

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

**MARK SCHEME for the October/November 2015 series****0620 CHEMISTRY****0620/23**

Paper 2 (Core Theory), maximum raw mark 80

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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>B</b> / $C_2$ / chlorine;	<b>1</b>
1(a)(ii)	<b>C</b> / $N_2$ / nitrogen;	<b>1</b>
1(a)(iii)	<b>E</b> / Ar / argon;	<b>1</b>
1(a)(iv)	<b>A</b> / ethene / $C_2H_4$ ;	<b>1</b>
1(a)(v)	<b>A</b> / ethene / $C_2H_4$ ;	<b>1</b>
1(a)(vi)	<b>F</b> / $CO_2$ / carbon dioxide;	<b>1</b>
1(b)	substance containing (two or more) different atoms bonded / substance containing (two or more) different atoms combined;	<b>1</b>
1(c)	in light bulbs / as an inert atmosphere / welding;	<b>1</b>
1(d)	3 (Mg) <u>and</u> $N_2$ ;	<b>1</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
2(a)(i)	plastics;	<b>1</b>
2(b)	third box ticked / exothermic;	<b>1</b>
2(c)	4;	<b>1</b>
2(d)(i)	speed up the reaction / increase reaction rate;	<b>1</b>
2(d)(ii)	carbon dioxide; water;	<b>1</b> <b>1</b>
2(e)	any two from: <ul style="list-style-type: none"> <li>• sulfur (oxidises / burns) to form sulfur dioxide;</li> <li>• acid rain / acidic gas formed;</li> <li>• effect of acid rain, e.g. kills animals in ponds (or lakes) / kills plants / soil demineralisation / erodes limestone buildings / iron structures corroded;</li> </ul>	<b>2</b>
2(f)(i)	alkane(s);	<b>1</b>
2(f)(ii)	colourless / liquid at room temperature / low melting point;	<b>1</b>

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
2(f)(iii)	$\begin{array}{c} \text{O} \\    \\ \text{C} - \text{O} - \text{H}; \end{array}$	<b>1</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
3(a)	flask; Bunsen burner / Bunsen / burner;	<b>1</b> <b>1</b>
3(b)	sodium sulfate;	<b>1</b>
3(c)(i)	3 correctly labelled = [2] 1 or 2 correctly labelled = [1];	<b>2</b>
3(c)(ii)	<b>X</b> = chlorine / $\text{Cl}_2$ ; <b>Y</b> = hydrogen / $\text{H}_2$ ;	<b>1</b> <b>1</b>
3(c)(iii)	calcium chloride; carbon dioxide; water;	<b>3</b>
3(d)(i)	1.6;	<b>1</b>
3(d)(ii)	idea that pH increases slowly at first ; idea of sudden increase at around $18 \text{ cm}^3$ ; idea of pH increasing at a slower rate in the more alkaline region;	<b>1</b> <b>1</b> <b>1</b>

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Question	Answer	Marks
4(a)	measure the volume of gas; in a (measuring) cylinder; at different times;	1 1 1
4(b)(i)	increases then decreases; comment on the curve, e.g. rate not constant at first/peak (or maximum) at 60 hours /rate of decrease less than rate of increase (around the maximum);	1 1
4(b)(ii)	0.29 (cm <sup>3</sup> CO <sub>2</sub> per hour);	1
4(b)(iii)	any two from: <ul style="list-style-type: none"> <li>• higher temperature (<b>R</b>: temperatures above 40 °C);</li> <li>• increase concentration of <u>glucose</u>;</li> <li>• increase amount of yeast;</li> </ul>	2
4(c)	<b>M1</b> correct method, e.g. add litmus /add sodium hydroxide /add sodium carbonate /measure pH; <b>M2</b> correct outcome, e.g. litmus turns red with acid /no change of litmus with ethanol /pH below 7 with acid /pH 7 with ethanol /acid reacts with sodium hydroxide or sodium carbonate / ethanol does not react with sodium hydroxide or sodium carbonate;	1 1

Question	Answer	Marks
5(a)	any four from: <ul style="list-style-type: none"> <li>• particles in the liquid slide over each other / move slowly / restricted movement;</li> <li>• particles in the liquid not regularly arranged / randomly arranged;</li> <li>• particles close together in liquid;</li> <li>• in the gas particles arranged randomly / are anywhere;</li> <li>• in the gas particles move from place to place / move freely / move fast;</li> <li>• particles far apart in the gas;</li> </ul>	4
5(b)(i)	liquid; temperature above melting point but below boiling point;	1 1
5(b)(ii)	copper <b>and</b> iron; both have <u>high</u> melting points;	1 1

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
5(b)(iii)	resistant to corrosion;	<b>1</b>
5(c)(i)	oxygen / air; water;	<b>1</b> <b>1</b>
5(c)(ii)	idea of layer stopping air or water getting to the surface / idea of blocking reaction with the surface of the iron, e.g. stops air or oxygen getting to surface / blocks water or moisture getting to the iron;	<b>1</b>
5(d)(i)	iron chloride / iron(II) chloride; hydrogen;	<b>1</b> <b>1</b>
5(d)(ii)	<b>M1</b> (aqueous) sodium hydroxide / (aqueous) ammonia; <b>M2</b> green precipitate / grey-green precipitate;	<b>1</b> <b>1</b>
5(e)	any suitable use, e.g. cutlery / chemical plant / surgical instruments / saucepans;	<b>1</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
6(a)	fractional distillation / fractionation / fractionating; differences in boiling point(s);	<b>1</b> <b>1</b>
6(b)(i)	refinery gas;	<b>1</b>
6(b)(ii)	kerosene / paraffin;	<b>1</b>
6(c)(i)	<b>B and C</b> / ethene <b>and</b> propene;	<b>1</b>
6(c)(ii)	H <sub>2</sub> ; C <sub>3</sub> H <sub>6</sub> ;	<b>1</b> <b>1</b>
6(d)(i)	copper;	<b>1</b>
6(d)(ii)	it is cooler / temperature lower;	<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>• 17 protons;</li> <li>• 18 neutrons;</li> <li>• 17 electrons;</li> <li>• protons positively charged;</li> <li>• neutrons no charge</li> <li>• electrons negatively charged;</li> <li>• electrons outside the nucleus in shells;</li> <li>• nucleus contains protons and neutrons;</li> <li>• electron arrangement 2, 8, 7/7 electrons in the outer shell;</li> </ul>	<b>5</b>
7(b)	sodium atoms each lose an electron/sodium has one more proton than electrons; chlorine atoms each gain an electron/chlorine has one more electron than protons;	<b>1</b> <b>1</b>
7(c)(i)	iodine formed;	<b>1</b>
7(c)(ii)	chlorine is more reactive than <u>iodine</u> /chlorine is higher in the reactivity series than <u>iodine</u> ;	<b>1</b>
7(d)(i)	$C_2ClF_5$ ;	<b>1</b>