OCR
Oxford Cambridge and RSA

# GCSE

# Additional Applied Science

Unit **A191/02:** Science in Society (Higher Tier)

General Certificate of Secondary Education

# Mark Scheme for June 2017

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

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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 | alternative wording |
| ORA | or reverse argument |

Available in RM Assessor 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 |
|  | 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. 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** |

**MARK SCHEME:**

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>1</td><td>a</td><td></td><td><table><tr><td>oxygen</td><td></td></tr><tr><td>carbon dioxide</td><td>✓</td></tr><tr><td>urea</td><td></td></tr><tr><td>lactic acid</td><td>✓</td></tr><tr><td>glucose</td><td></td></tr></table></td><td>2</td><td>Minus 1 mark for each additional incorrect response.<br>Candidate cannot score less than zero.</td></tr>
<tr><td></td><td>b</td><td>i</td><td>distance ÷ time</td><td>1</td><td>Allow d/t or 100÷10</td></tr>
<tr><td></td><td></td><td>ii</td><td>10;<br>m per sec;</td><td>2</td><td>Accept m/s</td></tr>
<tr><td></td><td></td><td>iii</td><td>To identify change in performance / show progress;</td><td>1</td><td>Accept monitor training programme</td></tr>
<tr><td></td><td>c</td><td></td><td>Any correct answer e.g.<br>Steroids/amphetamines;</td><td>1</td><td>Allow named examples of drugs<br>Allow cocaine<br>Ignore heroin / stimulants alone/</td></tr>
<tr><td></td><td>d</td><td>i</td><td>A – idea of movement at hip;<br>B – idea of movement at knee / pushes forward;</td><td>2</td><td>Just straightens leg / moves the bones = 1 mark.<br>Accept B moves leg forward.</td></tr>
<tr><td></td><td></td><td>ii</td><td>50 x 10 (= 500);<br>(500/10) = 50;</td><td>2</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[11]</td><td></td></tr>
</table>

| Question | | | Expected Answers | Marks | Additional Guidance |
|---|---|---|---|---|---|
| 2 | | | **[Level 3]**<br>Explanation of how to use formula that works.<br>Quality of written communication does not impede communication of the science at this level.<br>(5 – 6 marks)<br><br>**[Level 2]**<br>Explanation of how to use chart that works.<br>Quality of written communication partly impedes communication of the science at this level.<br>(3 – 4 marks)<br><br>**[Level 1]**<br>Shows some understand of what BMI is.<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 A***<br><br>**With chart sequence includes:**<br>• measure height<br>• measure weight<br>• use of chart / position on chart<br>• determine her weight range using colour key (or number / range key)<br><br>**Without chart sequence includes:**<br>• measure height<br>• measure weight<br><br>• use formula BMI = $\frac{\text{body mass kg}}{[\text{height (m)}]^2}$<br><br>• determine BMI<br>• use BMI number and number / range key to determine weight category.<br><br>**Understanding of BMI**<br>• reference to BMI<br>• reference to height and weight<br><br>**Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.** |
| | | | **Total** | **[6]** | |

| Question | | | Expected Answers | Marks | Additional Guidance |
|---|---|---|---|---|---|
| 3 | a | | *Any 3 from:*<br>Bone is broken;<br>Other bone not broken;<br>Idea of bone displaced;<br>Not a compound fracture/has not pierced the skin;<br>Only one break in the bone; | 3 | 'Only one bone is broken' subsumes MPs 1 and 2 so is 2 marks.<br>**Ignore** names of bones/reference to ligaments.<br><br><br>If no other marks scored **allow** 'leg is broken' for 1 mark. |
| | b | | *Any 2 from:*<br>Assess injury;<br>Devise exercises;<br>to aid recovery/strengthen muscles;<br>Develop programme/monitor progress; | 2 | |
| | | | **Total** | **[5]** | |

| Question | | | Expected Answers | Marks | Additional Guidance |
|---|---|---|---|---|---|
| 4 | a | | 8; | 1 | |
| | b | | C because it has bloodworm;<br>C because no other species present; | 2 | <br>**Accept** C has no larvae<br>**Accept** C has least amount of species for 1 mark<br>**Accept** C has only bloodworm for 2 marks<br>Maximum of 1 mark if C not chosen<br>**Ignore** reference to biotic index |
| | | | **Total** | **[3]** | |

| Question | | | Expected Answers | Marks | Additional Guidance |
|---|---|---|---|---|---|
| 5 | | | **[Level 3]**<br>Comments on conclusion, suggests improvements including some explanation.<br>Quality of written communication does not impede communication of the science at this level.<br>(5 – 6 marks)<br><br>**[Level 2]**<br>Comments on the conclusion and suggests improvements.<br>Quality of written communication partly impedes communication of the science at this level.<br>(3 – 4 marks)<br><br>**[Level 1]**<br>Comments on the conclusion **or** suggests improvement.<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 C**<br><br>**Conclusion:**<br>• (yes) it does contain posh pink<br>• but also contains daffodil yellow<br>• so only partially correct<br>• contains other dyes<br><br>**Improvements:**<br>• use more known dyes<br>• use different solvents<br>• 2 way chromatography<br>• work out Rf values<br>• ensure tank sealed<br>• use different type of chromatography<br><br>**Explanation of improvements may include:**<br>• as not all dyes have been identified/identify the unknowns/idea of comparison needed<br>• better separation<br>• separate even more dyes.<br>• so can look up Rfs of unknowns<br>• prevent evaporation<br><br>**Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.** |
| | | | **Total** | **[6]** | |

| Question | | | Expected Answers | Marks | Additional Guidance |
|---|---|---|---|---|---|
| 6 | a | | 21;<br>21 x 2 / 21÷0.5;<br>18 weeks; | 3 | **Allow** 20-22<br>**Allow** for measurement x 2 / ÷0.5<br>ecf from incorrect measurement of BPD. |
| | b | | 3 (chromosomes)( instead of 2);<br>Birth defects/deformities/abnormalities; | 2 | |
| | c | | Blood pressure;<br>pre eclampsia;<br>**or**<br>Urine;<br>pre eclampsia/(gestational) diabetes;<br>**or**<br>Blood test;<br>(gestational) diabetes/ spinabifida/ anaemia;<br>Or<br>Scan;<br>Development/abnormalities; | 2 | test = 1 mark<br>explanation = 1 mark |
| | | | **Total** | [7] | |

| Question | | | Expected Answers | Marks | Additional Guidance |
|---|---|---|---|---|---|
| 7 | | | **[Level 3]**<br>Good description of method and explanation of how results relate to turbidity in reference samples e.g. graph.<br>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 method that could be used to determine turbidity<br>Quality of written communication partly impedes communication of the science at this level.<br>(3 – 4 marks)<br><br>**[Level 1]**<br>Poor description of method that could be used to determine turbidity<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 A**<br><br>**Disappearing X/disc method may include:**<br>• use measuring cylinder/dip in river<br>• black X on paper under cylinder/Secchi disc.<br>• add water / sink in river until X/disc can no longer be seen by looking down through water<br>• record depth of water<br>• repeat for other samples<br><br>**Colourimeter method may include:**<br>• use pure water to calibrate<br>• set to zero<br>• place sample and measure absorbance<br>• repeat for other samples<br><br>**How results relate to turbidity**<br>• smaller depth is higher turbidity<br>• lower absorbance is higher turbidity<br>• compare to samples of known turbidity<br>• collects filtered solids and weighs<br>• greater mass per volume obtained means greater turbidity<br><br>For any method some marks may be credited from suitably labelled diagrams or sketch graphs<br><br>**Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.** |
| | | | **Total** | **[6]** | |

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>8</td><td>a</td><td></td><td><table>
<tr><td>Electrophoresis uses colour to identify substances.</td><td></td></tr>
<tr><td>Electrophoresis uses a scanning electron microscope.</td><td></td></tr>
<tr><td>Electrophoresis can be used on small biological samples.</td><td>✓</td></tr>
<tr><td>Electrophoresis can separate biological molecules.</td><td>✓</td></tr>
<tr><td>Electrophoresis measures the intensity of a colour.</td><td></td></tr>
<tr><td>Electrophoresis works by increasing the resolution of an image</td><td></td></tr>
<tr><td>Electrophoresis uses a calibration graph to produce the result.</td><td></td></tr>
</table></td><td>2</td><td>Minus 1 mark for each additional incorrect answer.<br>Candidate cannot score less than zero.</td></tr>
<tr><td></td><td>b</td><td></td><td>Particles carry charge;<br>Positive moves to neg and neg moves to positive;<br>Bigger the charge the faster they move/travel further;<br>Larger the particle the slower it moves/travels less far;</td><td>4</td><td>Accept reference to positive and negative<br><br>ORA</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[6]</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Paper total</td><td>50</td><td></td></tr>
</table>

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