



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

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**CHEMISTRY**

**0620/32**

Paper 3 Theory (Core)

**May/June 2016**

MARK SCHEME

Maximum Mark: 80

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**Published**

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| <b>Question</b> | <b>Answer</b>  | <b>Marks</b>       |
|-----------------|--|--------------------|
| 1(a)(i)         | B and D;   | <b>1</b>           |
| 1(a)(ii)        | C;<br>has only one type of atom;   | <b>2</b><br>1<br>1 |
| 1(a)(iii)       | Na <sub>3</sub> P;   | <b>1</b>           |
| 1(b)(i)         | 16;  | <b>1</b>           |
| 1(b)(ii)        | 5;   | <b>1</b>           |
| 1(b)(iii)       | 60;  | <b>1</b>           |
| 1(c)            | acidic;<br>because phosphorus is a non-metal/it is a non-metal oxide/it would react with bases/neutralises bases/<br>phosphorus is on the right-hand side of the Periodic Table; | <b>2</b><br>1<br>1 |

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| <b>Question</b> | <b>Answer</b>   | <b>Marks</b>       |
|-----------------|---|--------------------|
| 2(a)            | lead < nickel < zinc < titanium;<br>(1 mark if one pair reversed)   | <b>2</b>           |
| 2(b)            | positive electrode: oxygen / O <sub>2</sub> ;<br>negative electrode: aluminium / Al;  | 1<br>1<br><b>2</b> |
| 2(c)            | test: (aqueous) sodium hydroxide / (aqueous) ammonia;<br>result: (grey-) green precipitate / solid;   | 1<br>1<br><b>2</b> |
| 2(d)(i)         | oxygen / air;<br>water;   | 1<br>1<br><b>2</b> |
| 2(d)(ii)        | idea of covering surface with tin / zinc / other suitable metal / plastic / grease / oil / paint / galvanising;<br>prevents oxygen / air or water / moisture / steam from getting to the surface; | 1<br>1<br><b>2</b> |

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| <b>Question</b> | <b>Answer</b>   | <b>Marks</b> |
|-----------------|---|--------------|
| 3(a)            | reversible reaction / equilibrium;  | 1            |
| 3(b)            | exothermic <b>and</b> products have less energy than reactants;   | 1            |
| 3(c)(i)         | percentage yield decreases as temperature increases;  | 1            |
| 3(c)(ii)        | 91%;  | 1            |
| 3(d)            | test: (acidified) potassium manganate(VII) / potassium permanganate;<br>result: (pink solution) turns colourless; | 1<br>1       |
| 3(e)            | any suitable use, e.g. food preservation / manufacture of sulfuric acid;  | 1            |
| 3(f)            | sulfur dioxide;<br>(sulfur dioxide) loses oxygen;   | 1<br>1       |
| 3(g)            | 3 (H <sub>2</sub> O);   | 1            |

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| <b>Question</b> | <b>Answer</b>  | <b>Marks</b>            |
|-----------------|--|-------------------------|
| 4(a)            | any 2 from: <ul style="list-style-type: none"> <li>• family/group of similar chemicals;</li> <li>• with same functional group;</li> <li>• trend in physical properties;</li> <li>• same general formula;</li> <li>• same/similar chemical reaction;</li> <li>• successive members differ by CH<sub>2</sub>;</li> </ul> | <b>2</b>                |
| 4(b)(i)         | F and G;<br>contain <u>only</u> carbon and hydrogen;<br>have <u>only</u> single bonds/no double bonds;   | <b>3</b><br>1<br>1<br>1 |
| 4(b)(ii)        | F/methane/CH <sub>4</sub> ;  | <b>1</b>                |
| 4(b)(iii)       | H;<br>J;   | <b>2</b><br>1<br>1      |
| 4(b)(iv)        | contain oxygen;  | <b>1</b>                |
| 4(c)(i)         | ethanol;   | <b>1</b>                |
| 4(c)(ii)        | yes <b>and</b> because there is a general increase in the numbers/the numbers go up steadily;<br><b>OR</b><br>no <b>and</b> because the numbers go down then up again;   | <b>1</b>                |
| 4(c)(iii)       | 65°C;  | <b>1</b>                |
| 4(d)(i)         | 2 (CO);<br>3 (H <sub>2</sub> O);   | <b>2</b><br>1<br>1      |
| 4(d)(ii)        | poisonous/toxic;   | <b>1</b>                |

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| <b>Question</b> | <b>Answer</b>  | <b>Marks</b> |
|-----------------|--|--------------|
| 5(a)            | liquid;<br>6°C is higher than the melting point and lower than the boiling point/6°C is between the melting point and boiling point; | 2<br>1<br>1  |
| 5(b)(i)         | potassium chloride;<br>iodine;   | 2<br>1<br>1  |
| 5(b)(ii)        | <u>iodine</u> is less reactive than <u>bromine</u> / <u>bromine</u> is more reactive than <u>iodine</u> ;                            | 1            |
| 5(c)            | 357<br>(1 mark for 1 correct row, e.g. $(4 \times 16 =) 64$ or $(2 \times 35.5) = 71$ )  | 2            |
| 5(d)(i)         | cross shown on baseline;   | 1            |
| 5(d)(ii)        | ethanol/ other organic solvent;  | 1            |
| 5(d)(iii)       | dyes <u>move up</u> the paper and <u>separate</u> ;  | 1            |

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| <b>Question</b> | <b>Answer</b>  | <b>Marks</b>       |
|-----------------|--|--------------------|
| 6(a)            | any 5 from: <ul style="list-style-type: none"> <li>• conducts electricity / conducts heat;</li> <li>• soft;</li> <li>• solid;</li> <li>• shiny (when cut);</li> <li>• malleable / ductile;</li> <li>• reacts with water to produce hydrogen;</li> <li>• bubbles / fizzes in water;</li> <li>• vigorous reaction with water;</li> <li>• floats on water / low density;</li> <li>• forms an alkaline solution with water;</li> <li>• reacts with oxygen / air to form an oxide;</li> <li>• reacts with chlorine to form a chloride;</li> <li>• suitable word equations (maximum two equations);</li> </ul> | <b>5</b>           |
| 6(b)            | test: put the sodium compound on <u>nichrome</u> / <u>platinum wire</u> (on the edge of a blue Bunsen burner flame);<br>result: flame goes yellow;   | <b>2</b><br>1<br>1 |
| 6(c)(i)         | pH 13;   | <b>1</b>           |
| 6(c)(ii)        | add (red) litmus to sodium hydroxide / dip (red) litmus into sodium hydroxide;<br>turns blue;  | <b>2</b><br>1<br>1 |
| 6(d)            | sulfur dioxide produced / SO <sub>2</sub> formed;<br>causes breathing difficulties / harmful to eyes / coughing / damages lungs / irritates eyes / sore throat / skin burns /<br>difficulty swallowing / headache / vomiting;  | <b>2</b><br>1<br>1 |

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| <b>Question</b> | <b>Answer</b>  | <b>Marks</b> |
|-----------------|--|--------------|
| 7(a)            | flask;<br>(gas) syringe;   | 2<br>1<br>1  |
| 7(b)(i)         | 1.0 (mol/dm <sup>3</sup> ) because the initial gradient is steeper/initial slope is steeper;         | 1            |
| 7(b)(ii)        | steeper gradient than curve for 1.0 mol/dm <sup>3</sup> ;<br>same final volume;                      | 2<br>1<br>1  |
| 7(c)            | any suitable use, e.g. fuel/reducing agent/making margarine/making ammonia/Haber process/fuel cells; | 1            |
| 7(d)            | dust has a (very) high surface area;   | 1            |



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| <b>Question</b> | <b>Answer</b>   | <b>Marks</b> |
|-----------------|---|--------------|
| 8(a)            | <u>mixture</u> of 2 or more metals / <u>mixture</u> of a metal and a non-metal;   | <b>1</b>     |
| 8(b)            | any alloy, e.g. brass, bronze etc.;   | <b>1</b>     |
| 8(c)            | any 4 from: <ul style="list-style-type: none"> <li>• solder has melted;</li> <li>• atoms in solid (only) vibrate;</li> <li>• atoms in solid are regularly arranged / touching / close to each other;</li> <li>• atoms start to vibrate more;</li> <li>• atoms in liquid are irregularly arranged / close together / touching;</li> <li>• atoms in liquids slide over each other / atoms in liquids move slowly;</li> <li>• atoms move more during melting;</li> <li>• atoms become less regularly arranged during melting;</li> </ul> | <b>4</b>     |
| 8(d)            | vapour <u>spreads</u> everywhere / vapour <u>does not stay in one place</u> ;   | <b>1</b>     |