

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

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- 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]

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- (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 (cm³) [1]
(iii) 13 (cm³) [1]
- (d) it loses oxygen/MnO₂ 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) H₂O on right [1]
2 (HCl) on left [1]
note: mark dependent on H₂O 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]

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decreases / gets slower [1]

(d) 2nd and 3rd 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]

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- (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 CH₂ unit
 - physical properties show a trend / density shows a trend / boiling points show a trend
 - they have a general formula
- (ii) C₅H₁₂ [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) C₂H₄ [1]
H₂ [1]
- (iii) high temperature [1]
allow: heat / stated temperatures between 200–1000 °C
- catalyst [1]
ignore: names of incorrect catalysts

[Total: 14]

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- 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 (Ga_2O_3) [1]
- 4 (Ga) [1]
- note:** 2nd 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) Al_2Cl_6 [1]
ignore: AlCl_3
- (iii) aluminium has lower density (than silver) [1]
allow: aluminium is less expensive
ignore: reference to melting point

[Total: 11]