

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

## **MARK SCHEME for the October/November 2015 series**

### **0439 CHEMISTRY (US)**

**0439/21**

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>F</b> / barium chloride / $\text{BaCl}_2$ ;	<b>1</b>
1(a)(ii)	<b>D</b> / ammonium sulfate / $(\text{NH}_4)_2\text{SO}_4$ ;	<b>1</b>
1(a)(iii)	<b>A</b> / <b>Al</b> / $\text{Al}_2\text{Cl}_6$ / aluminium chloride;	<b>1</b>
1(a)(iv)	<b>E</b> / <b>HCl</b> / hydrogen chloride;	<b>1</b>
1(a)(v)	<b>B</b> / water / $\text{H}_2\text{O}$ ;	<b>1</b>
1(a)(vi)	<b>C</b> / methane / $\text{CH}_4$ ;	<b>1</b>
1(b)(i)	arrow under the aluminium foil;	<b>1</b>
1(b)(ii)	fume cupboard;	<b>1</b>
1(b)(iii)	3 ( $\text{Cl}_2$ );	<b>1</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
2(a)	make sure temperature change is the same throughout / make sure that there are no hot spots / no local heating;	<b>1</b>
2(b)	any two from: <ul style="list-style-type: none"> <li>• same amount of solid / same mass of solid;</li> <li>• same volume of water;</li> <li>• same amount of stirring;</li> </ul>	<b>2</b>
2(c)(i)	<b>Q</b>	<b>1</b>
2(c)(ii)	<b>R; T;</b>	<b>2</b>
2(d)(i)	$^{235}\text{U}$ ;	<b>1</b>
2(d)(ii)	138;	<b>1</b>
2(d)(iii)	cancer treatment / tracer / test thyroid function;	<b>1</b>
2(e)(i)	<u>kerosene</u> ;	<b>1</b>
2(e)(ii)	$\text{C}_5\text{H}_{10}$ ;	<b>1</b>

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
3(a)	2 (Ni); CO <sub>2</sub> (on right);	1 1
3(b)(i)	positive electrode / anode in box on left; negative electrode / cathode in upper box on right; electrolyte / named suitable electrolyte in lower box on right;  3 correct = [2] 1 or 2 correct = [1]	1 1
3(b)(ii)	cathode / negative electrode;	2
3(c)(i)	<i>the positive electrode</i> : chlorine; <i>the negative electrode</i> : nickel;	1
3(c)(ii)	inert / unreactive; conducts electricity;	1 1
3(d)(i)	giant structure / lots of carbon atoms joined to each other / lattice of covalent bonds; strong (covalent) bonds throughout;	1 1
3(d)(ii)	weak forces between layers; layers can slide (over each other);	1 1

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
4(a)(i)	gradient / slope is greater for strontium ora;	1

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
4(a)(ii)	11 (cm <sup>3</sup> );	<b>1</b>
4(a)(iii)	64–66 (s);	<b>1</b>
4(a)(iv)	the line was still going up / the line was still rising;	<b>1</b>
4(a)(v)	(rate) increases;	<b>1</b>
4(b)(i)	(volumetric) pipette;	<b>1</b>
4(b)(ii)	to show end point of titration / to show when the solution has been neutralised; litmus goes from blue to pink (at end point);	<b>1</b> <b>1</b>
4(c)(i)	decreases slowly at first; then sudden decrease in pH; then slow decrease;	<b>1</b> <b>1</b> <b>1</b>
4(c)(ii)	26 (cm <sup>3</sup> );	<b>1</b>
4(c)(iii)	strontium chloride;	<b>1</b>

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
5(a)	melting/ice melts/ice goes from solid to liquid;	<b>1</b>
	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;</li> <li>• particles in solid absorb energy;</li> <li>• particles (in solid) vibrate more / particles start to move when heated;</li> <li>• forces between particles (in solid) broken;</li> <li>• particles in liquid slide over each other / move;</li> <li>• particles in liquid not regularly arranged;</li> </ul>	<b>4</b>

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
5(b)(i)	coolant / for making ethanol / for making specified chemicals / solvent;	<b>1</b>
5(b)(ii)	washing / cooking / cleaning etc.;	<b>1</b>
5(c)(i)	lithium + water → lithium hydroxide + hydrogen;	<b>1</b>
5(c)(ii)	any two from: <ul style="list-style-type: none"> <li>• floats on surface (of water);</li> <li>• bubbles of gas;</li> <li>• fizzes / fizzing sound;</li> <li>• decreases in size / disappears;</li> <li>• moves around;</li> </ul>	<b>2</b>
5(c)(iii)	(potassium) more reactive / lithium less reactive;	<b>1</b>
5(d)(i)	correct structure of ethene;	<b>1</b>
5(d)(ii)	high temperature; catalyst/phosphoric acid;	<b>1</b> <b>1</b>
5(e)	cobalt → iron → cerium → calcium; one pair reversed or all reversed = [1]	<b>2</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
6(a)	C <sub>5</sub> H <sub>8</sub> ;	<b>1</b>

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
6(b)	bromine / bromine water / aqueous bromine; decolourised / goes from orange to colourless;	<b>1</b> <b>1</b>
6(c)(i)	double bond;	<b>1</b>
6(c)(ii)	poly(ethene) / any other addition polymer;	<b>1</b>
6(d)	it is a molecule / covalent compound;	<b>1</b>
6(e)	any two from: carbon or soot / carbon monoxide / water;	<b>2</b>
6(f)	<u>alcohols</u> / first box ticked;	<b>1</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
7(a)	any five from: <ul style="list-style-type: none"> <li>• 11 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>• 11 protons;</li> <li>• 12 neutrons;</li> <li>• electron arrangement 2,8,1 / 1 electron in outer shell;</li> </ul>	<b>5</b>
7(b)(i)	2 (NaOH); 2 (H <sub>2</sub> O);	<b>1</b> <b>1</b>
7(b)(ii)	substance containing carbon and hydrogen <u>only</u> / substance containing carbon and hydrogen and <u>no other</u> element;	<b>1</b>
7(b)(iii)	70;	<b>1</b>