**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**Cambridge International General Certificate of Secondary Education**

# MARK SCHEME for the May/June 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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2015 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

**Abbreviations used in the Mark Scheme**

- ; separates marking points
- / separates alternatives within a marking point
- **OR** gives alternative marking point
- **R** reject
- **I** ignore mark as if this material was not present
- **A** accept (a less than ideal answer which should be marked correct)
- **COND** indicates mark is conditional on previous marking point
- owtte or words to that effect (accept other ways of expressing the same idea)
- max indicates the maximum number of marks that can be awarded
- ecf credit a correct statement that follows a previous wrong response
- ( ) the word / phrase in brackets is not required, but sets the context
- ORA or reverse argument

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 1(a)(i) | C / $N_2$ / nitrogen; | 1 | |
| 1(a)(ii) | A / $NH_3$ / ammonia; | 1 | |
| 1(a)(iii) | B / $NaNO_3$ / sodium nitrate; | 1 | |
| 1(a)(iv) | E / NaC*l* / sodium chloride; | 1 | |
| 1(a)(v) | B / $NaNO_3$ / sodium nitrate; | 1 | |
| 1(b)(i) | sodium nitrate; | 1 | |
| 1(b)(ii) | gas; molecular; solid; ions; (1 mark each) | 4 | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 2(a)(i) | temperature rises / heat given off; | 1 | |
| 2(a)(ii) | structure completed with<br>O<br>‖<br>– C – O – H ; | 1 | **A** –OH in place of – O – H<br>**I** COOH |
| 2(a)(iii) | *Any three of:*<br>• evaporation / heat solution / leave the solution;<br>• to crystallisation point / to form crystals;<br>• filter off crystals / pick out crystals;<br>• dry crystals between filter papers / heat gently / heat to just above 100 °C; | 3 | **R** heat to dryness / heat until all water comes off<br>NOTE: filtration must be after crystallisation |
| 2(b) | 3rd and 5th boxes ticked (one mark each); | 2 | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 2(c) | *Any two of:*<br>• bubbles;<br>• fizzing (sound);<br>• magnesium disappears / gets smaller;<br>• change in temperature / gets warmer; | 2 | **I** pops / explodes<br><br>**A** gets colder |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 3(a)(i) | $4^{th}$ box down ticked (thermal decomposition); | 1 | |
| 3(a)(ii) | use fume cupboard / fume hood / well-ventilated area; | 1 | **A** breathing apparatus / safety goggles |
| 3(a)(iii) | liquid;<br>particles close together / touching;<br>particles randomly arranged / no fixed arrangement; | 3 | <br>**I** reference to gaps<br>**I** particles moving / slide over each other |
| 3(b)(i) | $H_2SO_4$; | 1 | **A** any order e.g. $SO_4H_2$ |
| 3(b)(ii) | pH 1; | 1 | |
| 3(c) | filter funnel and filter paper;<br>either funnel or filter paper labelled; | 2 | |
| 3(d)(i) | reversible reaction / equilibrium; | 1 | **A** goes both ways |
| 3(d)(ii) | white; to blue; | 2 | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 4(a) | carbon dioxide escapes / gas escapes; | 1 | **A** carbon dioxide / gas given off |
| 4(b)(i) | decreases;<br>then levels off / remains the same / becomes steady; | 2 | |
| 4(b)(ii) | 42–46 (s); | 1 | |
| 4(b)(iii) | 3.5 (g); | 1 | |
| 4(b)(iv) | initial gradient steeper and starts at 200 g;<br>ends up at same volume; | 2 | |
| 4(b)(v) | decreases / slows down; | 1 | **I** time increases |
| 4(c)(i) | zinc oxide / zinc hydroxide / zinc carbonate; | 1 | |
| 4(c)(ii) | anode: chlorine / $Cl_2$;<br>cathode: zinc / Zn; | 2 | **R** chloride ions / zinc ion |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 5(a)(i) | ring around the OH group; | 1 | |
| 5(a)(ii) | 3 / O,C and H; | 1 | **I** 'molecules' |
| 5(a)(iii) | 10; | 1 | **I** 'molecules' |
| 5(a)(iv) | double bond / C=C; | 1 | |
| 5(b)(i) | (C), B, E, D, A = 2 marks<br>one pair reversed = 1 mark | 2 | |
| 5(b)(ii) | boiling point; | 1 | **I** molecular mass |
| 5(c)(i) | X anywhere in top compartment;<br>H anywhere in bottom pipe or outside bottom pipe; | 2 | **A** H in bottom compartment |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 5(c)(ii) | any suitable e.g. making chemicals / making ethene; | 1 | **A** making gasoline / petrol / more fuel |
| 5(d)(i) | animal wastes / gases from animals / bacterial decay / rice paddy fields / fracking / landfill sites / decay of vegetation / melting permafrost; | 1 | **A** cows / sheep / pigs / bacteria |
| 5(d)(ii) | global warming / greenhouse gas / rise in temperature of atmosphere; | 1 | **A** effects of global warming e.g. ice caps melt / desertification / extreme weather |
| 5(d)(iii) | alkane(s); | 1 | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 6(a)(i) | A and B; (very) high melting points; | 2 | |
| 6(a)(ii) | A; good electrical conductor; | 2 | |
| 6(a)(iii) | C; | 1 | |
| 6(b) | *Any four of:*<br>• no reaction between bromine and potassium chloride / reaction mixture remains an orange colour / no colour change;<br>• because chlorine is more reactive than bromine ORA;<br>• solution goes brown with potassium iodide / solution darkens with potassium iodide;<br>• there is a reaction with potassium iodide / potassium bromide formed with potassium iodide / bromine formed with potassium iodide;<br>• iodine less reactive than bromine ORA; | 4 | **A** there is a colour change |
| 6(c) | kills bacteria / kills microorganisms; | 1 | **I** to purify water / to make it cleaner |
| 6(d) | pair of electrons between chlorine atoms;<br>6 non-bonding electrons on outer shell of right hand chlorine atom; | 2 | **I** inner shell electrons |
| 6(e)(i) | $In_2Cl_6$; | 1 | **I** $InCl_3$ |
| 6(e)(ii) | 49; | 1 | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 7(a) | evaporates easily / vaporises readily; | 1 | **A** has a low boiling point / evaporates at room temperature |
| 7(b) | *Any three of:*<br>• movement of particles;<br>• diffusion;<br>• particles collide with each other / particles bounce off each other;<br>• spreading out of particles;<br>• random (movement of particles);<br>• (particles move) from higher to lower concentration; | 3 | |
| 7(c)(i) | increases; | 1 | |
| 7(c)(ii) | no fixed pattern in melting points / melting points are irregular; | 1 | |
| 7(c)(iii) | third box down ticked ($CH_2$); | 1 | |
| 7(c)(iv) | oxygen (on left); water (on right); | 2 | |
| 7(d)(i) | atoms with same number of protons but different number of neutrons **OR**<br>atoms with same atomic number but different number of neutrons **OR**<br>atoms with same number of protons but different mass number; | 1 | **A** nucleon number for mass number<br>**A** elements with same number of protons but different number of neutrons **OR** atoms of same elements with different numbers of neutrons |
| 7(d)(ii) | $^{12}_{6}C$ ; | 1 | |