CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge Ordinary Level

MARK SCHEME for the May/June 2015 series

5070 CHEMISTRY

5070/42 Paper 4 (Alternative to Practical), maximum raw mark 60

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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1 (a) (i) silver / silvery / grey (1) [1]

(ii) $2Mg + O_2 \rightarrow 2MgO$ (1) [1]

(b) hydrogen / H_2 (1)
pops in flame / burning splint pops / lighted splint pops (1) [2]

(c) (i) MgO / magnesium oxide / solid / it disappears / dissolves
or a colourless solution / colourless liquid (is formed) (1) [1]

(ii) $MgO + H_2SO_4 \rightarrow MgSO_4 + H_2O$ (1) [1]

[Total: 6]

2 (a) (i)

32	38	44	all correct (1)
(20)	(20)	(20)	
12	18	24	all correct (1)

[2]

(ii) exothermic (1) [1]

(b) (i) (60 / 12 = 5 13.3 / 1 = 13.3 26.7 / 16 = 1.67)
3 : 8 : 1
Empirical Formula = C_3H_8O (1) **Reject** C_3H_7OH

Molecular formula = C_3H_8O (1) [2]

(ii) **X** = C_2H_5OH or CH_3OH (1) **Z** = C_4H_9OH or $C_5H_{11}OH$ (1)

Reasons: e.g. the more carbon atoms in the molecule /
the more carbon-carbon bonds / bigger M_r (reject A_r) / larger molecules
the more the temperature (rise) / more heat given out or reverse argument / more exothermic (1) [3]

(c) (i) propanoic (acid) /propionic (acid)
C_2H_5COOH / CH_3CH_2COOH / $C_2H_5CO_2H$ / $CH_3CH_2CO_2H$
(both name and structure required) (1) [1]

(ii) (acidified) potassium manganate(VII) or $KMnO_4$ or potassium permanganate (1)
purple / pink to colourless / decolourised (1)
OR
(acidified) potassium dichromate or $K_2Cr_2O_7$ (1)
orange to green (1)
(in both cases, award of second mark is conditional on first mark being obtained)
[2]

(d) propyl propanoate (1)

$C_2H_5COOC_3H_7$/ $C_2H_5COOC_2H_5$ CH_3/ $C_2H_5COOCH_2CH_2CH_3$
$CH_3CH_2COOC_3H_7$/$CH_3CH_2COOC_3H_7$/
C_2H_5COO $C_2H_5CH_3$ (1) [2]

[Total: 13]

3 **(d)** (1) **[Total: 1]**

4 **(d)** (1) **[Total: 1]**

5 **(c)** (1) **[Total: 1]**

6 **(b)** (1) **[Total: 1]**

7 **(b)** (1) **[Total: 1]**

8 **(a)** 16.11 g (1) [1]

(b) filtration / decant(ation) / centrifugation (1) [1]

(c) colourless / green to purple / pink (1) [1]

(d)

32.3	39.4	47(.0)	1 mark for each correct row or column
6.9	13.6	21.8	to the benefit of the candidate (3)
25.4	25.8	25.2	

Mean value = 25.3 (1) cm^3 [4]

(e) 0.000506 (1) **OR** ecf titre × 0.0200 / 1000 [1]

(f) 0.00253 (1) **OR** ecf **(e)** × 5 [1]

(g) **(i)** 0.0253 (1) **OR** ecf **(f)** × 10 [1]

(ii) 1.42 (1) g **OR** ecf **(g)(i)** × 56 [1]

(h) 8.79 (1) **OR** ecf **(g)(ii)** / **(a)** × 100 [1]

(i) **(i)** $(NH_4)_2SO_4$: 28 / 132 × 100 (1) = 21.2% (1) [2]

(ii) ammonium nitrate / urea / ammonia / ammonium phosphate / potassium nitrate etc. (1) [1]

[Total: 15]

9 **(a)** transition metal / element (ion or compound) absent (1) [1]

(b) **(i)** white ppt (1)

(ii) soluble (in excess) / dissolves / (colourless)solution (1) [2]

(c) **(i)** white ppt **AND (ii)** soluble (in excess) / dissolves / (colourless) solution (1) [1]

(d) M1 (aq) NaOH / sodium hydroxide / (1)
M2 A*l* / aluminium (foil) / Devarda's alloy (1)
M3 warm / heat / boil (1) may appear in observations
M4 ammonia / NH_3 **OR** **gas** turns litmus blue (1)

ALLOW
Brown ring test: conc. (1) sulfuric acid / H_2SO_4 (1) iron(II) sulfate / $FeSO_4$ (1) brown ring (1) [4]

[Total: 8]

10 **(a)** 0.63, 0.73, 0.81, 0.81 (1)
0.76, 0.81, 0.81, 0.81 (1) [2]

(b) $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$ (1) [1]

(c) carbon dioxide / gas (evolved which)
escapes (from the apparatus) / leaves (the apparatus) / is lost (from the apparatus) /
removed (from the apparatus) / is released into the air / is liberated to the outside (1) [1]

(d) all points plotted correctly (1)

two smooth curves through the points (within one small square)
one mark for each curve (2) [3]

(e) **(i)** 0.56 (1) g [1]

(ii) 87.50 – 0.60 (value from candidates graph to ± half a small square) = 86.9(0) (1) g [1]

(f) increase rate / increase speed / faster (1)
increased surface area / increased area of contact / more contact
between marble and acid (1) [2]

(g) Answers must be consequential on equation in **(b)** (unless equation is given as part of answer)

For a 1:2 mole ratio
0.036 / 2 = 0.018 mol $CaCO_3$
0.018 × 100 = 1.8 (g) (1)
10 – 1.8 = 8.2 (g) $CaCO_3$ (1)

E.c.f for a 1:1 mole ratio
0.036 × 100 = 3.6 (g) (1)
10 – 3.6 = 6.4 (g) (1) [2]

[Total: 13]