# Cambridge National

# Science

Unit **R072/02:** How Scientific Ideas Have Developed

Level 2

# Mark Scheme for January 2015

**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 | alternative wording |
| 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 |
| ▬ | draw attention to particular part of candidate's response |
| ∿ | draw attention to particular part of candidate's response |
| NBOD | no benefit of doubt |
| R | reject |

| | | |
|---|---|---|
| | ✔ | correct response |
| | | draw attention to particular part of candidate's response |
| | ⌃ | information omitted |

**Subject-specific Marking Instructions**

a.   If a candidate alters his/her response, examiners should accept the alteration.

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 boxes 3 and 4 are required for the mark:

Put ticks (✔) in the two correct boxes.

Put ticks (✔) in the two correct boxes.

Put ticks (✔) in the two correct boxes.

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 boxes:

Always check the additional guidance.

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. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses.
Credit should be given for each box correctly ticked. 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 a city in England, then in the boxes

| | |
|---|---|
| **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 |

| Question | | | Answer | | Mark | Guidance |
|---|---|---|---|---|---|---|
| **1** | a | | Africa & India | ✓ | 2 | |
| | | | South America and Africa | ✓ | | |
| | b | | Due to the Earth cooling <u>and</u> shrinking;<br>causing wrinkles (as the Earth cooled); | | 2 | |
| | c | | **Any two from:**<br>Share ideas / theory;<br>Check data ;<br>Share resources; | | 2 | Ignore: "help each other", "Support each other"<br>Ignore: peer review |
| | d | | **Any two from:**<br>jigsaw fit;<br>Idea of linked/similar/continuous:<br>　coal deposits;<br>　rock strata;<br>　mountain ranges; | | 2 | Ignore: Fossils |
| | e | | pole fleeing force / due to rotation of the Earth<br>force due to gravity / from sun or moon; | | 2 | Allow force towards the equator |
| | f | | C and E | | 1 | Both required |
| | g | i | **Any three from:**<br>Core heats mantle;<br>Hot material in mantle rises / plumes;<br>melts underside of crust;<br>Circular/horizontal motion (drags crust);<br>leaving rift / new rock / sea floor spreads; | | 3 | Ignore reference to convection currents (stem).<br>Allow: convection currents are in the mantle; |
| | | ii | no experimental data;<br>no need to explain movement / continents didn't seem to be moving | | 1 | Allow 'no evidence' |
| | | | | **Total** | **[15]** | |

| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| 2 | a | i | ((9.1 - 4.5) / 4.5 ) X 100;<br>=102 % | 2 | Allow 2 marks for correct answer with no working |
| | | ii | Any 4 from<br>Starts at similar level;<br>either (or both) goes up (after breakfast);<br>either (or both) recovers to lower level (within two hours);<br>Carbohydrate made a larger change;<br>Carbohydrate does not recover as far;<br>both reach a similar level by 09.00;<br>Neither falls to same / low level as pre breakfast; | 4 | Accept: reverse arguments<br>Allow: high protein stays level / does not recover |
| | | iii | Same energy content of breakfast ✓ | 1 | |

| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| | b | | **[Level 3]**<br>Describes glucose level risk in situations AND describes use of Insulin or food to correct this.<br>Quality of written communication does not impede communication of the science at this level.<br>(5 – 6 marks)<br><br>**[Level 2]**<br>Identifies correct glucose level risk in situations OR describes a situation and how insulin or food may correct this.<br>Quality of written communication partly impedes communication of the science at this level.<br>(3 – 4 marks)<br><br>**[Level 1]**<br>Identifies the idea that blood glucose level may be too high or too low in a situation OR needs to determine whether insulin / food is needed.<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 Level two distinction**<br><br>**Indicative scientific points may include:**<br><br>**Causes of different readings:**<br>• Little/no insulin produced<br>• Insulin is no longer effective<br>• So cells do not store excess glucose<br>• Or release more when needed<br><br>**Glucose levels may be too low which will require food:**<br>• A long time after eating/before bed<br>• After exercise<br>• As a result of excessive use of glucose<br><br>**Glucose levels may be too high**<br>• After a (large) meal<br>• Inappropriate diet<br>  Requires change in diet<br>  Or extra insulin<br><br>**Use the L1, L2, L3 annotations in Scoris; do not use ticks.** |
| | c | i | Measurement is qualitative / not to definite scale | 1 | ignore: apparatus not invented |
| | | ii | No way to measure <u>blood</u> glucose level / not invented | 1 | |
| | | | **Total** | **[15]** | |

| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| 3 | a | i | N | 1 | |
| | | ii | Idea that it was not a "blind" trial. | 1 | Accept: prevent cheating |
| | b | i | Infra-red | 1 | |
| | | ii | wave does not leave fibre / does not spread out | 1 | Accept: idea of total internal reflection / bounces off the edge<br>Accept: little / no energy loss |
| | | iii | Idea of 8 bits per byte / use of x8 in calculation;<br>Idea of mega = 1,000,000 / 1000 x 1000 / 1024 x 1024;<br>= 16,000,000 / 16,777,216; | 3 | correct answer with no working = 3 marks |
| | | | **Total** | **[7]** | |

| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| **4** | a | | galaxy | 1 | |
| | b | i | 510 (km/s) | 1 | accept range 501 – 525 |
| | b | ii | **[Level 3]**<br>Describes quantitatively the idea that distant galaxies are accelerating away from Earth, linked with increasing size of the universe or Big Bang.<br>Quality of written communication does not impede communication of the science at this level.<br>(5 – 6 marks)<br><br>**[Level 2]**<br>Galaxies are accelerating away from us or describes correlation between distances and speed OR links expanding universe / Big Bang to qualitative explanation.<br>Quality of written communication partly impedes communication of the science at this level.<br>(3 – 4 marks)<br><br>**[Level 1]**<br>Describes the graph / the idea that galaxies are moving (away from us) OR identifies expanding universe / Big Bang.<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 Level two Distinction\***<br><br>**Indicative scientific points may include:**<br>• Many galaxies exist<br>• At different distances (from Earth)<br>• Redshift allows measurement of speed<br>• Other galaxies are moving away from ours<br>• Speed increases with distance<br>• Speed is proportional to distance<br>• Hubble's Law<br>• Positive correlation<br>• Suggests universe is expanding<br>• Suggests origin of the universe was Big Bang<br><br>**Use the L1, L2, L3 annotations in Scoris; do not use ticks.** |

| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| | c | | **Any 3 from**<br>better equipment / telescopes available;<br>more accurate measurements / better resolution;<br>(more scientists so) more measurements made;<br>working in teams / peer review<br>new speed (measurements) are lower / distance<br>(measurements) are larger; | 3 | Accept: Hubble was mistaken<br>Ignore: Galaxies have moved |
| | d | | **R**ed-shift;<br>**S**peed of galaxies;<br><br>**B**ackground radiation;<br>**C**ooling universe; | 4 | |
| | | | **Total** | **[15]** | |

| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| 5 | a | | (All) grew long hair (during their lifetime);<br>acquired characteristic / long hair is not passed on; | 2 | Ignore: references to genes |
| | b | | **variation:** some individuals have longer hair;<br>**competition:** some have an advantage in survival;<br>**selection:** those with advantage breed / pass on characteristics ( / genes);<br>**QWC** Answer is clear and addresses the question | 4 | Allow: Mutation (producing variation)<br>Allow: "fittest survive" OWTTE (1)<br>Allow: short haired mammoths do not survive / breed |
| | c | | Any two from:<br>Lack of confidence / support / to make sure;<br>Collect more evidence / experimentation / check data;<br>Refining theories / models / mechanisms | 2 | accept: opposition (from religion / orthodoxy)<br>Ignore: "do not want to look stupid" |
| | | | **Total** | **[8]** | |
| | | | | | |
| | | | **Overall Total** | **[60]** | |

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