OCR
Oxford Cambridge and RSA

# Cambridge National

# Science

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

Level 2

# Mark Scheme for June 2017

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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.

These are the annotations, (including abbreviations), including those used in RM Assessor, which are used when Marking

| **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 |

| Annotation | Meaning of annotation |
|---|---|
|  | 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 |
|  | benefit of doubt not given |
|  | reject |
|  | correct response |
|  | draw attention to particular part of candidate's response |
|  | information omitted |

Subject specific instructions for this question paper

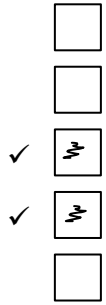
If a candidate alters his/her response, examiners should accept the alteration.

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.

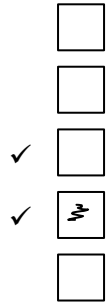
For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.



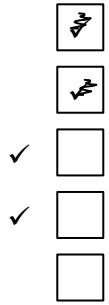
This would be worth 1 mark.

Put ticks (✓) in the two correct boxes.



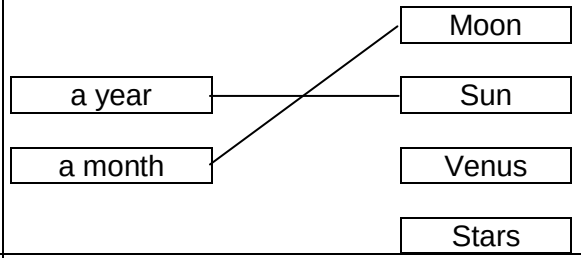
This would be worth 0 marks.

Put ticks (✓) in the two correct boxes.



This would be worth 1 mark.

0

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| 1 | a | i | Difference: Ptolemy has Sun orbiting Earth / Copernicus has Earth orbiting Sun;<br>Similarity: Both have moon orbiting the Earth; | 2 | needs to mention movement |
| | | ii |  | 2 | |
| | b | i | (1577) comet travelled from outside the system | 1 | |
| | | ii | Using Brahe's data;<br>(careful) calculation; | 2 | |
| | c | i | lenses | 1 | **accept** telescope |
| | | ii | phases of Venus | 1 | |
| | | iii | disapproval of church;<br>threat of persecution; | 2 | |
| | | | Earth has more mass than the apple;<br>so force has more effect on apple | 2 | **accept** force depends on mass of object |
| | e | | Bonnie;<br>Claude; | 2 | |
| | | | | | |
| | | | **Total** | **15** | |

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| 2 | a | i | (7 + 9 + 16) ÷ 400 x 100 = 8% | 1 | Mark the working, not the final answer |
| | | ii | (yes)<br>([30+31+59] ÷ 400 x 100 = ) 30;<br>which is higher than 8% | 2 | |
| | **b** | | **[Level 3]**<br>Good description of survival rates AND explanation AND Natural selection. Quality of written communication does not impede communication of the science at this level.<br>(5 – 6 marks)<br><br>**[Level 2]**<br>Good description of survival rates AND some explanation or Natural selection. Quality of written communication partly impedes communication of the science at this level.<br>(3 – 4 marks)<br><br>**[Level 1]**<br>Good description of survival rates OR explanation. 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)<br>20 | **6** | **This question is targeted at grades up to D**<br><br>**Indicative scientific points may include:**<br><br>**Populations:**<br>• Many moths not recaptured / died<br>• Speckled decreases in C<br>• Speckled decreases in D<br>• Speckled have equal survival in both places<br>• Dark decreases in C<br>• Dark decreases less in D<br>• Dark survives better in D<br><br>**Explanation:**<br>• Missing moths eaten by birds<br>• Dark moths less visible in woodland D<br>• Dark moths show up in woodland C<br>• Fewer dark moths survive in C than D<br><br>**Natural selection**<br>• Different pressure of predation<br>• Different rates of survival<br>• Those that survive more likely to breed successfully<br>• Population in woodland D likely to be largely dark<br><br>**Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.** |
| | | | **Total** | **9** | |

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| 3 | a | | Amount of pasta / sauce / other food / | 1 | **Accept** any other sensible controlled variable |
| | b | | increase confidence / reliability;<br>Remove/reduce the effect of outliers/anomalies; | 2 | |
| | c | | **Any 3 differences from:**<br>Fresh cooked has highest maximum/ shows largest variation;<br>Chilled and reheated give lowest max;<br>FC takes longest to return to normal/level before eating;<br>chilled and reheated shows lowest variation/ has lowest BGL over time; | 3 | Responses must address point of **difference** |
| | | | **Total** | **6** | |

0

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| 4 | (a) | | characteristics/red inherited from parents (1);<br>red gene passed through gamete (1) | 2 | |
| | (b) | | recessive | 1 | |
| | (c) | (i) | Both parents have two red alleles ☐<br>Both parents have two yellow alleles. ☐<br>Both parents have one red and one yellow allele. ☑<br>One parent has two red alleles and the other parent has two yellow alleles. ☐ | 1 | |
| | | (ii) | All plants would have red tomatoes. ☐<br>All plants would have yellow tomatoes. ☑<br>A few of the plants would have red tomatoes. ☐<br>A few of the plants would have yellow tomatoes. ☐ | 1 | |
| | (d) | (i) | blending gives pale purple/purplish white mix | 1 | |
| | | (ii) | no white parents / offspring do not resemble parents (1);<br>expect all offspring to be purple (1) | 2 | |
| | | (iii) | 705:224 = 3(.15):1 / 929 total gives 697:232 (1);<br>(statistically) very near (1);<br>breeding random so expect some variation (1) | 3 | |
| | | | **Total** | 11 | |

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| 5 | | | **[Level 3]**<br>Describes relationship between $CO_2$ and temperature **and** describes greenhouse effect **connecting** them by correlation, cause and effect.<br>Quality of written communication does not impede communication of the science at this level.<br>(5 – 6 marks)<br><br>**[Level 2]**<br>Describes relationship between $CO_2$ and temperature **and** describes greenhouse effect.<br>Quality of written communication partly impedes communication of the science at this level.<br>(3 – 4 marks)<br><br>**[Level 1]**<br>Describes relationship between $CO_2$ and temperature **or** outlines greenhouse effect.<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><br>**Climate:**<br>• Look for changes in $CO_2$<br>• Correlation between $CO_2$ and temp<br>• Increase in $CO_2$ causes higher temp<br><br>**Reason:**<br>• Greenhouse effect<br>• Cause and effect<br>• $CO_2$ increased amounts in atmosphere<br>• Radiation from Sun gets to Earth<br>• (some) Radiation from Earth cannot escape through atmosphere / is absorbed<br>• IR from Sun passes through atmosphere but IR from Earth cannot<br>• Earth warms up<br><br>**Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.** |
| | | | **Total** | 6 | |

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| 6 | (a) | | …….the same wavelength ☐<br>…….pass through concrete ☐<br>…….through space at the same speed ☑<br>…….the atmosphere without being absorbed ☐ | 1 | |
| | (b) | | (speed=) 300000 km/s / $3x10^8$ m/s (1);<br>speed=dist÷time / $3x10^5=2.1x10^{10}$÷time (1)<br>70000 / $7x10^4$ (1) | 3 | seen anywhere in working, **allow** standard form or zeros<br>**allow** any subject for equation<br>correct answer without working gets 3 marks |
| | (c) | (i) | two straight lines (1);<br>reflection within atmosphere (1) | 2 | |
| | | (ii) | (microwaves) not discovered / only radio waves discovered | 1 | |
| | (d) | (i) | improve quality of result / check timing / calculate mean | 1 | |
| | | (ii) | use a more sensitive timer / use a larger file / ignore 2nd result | 1 | Ignore: Repeat more times |
| | | | **Total** | 9 | |

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| 7 | (a) | | could not detect movement of continents / he was a meteorologist/not a geologist | 1 | Accept: No evidence of <u>continents moving</u> |
| | (b) | (i) | circular line in mantle (1);<br>arrow going clockwise (1) | 2 | need not be full circle |
| | | (ii) | rise in sea levels ☐<br>sea floor spreading √<br>jig-saw fit of continents ☐<br>fossils common to different continents ☐ | 1 | |
| | | | **Total** | 4 | |

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