of scientific terms.<br>Quality of written communication partly impedes communication of the science at this level.<br>(3 – 4 marks)<br><br>**[Level 1]**<br>Makes a correct conclusion for one plant **OR** comments on difficulty with Z. Quality of written communication impedes communication of the science at this level.<br>(1 – 2 marks)<br><br>**[Level 0]**<br>Insufficient or irrelevant science. Answer not worthy of credit.<br>(0 marks) | 6 | **This question is targeted at grades up to D**<br><br>**Indicative scientific points may include:**<br><br>**Conclusions**<br>• plant X – lily<br>• plant Y – daisy<br>• plant Z – willow herb or lily<br><br>**Justification**<br>• range for plant X only covers lily / does not overlap other plants<br>• range for plant Y only covers daisy / does not overlap other plants<br><br>**Difficulty in identifying plant Z**<br>• range overlaps willow herb and lily<br><br>**Use the L1, L2, L3 annotations in Scoris; do not use ticks.** |
| | **Total** | **10** | |

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| 5 | (a) | (i) | UI only gives integer values (OWTTE) / 5.8 to 6.2 could be orange or yellow (1);<br>colour is subjective (OWTTTE) (1) | 2 | **Allow** could be higher than 6.2 (within 6 integer range) / outside the range of yellow |
| | | (ii) | Any **TWO** from:<br>(more) accurate<br>(more) sensitive<br>(more) quantitative<br>not subjective | 2 | **Allow** no contamination (of sample) |
| | (b) | | chloride (1);<br>copper (1) | 2 | |
| | | | **Total** | 6 | |

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