

**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

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.

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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>