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**COMBINED SCIENCE**

**0653/42**

Paper 4 Extended Theory

**October/November 2018**

MARK SCHEME

Maximum Mark: 80

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**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.

Cambridge International is publishing the mark schemes for the October/November 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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This document consists of **8** printed pages.

**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.

**GENERIC MARKING PRINCIPLE 5:**

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:**

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.

| Question  | Answer   | Marks |
|-----------|--|-------|
| 1(a)(i)   | Z  | 1     |
| 1(a)(ii)  | 2000 (N) ;<br>constant speed / no acceleration, (so forces must balance) ;   | 2     |
| 1(b)(i)   | C on any point on graph line between 50 and 60 s ;   | 1     |
| 1(b)(ii)  | distance travelled 20–50 s = speed $\times$ time = $30 \times 3.5 = 105$ m ;<br>distance travelled 50–60 s = $\frac{1}{2} \times 10 \times 3.5 = 17.5$ m ;<br>total distance = $46 + 105 + 17.5 = 168.5$ m ; | 3     |
| 1(c)(i)   | work done = force $\times$ distance / $F \times d$ ;<br>= $1500 \times 50 = 75\,000$ (J) ;   | 2     |
| 1(c)(ii)  | $E = Pt$ / $E = 25\,000 \times 15$ ;<br>= $375\,000$ (J) ;   | 2     |
| 1(c)(iii) | efficiency = work out / work in ( $\times 100$ to give %) / $75\,000 \div 375\,000$<br>= $0.20 / 20\%$ ;   | 2     |

| Question  | Answer   | Marks |
|-----------|--|-------|
| 2(a)(i)   | (remove $\text{MgCO}_3$ ) filtration / filtering / filter ;<br>(obtain solid salt) evaporation / crystallisation ; | 2     |
| 2(a)(ii)  | decreases ;  | 1     |
| 2(a)(iii) | (effect) increases ;<br>(explanation) particles collide more frequently / more chance of collisions ;              | 2     |
| 2(b)      | exothermic ;<br>chemical (energy changes) to heat / thermal (energy) ;   | 2     |

| Question | Answer  | Marks |
|----------|---|-------|
| 2(c)(i)  | $(\text{MgCO}_3) + 2(\text{HCl}) \rightarrow \text{MgCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$ ;<br>formula of magnesium chloride ;<br>all else correct ; | 2     |
| 2(c)(ii) | (test) (dil. nitric acid and) aqueous silver nitrate / $\text{AgNO}_3$ ;<br>(result) white precipitate / solid;   | 2     |

| Question | Answer   | Marks |
|----------|--|-------|
| 3(a)     | contains half the full number of chromosomes / half the full amount of genetic material ;<br>the controlling centre of the cell / contains genetic material ;  | 2     |
| 3(b)     | <i>tick next to</i><br>small green or brown flowers ;<br>stigma outside the flowers ;<br>light, smooth pollen grains ;   | 3     |
| 3(c)     | <i>any two of</i><br><b>A</b> might have a larger (overall) leaf area than <b>B</b> ;<br><b>A</b> might have more stomata (per leaf) than <b>B</b> ;<br><b>B</b> might have a thicker / waxy cuticle ;<br><b>Max 2</b> | 2     |
| 3(d)(i)  | similar line to <b>B</b> drawn below it with a gentler gradient ;  | 1     |
| 3(d)(ii) | rate of transpiration is reduced when the humidity increases ;   | 1     |

| Question | Answer                  | Marks |
|----------|-------------------------|-------|
| 4(a)     | <b>P</b> and <b>S</b> ; | 1     |

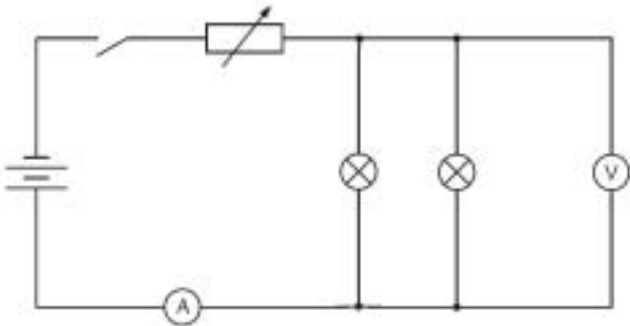
| Question  | Answer   | Marks |
|-----------|--|-------|
| 4(b)      | right ;<br>lower ;<br>left ;<br>shorter ;  | 3     |
| 4(c)(i)   | <b>X</b> umbilical cord ;<br><b>Y</b> amniotic fluid ;   | 2     |
| 4(c)(ii)  | reference to the loss of protection (of fetus) ;<br>higher risk of physical damage / infection / premature birth ; | 2     |
| 4(c)(iii) | oxygen / glucose / any named dissolved nutrient ;<br>carbon dioxide ;  | 2     |

| Question | Answer   | Marks |
|----------|--|-------|
| 5(a)(i)  | covalent ;   | 1     |
| 5(a)(ii) | $  \begin{array}{c}  \text{H} \quad \text{H} \\    \quad   \\  \text{H} - \text{C} - \text{C} - \text{H} \\    \quad   \\  \text{H} \quad \text{H}  \end{array}  $ C – C single bond ;<br>six correctly located C-H single bonds ; | 2     |
| 5(b)(i)  | <u>fractional</u> distillation ;   | 1     |
| 5(b)(ii) | gasoline molecules <ul style="list-style-type: none"> <li>• are smaller ;</li> <li>• have lower boiling points ;</li> <li>• have weaker intermolecular attractive forces ;</li> </ul>  | 3     |
| 5(c)     | cracking ;   | 1     |
| 5(d)     | 2,4 ;  | 1     |

| Question | Answer   | Marks |
|----------|--|-------|
| 6(a)     | In liquids:<br>in liquids molecules further apart / not tightly packed / in solids molecules are tightly packed ;<br>in liquids attractive forces are low / in solids attractive forces are high ;<br>in liquids molecules are able to move around / slide past each other / in solids molecules (only) vibrate (around a fixed point) ; | 3     |
| 6(b)     | thermometer ;  | 1     |
| 6(c)     | ticks in first, second, and fourth box, cross in 3rd box ;   | 2     |
| 6(d)(i)  | Conduction and convection require a medium / can't travel though a vacuum / radiation can travel through a vacuum ;  | 1     |
| 6(d)(ii) | highest frequency ;  | 1     |

| Question | Answer  | Marks |
|----------|---|-------|
| 7(a)     | glucose / starch / sugar ;  | 1     |
| 7(b)     | $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$<br>1 mark for formulae ;<br>1 mark for balanced ;   | 2     |
| 7(c)(i)  | <i>any two from</i><br>not all of the rabbit is eaten ;<br>not all of the rabbit is digested / absorbed by the fox / egestion in fox ;<br>excretion / production / loss of urine in fox ;<br>some energy wasted as heat / respiration / carbon dioxide in fox ;<br><b>Max 2</b> | 2     |
| 7(c)(ii) | decomposers / named type of decomposer e.g. bacteria / fungi ;<br>feed on / break down (carbon compounds in the fox's) body ;<br>carbon dioxide released by <b>respiration</b> (of decomposers) ;<br><b>Max 2</b>   | 2     |

| Question | Answer  | Marks |
|----------|---|-------|
| 8(a)     | lead bromide is solid / needs to be molten / liquid ;<br>so that ions are mobile / can move ; | 2     |
| 8(b)(i)  | high density / high melting point / (element or compound) act as catalysts ;                  | 1     |
| 8(b)(ii) | (to the anode) bromide / $\text{Br}^-$ ;<br>(to the cathode) copper(II) / $\text{Cu}^{2+}$ ;  | 2     |
| 8(c)(i)  | carbon / C / coke ;   | 1     |
| 8(c)(ii) | carbon monoxide / CO / carbon / C ;   | 1     |

| Question | Answer   | Marks |
|----------|--|-------|
| 9(a)     | to control / vary the current through / voltage across the lamp ;  | 1     |
| 9(b)     | the idea that lamp less bright because lower power / energy output ;<br>use of power = $V \times I$ e.g. $V \times I$ reduces in value from expt. 1 to expt. 4 ; | 2     |
| 9(c)(i)  |  <p>lamp in parallel as shown ;</p>  | 1     |
| 9(c)(ii) | 0.38 A ;<br>because lamps are identical current divides <b>equally</b> / they have the same / equal resistance ;   | 2     |