UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2010 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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1 metal – suitable name, symbol, physical property (3 × 1)
non-metal – suitable name, symbol, physical property (3 × 1)

accept all valid alternatives [6]

2 **A** – element (1)
B – compound (1)
C – mixture (1)
D – mixture (1)
E – compound (1) [5]

3 hydrochloric acid acid – red (1)
product – carbon dioxide or ammonium chloride or water (1)
sodium hydroxide – blue or violet (1)
product – ammonia or sodium carbonate or water (1) [4]

4 **(a)** chromatography apparatus
paper just dipping into solvent (1)
spots of ink just above surface of solvent (1) [2]

(b) **(i)** **J**, **(ii)** **G** & **I**, **(iii)** **H**. (3 × 1) [3]

accept words to this effect

(c) dyes insoluble or likely that the inks / dyes would not separate / dissolve / move. (1) [1]

[Total: 21]

5 **(a)** **(i)** 2.7 (1)

(ii) gains an electron (1)

(iii) single negative charge (1) [3]

(b) **(i)** **O** (1)

(ii) **K** (1)

(iii) **M** & **N** (1) [3]

[Total: 6]

6 **(a)** **(i)** poly(ethene)/polythene (1)

(ii) oxidation (1)

(iii) ethyl ethanoate (1) [3]

(b) discrete / <u>small</u> molecules (1) with little attraction for one another (1) [2]

[Total: 5]

7 **(a)** prevent loss of liquid out (1) through neck [1]

accept 'prevents dust entering' or words to this effect

(b) **(i)** gas / carbon dioxide is lost (1)

(ii) rate / speed decreases (1) reaction stops (1)

(iii) 3 grams (1) +/- 0.2 grams

(iv) 3/8 or 0.38 (1) [5]

[Total: 6]

8 **(a)** **(i)** Group 1 (1)

(ii) Aa (1)

(iii) Aa_2O (1) [3]

carry forward errors throughout

(b) **(i)** sodium (1)

(ii) to produce hydrogen (1) or a rate term other than 'slow'

(iii) appropriate equation – correct formulae (1), balanced (1)
$2Bb + 2H_2O \rightarrow 2BbOH + H_2$

carry forward errors throughout [4]

[Total: 7]

Section B

9 (a) limestone or calcium carbonate(1) heated (1) in a kiln
$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$
equation (1) state symbols (1)
use to neutralise acids (1)
(in fields or for acid waste from industry) [5]

accept all valid alternatives including 'to make slaked lime'

(b) **P** – lime water (calcium hydroxide solution) (1)
Q – calcium carbonate (1)
R – calcium chloride solution (1)
S – silver chloride (1)
T – hydrochloric acid (1) [5]

[Total: 10]

10 (a) sulfur dioxide – formation
combustion / burning (1) of sulfur with oxygen (1)
harmful –
to either damages buildings (or forms acid rain) or toxic to humans/fish (1)

carbon monoxide – formation
incomplete combustion (1) of coal/carbon in oxygen / air (1)
harmful –
to humans as it is toxic / poisonous (1) [6]

(b) 2 grams of sulfur in 100 grams of coal (1)
$S + O_2 \rightarrow SO_2$
32 grams of sulfur give 64 grams of sulfur dioxide
2 grams of sulfur give 4 grams of sulfur dioxide (1)

64 grams of sulfur dioxide have a volume of 24 dm^3 at rtp (1)
4 grams of sulfur dioxide have a volume of $(4 \times 24) / 64$ dm^3 at rtp
= 1.5 dm^3 (1) [4]

[Total: 10]

11 (a) any three from:
represented by a general formula;
differs from the next in the series by CH_2;
have similar chemical properties;
a gradation in physical properties (as move through the series) (3 × 1) [3]

accept 'same' chemical properties
accept melting point, boiling point, viscosity, (relative molecular mass).
carry forward errors throughout

(b) (i) ethane – relative molecular mass = 24 + 6 = 30 (1)

(ii) ethane structure – showing all C–H bonds (1)
% hydrogen = (6/30) × 100 = 20 % (1)

(iii) both carbon dioxide and water (1)
$2C_2H_6(g) + 7O_2(g) \rightarrow 4CO_2(g) + 6H_2O(l)$
formulae (1) balanced (1) state symbols (1) [7]

[Total: 10]