

# CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

## MARK SCHEME for the October/November 2015 series

### 0620 CHEMISTRY

0620/22

Paper 2 (Core Theory), maximum raw mark 80

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.

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#### **Abbreviations used in the Mark Scheme**

- ; separates marking points
- / separates alternatives within a marking point
- () the word or phrase in brackets is not required but sets the context
- **A** accept (a less than ideal answer which should be marked correct)
- **I** ignore (mark as if this material were not present)
- **R** reject
- ecf credit a correct statement that follows a previous wrong response
- ora or reverse argument
- owtte or words to that effect (accept other ways of expressing the same idea)

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| <b>Question</b> | <b>Answer</b>   | <b>Marks</b>         |
|-----------------|---|----------------------|
| 1(a)(i)         | <b>E</b> / NO <sub>2</sub> / nitrogen dioxide;  | <b>1</b>             |
| 1(a) (ii)       | <b>B</b> ;  | <b>1</b>             |
| 1(a)(iii)       | <b>C</b> / NaI / sodium iodide;   | <b>1</b>             |
| 1(a)(iv)        | <b>E</b> / NO <sub>2</sub> / nitrogen dioxide;  | <b>1</b>             |
| 1(a)(v)         | <b>D</b> / F <sub>2</sub> / fluorine;   | <b>1</b>             |
| 1(a)(vi)        | <b>C</b> / NaI / sodium iodide;   | <b>1</b>             |
| 1(b)            | substance containing only one type of atom / substance which cannot be broken down further by chemical means; | <b>1</b>             |
| 1(c)            | O <sub>2</sub> ;<br>4 (HF);   | <b>1</b><br><b>1</b> |

| <b>Question</b> | <b>Answer</b>   | <b>Marks</b> |
|-----------------|---|--------------|
| 2(a)            | any two from: <ul style="list-style-type: none"> <li>• (same) volume of water;</li> <li>• (same) distance of flame from beaker;</li> <li>• (same) height of flame;</li> </ul> | <b>2</b>     |
| 2(b)            | exothermic and heat released / heat given out;  | <b>1</b>     |
| 2(c)(i)         | hexane;   | <b>1</b>     |
| 2(c)(ii)        | hexane;   | <b>1</b>     |
| 2(d)(i)         | correct structure of methane;   | <b>1</b>     |
| 2(d)(ii)        | natural gas;  | <b>1</b>     |
| 2(e)(i)         | both end in –ane;   | <b>1</b>     |
| 2(e)(ii)        | compounds;<br>properties;<br>functional;  | <b>3</b>     |

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| <b>Question</b> | <b>Answer</b>  | <b>Marks</b> |
|-----------------|--|--------------|
| 3(a)(i)         | gives off bubbles rapidly / fast / many bubbles;<br>disappears quickly;  | 1<br>1       |
| 3(a)(ii)        | zinc;  | 1            |
| 3(a)(iii)       | too reactive / high in the electrochemical / reactivity series;  | 1            |
| 3(b)            | oxygen removed from barium oxide / it loses oxygen;  | 1            |
| 3(c)(i)         | use pH meter <b>and</b> pH above 7 / (red) litmus turns blue;  | 1            |
| 3(c)(ii)        | barium chloride;<br>water;   | 1<br>1       |
| 3(d)(i)         | burette;   | 1            |
| 3(d)(ii)        | any two from: <ul style="list-style-type: none"> <li>• starts off at high / alkaline pH / pH above 7;</li> <li>• pH decreases / gets more acidic / less alkaline / becomes neutral;</li> <li>• ends up at acidic pH / pH below 7;</li> </ul> | 2            |
| 3(e)            | two electrodes dipping into the electrolyte;<br>electrodes correctly connected to battery / power supply;<br>correct labels for electrodes and power supply battery;   | 1<br>1<br>1  |

| <b>Question</b> | <b>Answer</b>  | <b>Marks</b> |
|-----------------|--|--------------|
| 4(a)(i)         | measure volume of gas / measure amount of gas;<br>gas collected in the measuring cylinder;<br>at different times / use of stopclock to measure time; | 1<br>1<br>1  |
| 4(a)(ii)        | faster reaction / rate increases;  | 1            |
| 4(b)(i)         | same concentration of acid;<br>same mass of iron;<br>same size of iron pieces;   | 1<br>1<br>1  |

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| <b>Question</b> | <b>Answer</b>  | <b>Marks</b> |
|-----------------|--|--------------|
| 4(b)(ii)        | rate increases with increase in temperature<br>rate increases with temperature = [1]   | <b>2</b>     |
| 4(c)            | any three from: <ul style="list-style-type: none"> <li>• filter (off the iron);</li> <li>• evaporate water / heat gently;</li> <li>• to crystallisation point / leave to cool (after heating);</li> <li>• filter off / pick out crystals;</li> <li>• dry crystal between filter papers;</li> </ul> | <b>3</b>     |

| <b>Question</b> | <b>Answer</b>   | <b>Marks</b>         |
|-----------------|---|----------------------|
| 5(a)            | any four from: <ul style="list-style-type: none"> <li>• in solid particles regularly arranged;</li> <li>• in solid particles arranged in fixed position / cannot move or vibrate;</li> <li>• particles close together in solid;</li> <li>• particles in liquid slide over each other / move;</li> <li>• particles in liquid not regularly arranged;</li> <li>• particles close together in liquid;</li> </ul> | <b>4</b>             |
| 5(b)(i)         | any two from: <ul style="list-style-type: none"> <li>• fossil fuels contain sulfur / named fossil fuel contains sulfur;</li> <li>• burning fossil fuel;</li> <li>• sulfur reacts with oxygen / sulfur reacts with air;</li> <li>• sulfur dioxide is a gas (so escapes into air);</li> </ul>   | <b>2</b>             |
| 5(b)(ii)        | acidic / acid;  | <b>1</b>             |
| 5(b)(iii)       | calcium oxide / calcium carbonate;<br>reacts with (moist) sulfur dioxide / reacts with acidic gas / forms calcium sulfite;  | <b>1</b><br><b>1</b> |
| 5(b)(iv)        | 2 (H <sub>2</sub> O) on right;<br>2 (H <sub>2</sub> SO <sub>4</sub> ) on left;  | <b>1</b><br><b>1</b> |

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| <b>Question</b> | <b>Answer</b>  | <b>Marks</b>         |
|-----------------|--|----------------------|
| 5(c)            | any two from: <ul style="list-style-type: none"> <li>• conducts heat / conducts electricity;</li> <li>• malleable;</li> <li>• ductile;</li> <li>• lustrous / shiny surface;</li> </ul> | <b>2</b>             |
| 5(d)(i)         | aluminium is good conductor;<br>steel is strong / core is strong;  | <b>1</b><br><b>1</b> |
| 5(d)(ii)        | copper is cheap(er) (than silver) / silver is (more) expensive;  | <b>1</b>             |

| <b>Question</b> | <b>Answer</b>  | <b>Marks</b>         |
|-----------------|--|----------------------|
| 6(a)(i)         | ring around OH group;  | <b>1</b>             |
| 6(a)(ii)        | unsaturated <b>and</b> has double bonds;   | <b>1</b>             |
| 6(b)(i)         | condenser;   | <b>1</b>             |
| 6(b)(ii)        | any characteristic of a mixture, e.g. can be separated by physical means / has variable composition / properties are the average of those of the components; | <b>1</b>             |
| 6(b)(iii)       | geraniol floats on top of the water;   | <b>1</b>             |
| 6(c)(i)         | structure of ethanol drawn correctly with all atoms and bonds;   | <b>1</b>             |
| 6(c)(ii)        | carbon dioxide;<br>water;  | <b>1</b><br><b>1</b> |
| 6(d)            | 21%;   | <b>1</b>             |

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| <b>Question</b> | <b>Answer</b>  | <b>Marks</b> |
|-----------------|--|--------------|
| 7(a)            | any five from: <ul style="list-style-type: none"> <li>• four electrons;</li> <li>• electrons negatively charged;</li> <li>• electrons outside nucleus in shells;</li> <li>• nucleus contains protons and neutrons;</li> <li>• protons positively charged;</li> <li>• neutrons no charge;</li> <li>• four protons;</li> <li>• five neutrons;</li> <li>• electron arrangement [2,2]/two electrons in outer shell;</li> </ul> | <b>5</b>     |
| 7(b)            | $\text{BeCl}_2$ ;  | <b>1</b>     |
| 7(c)(i)         | 43<br>correct atomic masses only = [1]   | <b>2</b>     |
| 7(c)(ii)        | global warming / greenhouse effect / effect of global warming, e.g. rise in sea level / desertification / more extreme weather / climate change;   | <b>1</b>     |