UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2011 question paper for the guidance of teachers

5124 SCIENCE (PHYSICS AND CHEMISTRY)

5124/03 Paper 3 (Theory – Chemistry), maximum raw mark 65

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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International Examinations

Section A

1 aluminium – aircraft parts because of strength and low density, and food containers because of its resistance to corrosion (2x1)

calcium carbonate – manufacture iron as it produces carbon dioxide or calcium oxide, manufacture of glass, to provide calcium oxide which lowers the solubility of glasses, manufacture of cement, to produce calcium oxide (2x1)

diamond – cutting glass, as it is harder than glass, accept in jewellery because of its glitter/value/appearance (2x1)

helium – filling lighter than air balloons, because inert/lighter than air (2x1) [8]

(accept all valid alternatives)

[Total: 8]

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

(b) brass [1]

(c) ammonia [1]

(d) silver chloride [1]

(e) sodium ion [1]

[Total: 5]

3 **(a)** filter paper [1]

(b) measuring cylinder [1]

(c) (Liebig) condenser [1]

(d) burette [1]

[Total: 4]

4 **(a)** **A**, **C**, **B**, **D** [2]

(b) any three of (metals from syllabus)
A – potassium or sodium
B – iron
C – calcium
D – copper [3]

(accept valid alternatives that are not in the syllabus)

[Total: 5]

5 alcohol (1)
correct structural formula for ethanol (accept OH but not CH) (1)
ethanoic acid (1)
–COOH (1) [4]

[Total: 4]

6 **(a)** **(i)** acid – correct name and formula (1)

(ii) alkali – correct name and formula (1) [2]

(b) correct resulting salt (1) water (1) [2]

(c) acids produce excess (1) hydrogen ions (1) alkalis produce hydroxide ions(1) [3]

(accept symbols)

[Total: 7]

7 **(a)** 17 protons (1) 18 neutrons (1) [2]

(b) **1.** can gain (1) one (1) electron from a suitable atom [2]

2. can share (1) one (1) electron with a suitable atom [2]

[Total: 6]

8 **(a)** **(i)** (5 x 207) + (51 + 4.16)3 + 35.5 = 1415.5 (1)

(ii) (3 x 51 / 1415.5)100 (1) = 10.8% (1)

(10.8 earns two marks) [3]

(b) **(i)** balanced equation $\underline{3}\,Mg + \underline{2}\,VCl_3 \rightarrow \underline{2}\,V + \underline{3}\,MgCl_2$ (1)

(ii) 2 x 51 units of vanadium needs 3 x 24 units of magnesium
5 kg of vanadium needs [5 x (3 x 24)] / (2 x 51) (1)
= 3.5 kg of magnesium (1)

(3.5kg earns two marks) [3]

[Total: 6]

Section B

9 (a) (i) **E** – copper(II) nitrate
F – ammonia
G – ammonium hydroxide
H – copper(II) hydroxide (4×1)

(penalise once for missing 'II')

(ii) suitable equation – all correct formulae (1) balanced (1) [6]

(b) formation pure crystals (any four points)
boil to concentrate
leave to crystallise/cool
separate/filter
wash with distilled water
dry with filter/blotting paper (4×1) [4]

[Total: 10]

10 (a) alkane cracked (1) by passing over a heated (1) (or 'at 600°C ± 50 °C') catalyst (1) of aluminium oxide or silicon(IV) oxide or porous pot or zeolite (1) [4]

(b) pass into aqueous bromine (1), alkanes – no change (1), alkenes – colour disappears (1) [3]

(c) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ (1)
one volume of methane needs two volumes of oxygen (1)
10 dm^3 of methane needs 20 dm^3 of oxygen (1) [3]

[Total: 10]

11 (a) two elements – 3 is lithium (1), 11 is sodium (1), Group I (1) [3]

(b) lithium is 2.1 (1), sodium is 2.8.1 (1), both have one electron in the outermost shell and so in Group I (1) [3]

(c) any two similar properties, chemical or physical, any physical property of metals (including 'soft'), any chemical property of Group I metals (2)
any two trends of physical (melting point, boiling point) and of chemical properties (including with water and chlorine) (2) [4]

[Total: 10]