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**Cambridge Assessment International Education**
Cambridge International General Certificate of Secondary Education

**COMBINED SCIENCE** **0653/43**

Paper 4 Extended Theory **October/November 2018**

MARK SCHEME

Maximum Mark: 80

**Published**

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

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**PUBLISHED**

**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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| GENERIC MARKING PRINCIPLE 5:<br><br>Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen). |
| GENERIC MARKING PRINCIPLE 6:<br><br>Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind. |

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| Question | Answer | Marks |
|---|---|---|
| 1(a) | (**B**) cilia ;<br>removes mucus from airway ;<br>(**C**) cytoplasm ;<br>place where chemical reactions / respiration takes place ; | **4** |
| 1(b)(i) | feathery / large surface area ;<br>for collecting pollen ; | **2** |
| 1(b)(ii) | no need to attract insects ;<br>because they are not needed for pollination / pollination is by wind / not by insects ; | **2** |

| Question | Answer | Marks |
|---|---|---|
| 2(a)(i) | <br>Two bonding pairs between C atom and each O atom ;<br>correct non-bonding electrons on each O atom ; | **2** |
| 2(a)(ii) | covalent ; | **1** |
| 2(a)(iii) | (test) (step 1) add acid **and**<br>(step 2) reference to use of limewater ;<br>(observations) (limewater turns) milky / cloudy / white ppt. / solid ; | **2** |
| 2(a)(iv) | the idea that<br>thermal (energy) / heat (changes) to chemical (energy) ; | **1** |
| 2(b)(i) | 2, 8, 8, 2 shown as crosses or clear dots ; | **1** |
| 2(b)(ii) | loss of electrons ;<br>(reference to loss of) two electrons ; | **2** |

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| Question | Answer | Marks |
|---|---|---|
| 3(a)(i) | C at any point on graph line between 5.7 and 10 s ; | 1 |
| 3(a)(ii) | average speed = total distance / total time = 20 / 30 ;<br>= 0.67 (m / s) ; | 2 |
| 3(b)(i) | **Z** ; | 1 |
| 3(b)(ii) | **X** and **Z** equal / same (20–25) s ;<br>**X** > **Z** for (25–30) s ; | 2 |
| 3(c) | KE = ½ $mv^2$ / ½ × 20 × $0.8^2$ ;<br>= 6.4 J ; | 2 |
| 3(d) | efficiency = [energy out / energy in] (× 100%) **or**<br>energy in = energy out / 0.2 **or** 2400 / 0.2 / energy in = 2400 × 100 / 20 ;<br>= 12 000 (J) ; | 2 |

| Question | Answer | Marks |
|---|---|---|
| 4(a) | produces irritation / cough / more mucus production ; | 1 |
| 4(b)(i) | thin layer of carbon reduces the amount of light (energy) reaching leaves / chlorophyll ;<br>(chlorophyll) traps less light (energy) ;<br>less conversion to chemical energy ;<br>reduces rate of photosynthesis ;<br>**Max 3** | 3 |
| 4(b)(ii) | oxygen used during combustion (of wood) ;<br>oxygen not produced by plants ; | 2 |
| 4(c) | methane ;<br>infra-red ;<br>global warming ; | 3 |

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| Question | Answer | Marks |
|---|---|---|
| 5(a)(i) | (most) **A**<br>**C**<br>**B**<br>(least) **D** ; | **1** |
| 5(a)(ii) | (effect) increase ;<br><br>(explanation) ***two** out of*<br>(particles) move faster / gain more kinetic energy ;<br>(particles) collide more often / frequently ;<br>(particles) collide with more energy ;<br>**Max 3** | **3** |
| 5(b)(i) | air ;<br>***allow*** oxygen<br>coke ;<br>***allow*** carbon | **2** |
| 5(b)(ii) | loss / removal of oxygen / O ; | **1** |
| 5(c)(i) | (aluminium is) too reactive / more reactive than carbon ; | **1** |
| 5(c)(ii) | electrolysis ; | **1** |

| Question | Answer | Marks |
|---|---|---|
| 6(a) | *any **three** of*<br>distances between molecules greater / molecules further apart in gases molecules are closer together in liquids ;<br>forces between molecules of gases are weaker / forces between molecules of a liquid are stronger ;<br>molecules can move freely in gas / molecules rolling / sliding over each other in liquids ;<br>gas volume greater for same mass / liquid volume is smaller for the same mass ;<br>**Max 3** | **3** |
| 6(b)(i) | faster / more energetic molecules escape (from surface) ;<br>average speed of remaining molecules less / water has less energy (leading to cooling) ; | **2** |

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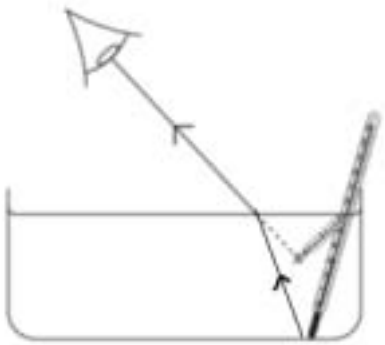
| Question | Answer | Marks |
|---|---|---|
| 6(b)(ii) | less / slower cooling **and** less / slower mass loss ;<br>less surface area for evaporation ; | **2** |
| 6(c)(i) | refraction ; | **1** |
| 6(c)(ii) |  <br>ray from thermometer bulb to meet ray to eye at water surface; | **1** |

| Question | Answer | Marks |
|---|---|---|
| 7(a)(i) | to supply the heart muscle / tissue ;<br>with oxygen / glucose / oxygenated blood ;<br>for respiration ; | **2** |
| 7(a)(ii) | fatty deposits ; | **1** |
| 7(a)(iii) | *any **two** of*<br>take plenty of exercise ;<br>eat a diet with little (saturated) fat ;<br>try to reduce stress ;<br>stop / do not smoke ;<br>**Max 2** | **2** |
| 7(b)(i) | $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$<br>formulae ; balanced ; | **2** |

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| Question | Answer | Marks |
|---|---|---|
| 7(b)(ii) | contraction ; | 1 |
| 7(b)(iii) | to transport more glucose / oxygen (to muscles) ;<br>to transport more carbon dioxide / distribute heat ; | 2 |

| Question | Answer | Marks |
|---|---|---|
| 8(a)(i) | (**A**) ethene ;<br>(**B**) methane ; | 2 |
| 8(a)(ii) | (**A**) decolourises ;<br>(**B**) no (visible) change ; | 2 |
| 8(a)(iii) | $C_3H_8$ + **5**$O_2$ → **3**$CO_2$ + **4**$H_2O$<br>species ;<br>balanced ; | 2 |
| 8(b)(i) | cracking ; | 1 |
| 8(b)(ii) | (difference) *[(b.pt of) **Q** is greater]*<br>NOTE: no mark for difference, but must be correct for explanation marks to be awarded<br>(explanation)<br>**Q** has larger / heavier molecules ;<br>molecules of **Q** have greater intermolecular attractive forces ; | 2 |

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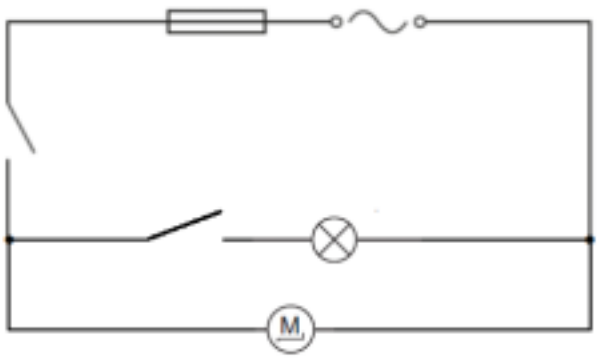
| Question | Answer | Marks |
|---|---|---|
| 9(a)(i) |  <br>correct symbol for lamp ;<br>parallel circuit with motor in one branch, lamp in other branch **and** no short circuit and no additional components ;<br>switch in series with lamp only ; | **3** |
| 9(a)(ii) | mains supply / (a.c.) power supply ; | **1** |
| 9(b) | use of P = IV / I = P / V ;<br>(total) P = 40 + 300 = 340 W ;<br>(I = 340 / 240) = 1.42 / 1.4 (A) ;<br>**or**<br>use of P = IV / I = P / V ;<br>40 / 240 + 300 / 240 ;<br>= (0.17 + 1.25) = 1.42 (A) / 1.4 (A) ; | **3** |

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