

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

## **MARK SCHEME for the October/November 2014 series**

### **0620 CHEMISTRY**

**0620/22**

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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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0620	22

- 1 (a) (i) A [1]  
(ii) B [1]  
(iii) C [1]  
(iv) E [1]  
(v) E [1]  
(vi) D [1]

- (b) 1 mark for each correct word:  
atoms;  
protons;  
neutrons. [3]

[Total: 9]

- 2 (a) (i) chloride /  $Cl^-$  [1]  
(ii) sulfate [1]  
(iii)  $MgCl_2$  [1]  
(iv) 26 g [1]

- (b) bromine water / bromine / aqueous bromine [1]

saturated → no colour change **or** remains orange / yellow / brown [1]  
**note:** mark dependent on correct reagent

unsaturated → decolourised / goes colourless [1]  
**ignore:** goes clear / discoloured  
**note:** mark dependent on correct reagent

**allow:** (acidified) potassium manganate(VII) (1) remains purple / remains pink / no colour change with saturated hydrocarbon (1) decolourised with unsaturated hydrocarbon (1)

- (c) (i) pH 5 [1]  
(ii) one or both carboxylic acid groups ringed [1]

[Total: 9]

- 3 (a) sulfuric acid + sodium chloride → sodium sulfate + hydrogen chloride [1]

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0620	22

- (b) (i) bonding electron pairs on both overlap areas between hydrogen and oxygen atoms [1]  
**do not allow:** additional electrons on the hydrogen atom
- 4 non-bonding electrons on outer shell of oxygen [1]  
**note:** these electrons do not have to be paired up
- (ii) white [1]  
precipitate [1]
- (c) (i) 10.8 [1]  
(ii) 1.5 (cm<sup>3</sup>) [1]  
(iii) 13 (cm<sup>3</sup>) [1]
- (d) it loses oxygen/MnO<sub>2</sub> loses oxygen/hydrogen gains oxygen [1]  
**allow:** oxidation number of manganese decreases / manganese gains electrons
- (e) C  
because:  
forms different ions / ions with different charges / forms 2 types of ions [1]  
**note:** dependent on C
- has coloured oxide / has coloured compound [1]  
**ignore:** has high boiling point / has high density

[Total: 11]

- 4 (a) H<sub>2</sub>O on right [1]  
2 (HCl) on left [1]  
**note:** mark dependent on H<sub>2</sub>O on right
- (b) (i) A = flask / Erlenmeyer [1]  
B = (top pan) balance [1]
- (ii) carbon dioxide is a gas / gas escapes / carbon dioxide escapes / carbon dioxide given off / gas given off [1]
- (c) (i) **allow:** 420–440 (s) [1]  
(ii) 0.175g [1]  
(iii) increases / gets faster [1]  
decreases / gets slower [1]

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0620	22

decreases / gets slower [1]

(d) 2<sup>nd</sup> and 3<sup>rd</sup> boxes down ticked (decomposition and endothermic) [2]

(e) (i) Any **two** from: [2]

- calcium oxide is basic
- reacts with acidic gases / reacts with acidic vapours / reacts with sulfur dioxide / removes acidic gases / removes sulfur dioxide

**allow:** reacts with acids

- idea of neutralisation
- ignore:** prevents gases escaping unless qualified
- ignore:** reacts with sulfur

(ii) any suitable use e.g. neutralising (or reducing acidity of) acidic soils / neutralising (or reducing acidity of) acidic industrial waste / making mortar / steelmaking [1]

[Total: 15]

5 (a) Any **four** from: [4]

- both giant structures
  - both have layered structures
  - graphite covalent
  - sodium chloride ionic
  - graphite macromolecule / giant covalent structure
  - graphite has layers which are separated / further apart (than C-C bonds)
  - sodium chloride has ions touching
  - graphite has only one type of particle / graphite is an element / only has C atoms
  - sodium chloride has two types of particles / sodium chloride is a compound
  - graphite has hexagonal arrangement (of atoms)
  - sodium chloride has cubic arrangement **allow:** square arrangement
  - graphite has atoms all of one size
  - sodium chloride has different sized particles / ions
- ignore:** properties / weak or strong bonding

(b) (i) substance containing only one type of atom [1]  
**allow:** substance that cannot be split up (by chemical means)

(ii)  $C + O_2 \rightarrow CO_2$  [2]

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0620	22

- (c) (i) A [1]  
(ii) C [1]  
(iii) B [1]  
(iv) D [1]

[Total: 11]

- 6 (a) (i) Any **two** from: [2]  
  - have same functional group
  - group of similar compounds / have similar chemical properties
  - (molecular) formula increases by CH<sub>2</sub> unit
  - physical properties show a trend / density shows a trend / boiling points show a trend
  - they have a general formula
(ii) C<sub>5</sub>H<sub>12</sub> [1]  
(iii) increases [1]  
(iv) **allow**: between 0.50 and 0.58 [1]
- (b) any suitable solid fuel e.g. coal / wood / coke / peat [1]  
**ignore**: bitumen / petroleum  
any suitable liquid fuel e.g. paraffin / fuel oil / diesel / petrol etc. [1]
- (c) (i) X in top compartment; [1]  
**allow**: X in top pipe  
F outside or in bottom right pipe; [1]  
M outside or in bottom left pipe; [1]  
(ii) C<sub>2</sub>H<sub>4</sub> [1]  
H<sub>2</sub> [1]  
(iii) high temperature [1]  
**allow**: heat / stated temperatures between 200–1000 °C  
catalyst [1]  
**ignore**: names of incorrect catalysts

[Total: 14]

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0620	22

- 7 (a) Any **four** from: [4]
- melting / solid changes to liquid  
**ignore:** dissolving
  - in solid gallium the particles are close together
  - in solid gallium the particles only vibrate **allow:** particles do not move
  - when gallium melts particles become random / move randomly
  - when gallium melts, the particles start sliding over each other / bumping into each other / particles move  
**ignore:** particles further apart in liquid
  - idea of energy (of the hot tea causing the particles to slide / move)
  - ideas about forces between particles being weakened (on melting)
- note:** there must be some reference to particles / atoms / ions to score these marking points
- (b) 2 ( $\text{Ga}_2\text{O}_3$ ) [1]
- 4 (Ga) [1]
- note:** 2<sup>nd</sup> mark dependent on first being correct
- (c) Any **two** from: [2]
- aluminium does not corrode / does not react;
  - aluminium has an (unreactive) oxide layer
  - low density / lightweight
  - malleable
  - **allow:** not toxic
- note:** unreactive oxide layer is 2 marks  
**ignore:** does not rust
- (d) (i) arrow under Al foil [1]
- (ii)  $\text{Al}_2\text{Cl}_6$  [1]  
**ignore:**  $\text{AlCl}_3$
- (iii) aluminium has lower density (than silver) [1]  
**allow:** aluminium is less expensive  
**ignore:** reference to melting point

[Total: 11]