CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2013 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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CAMBRIDGE
International Examinations

1 **(a)** **(i)** D / chlorine / Cl_2 [1]

E / carbon / graphite [1]
IGNORE: C
REJECT: diamond

(ii) E / carbon / graphite [1]
IGNORE: C
REJECT: diamond

(iii) C / ammonia / NH_3 [1]

(iv) A / ethanol [1]
IGNORE: alcohol

(v) E / graphite / carbon [1]
IGNORE: C
REJECT: diamond

(b) atom; combined; molecules; ionic (1 mark each) [4]

[Total: 10]

2 **(a)** increases [1]

(b) 5.2–6.6 (actual = 5.96) [1]

(c) (substance which) speeds up chemical reaction / increases reaction rate / lowers activation energy [1]

(d) Any three of: [3]

- high boiling point / high melting points
- high density / they are very dense **IGNORE:** they are dense
- form coloured <u>compounds</u> **REJECT:** they are coloured
- have different oxidation states / form ions with different charges
- form complex ions
- **ALLOW:** they are hard<u>(er)/</u> strong

(e) 3 (Fe) [1]

4 (H_2O) [1]

(f) iron sulfate [1]
IGNORE: incorrect oxidation number of iron
IGNORE: formula

hydrogen [1]
IGNORE: formula

[Total: 10]

3 **(a)** A = (volumetric) pipette [1]
B = burette [1]
C = (conical) flask
ALLOW: Erlenmeyer (flask) [1]
D = (filter) funnel [1]

(b) **(i)** 13.2 [1]

(ii) 10 (cm^3) [1]

(iii) (pH) 7 [1]

(c) **(i)** 2nd and 3rd boxes ticked (calcium carbonate and calcium oxide) [2]
(one mark each)
APPLY: listing

(ii) so that crops grow well / so crops grow better / allows maximum growth/ plants don't grow as well in too acidic conditions/plants killed/plants die [1]
IGNORE: plants can grow

[Total: 10]

4 **(a)** **(i)** correct structure of methane showing all atoms and bonds [1]

(ii) name of any alkane other than methane [1]
IGNORE: formulae

(iii) Any one of: [1]

(waste product from digestion in) cows / other suitable animals/
marshes / paddy fields / bacterial decay / decomposition of vegetation
IGNORE: industrial sources / leaking from the Earth

(iv) CO_2 on right [1]

2 on left [1]
NOTE: second mark dependent on the first being correct

(b) (i) (differences in) boiling point(s) [1]

(ii) 1 mark each [4]

diesel → fuel for cars / lorries
fuel oil → fuel for ships
kerosene → fuel for jet aircraft
naphtha → making chemicals

[Total: 10]

5 (a) oxygen + 20/21 (%) [1]

nitrogen + 78/79 (%) [1]

sulfur dioxide + correct source e.g. burning <u>fossil fuels</u> or named fossil fuel [1]

carbon monoxide + correct source e.g. car exhausts / car engines / incomplete combustion (of fossil fuels) [1]

oxides of nitrogen + correct source e.g. car exhausts / car engines / lightning [1]

(b) (i) PbS [1]

(ii) oxygen removed (from lead oxide) / carbon takes away the oxygen [1]
IGNORE: reference to electrons

(c) (i) arrangement: irregular / (fairly) random / not ordered [1]

closeness: (very) close / touching / near [1]

(ii) $C_2H_4Cl_2$ (**ALLOW:** any order) [1]

(iii) 99 [2]
(If 2 marks not scored **ALLOW** correct atomic masses seen C = 12, H = 1, C*l* = 35.5 anywhere in the question for 1 mark)

[Total: 12]

6 **(a)** zinc → magnesium → calcium → rubidium [2]

1 mark for 1 pair reversed
ALLOW: all reversed for 1 mark

(b) zinc/ iron [1]
REJECT: if K / Na / Al included = 0 marks

(c) **(i)** 2 electrons in outer shell [1]

8 electrons in middle shell [1]
ALLOW: 2,8,2 in numbers for 2 marks

(ii) 14 [1]

[Total: 6]

7 **(a)** <u>ions</u> can <u>move</u> / <u>ions</u> are <u>mobile</u> [1]
IGNORE: it has an ionic structure
REJECT: if mention of atoms/ molecules

(b) it is a molecular structure / it has <u>no ions</u> [1]
IGNORE: electrons can't move

(c) add water and shake / stir / mix [1]

filter [1]

(d) **(i)** C [1]

(ii) graphite [1]

(iii) negative electrode: zinc / Zn [1]

positive electrode: chlorine / Cl_2 [1]
IGNORE: Cl
REJECT: Chloride / Cl^-

(iv) acidify / add nitric acid [1]
REJECT: add sulfuric acid / add hydrochloric acid

add (aqueous) silver nitrate [1]

<u>white precipitate</u> [1]

3rd marking point dependent on correct reagent (silver nitrate)

[Total: 11]

8 (a) Any four of: [4]

- sugar dissolves
- sugar particles become separated or water molecules get in between sugar particles
- diffusion
- movement of <u>particles</u> (in solution)
- random (movement)
- (sugar) particles constantly collide with (water) molecules
- particles (in solution) spread out / seperate
- **ALLOW:** particles move from concentrated to dilute (sugar) solution

(b) (i) 3 [1]

(ii) 12 [1]

(iii) any OH group ringed / all OH groups ringed [1]

(iv) carbon dioxide [1]
IGNORE: CO_2

(v) yeast [1]

no <u>air</u> / <u>oxygen</u> present [1]
IGNORE: reference to temperatures between 5–45 ^{o}C

(vi) solvent / fuel / making a named chemical e.g. making ethanoic acid and esters / antiseptic / medical wipes / cleaning fluid / vodka sauce / paints/ disinfectant / preservatives [1]
IGNORE: unqualified uses e.g. in cars / food / cooking

[Total: 11]