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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 (cm^3) [1]

(iii) 13 (cm^3) [1]

(d) it loses oxygen / MnO_2 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_2O on right [1]

2 (HCl) on left [1]
note: mark dependent on H_2O 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) 0.175 g [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 CH_2 unit
- physical properties show a trend / density shows a trend / boiling points show a trend
- they have a <u>general</u> formula

(ii) C_5H_{12} [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_2H_4 [1]

H_2 [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 A*l* 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]

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