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.

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1 **(a)** **(i)** A

(ii) B

(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]

(b) (i) bonding electron pairs on both overlap areas between hydrogen and oxygen atoms
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]

decreases / gets slower

(d) 2nd and 3rd boxes down ticked (decomposition and endothermic) [1]

(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]

(c) (i) A

(ii) C

(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]

7 **(a)** Any **four** from:

- 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]