UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE O Level

MARK SCHEME for the June 2004 question papers

5070 CHEMISTRY

5070/01	**Paper 1 (Multiple Choice), maximum raw mark 40**
5070/02	**Paper 2 (Theory 1), maximum raw mark 75**
5070/03	**Paper 3 (Practical 1), maximum raw mark 40**
5070/04	**Paper 4 (Theory 2 (A2 Core)), maximum raw mark 60**

These mark schemes are published as an aid to teachers and students, to indicate the requirements of the examination. They show the basis on which Examiners were initially instructed to award marks. They do not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

- CIE will not enter into discussion or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the June 2004 question papers for most IGCSE and GCE Advanced Level syllabuses.

UNIVERSITY of CAMBRIDGE
International Examinations

June 2004

GCE O LEVEL

MARK SCHEME

MAXIMUM MARK: 40

SYLLABUS/COMPONENT: 5070/01

CHEMISTRY
Paper 1 (Multiple Choice)

UNIVERSITY of CAMBRIDGE
International Examinations

Question Number	*Key*	*Question Number*	*Key*
1	**B**	21	**A**
2	**B**	22	**B**
3	**B**	23	**D**
4	**B**	24	**D**
5	**D**	25	**C**
6	**B**	26	**B**
7	**D**	27	**D**
8	**B**	28	**B**
9	**A**	29	**D**
10	**C**	30	**B**
11	**B**	31	**A**
12	**D**	32	**A**
13	**C**	33	**B**
14	**B**	34	**C**
15	**C**	35	**C**
16	**D**	36	**C**
17	**D**	37	**D**
18	**B**	38	**C**
19	**A**	39	**C**
20	**C**	40	**A**

Total = 40

June 2004

GCE O LEVEL

MARK SCHEME

MAXIMUM MARK: 75

SYLLABUS/COMPONENT: 5070/02

CHEMISTRY
Paper 2 (Theory 1)

UNIVERSITY of CAMBRIDGE
International Examinations

KEY

a semi colon ;	indicates a separation of marking points
an oblique line /	indicates alternative wording or acceptable alternative
R	means reject
A	means accept
AW	means 'alternative wording'
underlined with a straight line	accept this word only, no alternative word is acceptable
D	represents quality mark(s) awarded for diagrams, as indicated on the Mark Scheme
L	represents mark(s) awarded for labels on diagrams, as indicated on the Mark Scheme
Q	represents quality of expression and is used for marks awarded on free-response questions

Section A Maximum 45 marks

A.1 four names at {1} each penalise correct formulae once only

(a) methane

(b) potassium nitrate

(c) potassium nitrate *or* lead(II) nitrate allow just lead nitrate

(d) phosphorus oxide *or* sulphur dioxide

---

total [4]

A.2

(a) first line K 39 p =19, e = 19, n = 20 {1}
second line K 40 p =19, e = 19, n = 21 {1}
{2}

……..

(b) any **two** from:

floats melts silvery ball runs around lilac flame
{2}

……

(c)

(i) 0.195/39 = 0.005 mol K hence
mol OH^- = 0.005 {1}

(ii) mol H^+ = 0.010 {1}

(iii) ionic equation {1}

$$H^+ + OH^- \rightarrow H_2O$$

ignore any state symbols

(iv) pH is 1 to 4 {1}
because an excess of HCl present {1}
or an extra 0.005 mol acid present
{4} on Q. paper, but {5}

……

(d) potassium ion has 2. 8. 8 and +1 charge {1}
oxide ion has 2. 8 and – 2 charge {1}
{2}

---

total [12]

A.3

(a) marks only for the reasons for the choice of poly(propene)
if any other polymer chosen, {0} for the section

useable temp. is above 100 °C {1}
insoluble in oil {1}

{2}

……

(b) polythene used for cling film plastic bags etc. {1}

{1}

……

(c) any **two** problems from

non-biodegradable litter filling landfill sites
burning gives toxic gases

{2}

……

(d) structure of poly(propene)

correct repeat unit {1}
shows continuation {1}

{2}

……

(e)
(i) ester linkage {1}

(ii) fats lipids {1}

{2}

……..

(f) nylon structure {1}

allow protein or nylon 6

{1}

---

total [10]

A.4

(a)

(i) equation {1}

$N_2 + O_2 \rightarrow 2\,NO$

(ii) more collisions per unit volume {1}
or more crowded molecules

(ii) faster molecules {1}
hence more frequent collisions {1}

{4}

……

(b) incomplete combustion {1}

{1}

……

(c)

(i) equation {1}

$2\,NO + 2\,CO \quad 2\,CO_2 + N_2$

ignore state symbols

(ii) powder has a large surface area {1}
hence faster reaction {1}

{3}

……

total [8]

A.5

(a)

(i) copper is below hydrogen in the activity series
or Cu^{2+} gains electrons
or Cu^{2+} is reduced more easily than H^+ {1}

(ii) oxidation is electron loss
or oxidation state of oxygen increases (1}

(iii) equation {1}

$Cu \rightarrow Cu^{2+} + 2\ e^-$

{3}

……..

(b)

(i) in solid ions cannot move {1}
in melt ions can move {1}

(ii) cathode $Pb^{2+} + 2\ e^- \rightarrow 2\ Pb$ {1}
anode $2\ Br^- \rightarrow Br_2$ {1}

allow {1} if equations reversed

{4}

---

total [7]

A.6

(a) covalent {1}

……

(b)

(i) both are giant structures *or* macromolecules {1}
many strong bonds to break {1}

(ii) graphite has fewer strong bonds to break {1}

{3}

……..

(c) graphite conducts, diamond does not {1}
delocalised electrons in graphite {1}

{2}

……..

---

total [6]

Section A. score any 45 from 46

Section B

B.7

(a) bond formation is exothermic {1}
bond breaking is endothermic {1}
more energy released than absorbed {1}
{3}

……

(b) diagram shows:

labelled reactant above labelled product. {1}
activation energy correctly labelled {1}
enthalpy change correctly labelled {1}
{3}

……..

(c) note that units are not required
in (ii) & (iii) some working required to score both

(i) finish at 35 ± 1 {1}

(ii) mols of O_2 is 60/24000 {1}
= 0.00250 {1}

(iii) mols of H_2O_2 = 2x0.0025 = 0.0050 {1}
conc. of H_2O_2 = 20x0.0050 = 0.10 {1}
{5}

---

score any [10] from [11]

B.8

(a)

(i) equation {1}

$2\ NiS\ +\ 3\ O_2\ \rightarrow\ 2\ NiO\ +\ 2\ SO_2$

(ii) (59 + 32) kg NiS forms (32 + 32) kg SO_2 {1}
182 kg NiS forms 182x64/91 = 128 kg SO_2 {1}

{3}

……..

(b) it is covalent {1}
because low b.p. {1}
shows small forces present {1}

{3}

……..

(c) compound and problem both needed {1}
e.g.
SO_2 causes acid rain *or* an effect of acid rain
CO_2 causes greenhouse effect *or* an effect of warming
CO is toxic

{1}

……

(d) used in hydrogenation of alkenes {1}

{1}

……

(e) $Ni + Zn(NO_3)_2$ no reaction {1}
$Ni + Cu(NO_3)_2$ soln changes blue to green
and/or pink solid {1}

an equation {1}

$Zn\ +\ Ni^{2+}\ \rightarrow\ Zn^{2+}\ +\ Ni$
$Zn\ +\ Cu^{2+}\ \rightarrow\ Zn^{2+}\ +\ Cu$
$Ni\ +\ Cu^{2+}\ \rightarrow\ Ni^{2+}\ +\ Cu$

{3}

---

score any [10] from [12]

B.9

(a) equation {1}

$C_{12}H_{26} \rightarrow C_2H_4 + C_{10}H_{22}$ et.al.

{1}

……

(b) ethene diagram {1}

{1}

……

(c) mols C = 0.72/12 = 0.06
mols H = 0.18/1 = 0.18
mols O = 0.96/16 = 0.06
all three needed for {1}

formula is $C_6H_{18}O_6$ {1}
hence empirical is CH_3O {1}

{3}

……

(d) react with steam {1}

using phosphoric acid {1}
and one of 300 ° to 600 °C; 60 to 80 atmos. {1}

just heat, pressure, catalyst scores {1} only

{3}

……

(e)
(i) colour changes from orange to blue/green {1}
structure of ethanoic acid {1}

allow full structure
or condensed versions e.g. CH_3CO_2H; CH_3COOH

(ii) product structure {1}

$(CO_2H)_2$ *or* $(CHO)_2$
or $HOCH_2.CO_2H$

{3}

---

score any [10] from [11]

B.10

(a) no mark for Fe_3O_4 alone

% Fe's are Fe_2O_3 122/160 = 70.0 {1}
Fe_3O_4 168/232 = 74.4 {1}
$FeCO_3$ 56/126 = 48.2 {1}

{3}

……

(b) four equations plus four statements at {1} each
allow statements using oxidation states

$C + O_2 \rightarrow CO_2$
C oxidised and O_2 reduced

$C + CO_2 \rightarrow 2\ CO$
C oxidised and CO_2 reduced

$Fe_2O_3 + 3\ CO \rightarrow 2\ Fe + 3\ CO_2$
Fe_2O_3 reduced and CO oxidised

$Fe_2O_3 + 3\ C \rightarrow 2\ Fe + 3\ CO$
Fe_2O_3 reduced and C oxidised

{4}

……

(c) metals have +ve ions in sea of electrons {1}
ions can slide around {1}

{2}

……

(d) low carbon gives softer/more malleable steel {1}
carbon disrupts the packing {1}

{2}

---

score any [10] from [11]

June 2004

GCE O LEVEL

MARK SCHEME

MAXIMUM MARK: 40

SYLLABUS/COMPONENT: 5070/03

CHEMISTRY
Paper 3 (Practical 1)

1 Maximum 20 marks

(a) 3 marks for each reading within 1°C of the Supervisor's value. (12)
1 mark for each reading within 2°C of the Supervisor's value.

Any subtraction error (-1), but give the 'accuracy' mark on the corrected value.

(b) 1 mark for plotting all the points correctly, tolerance one small square. (4)

Give one mark for two straight lines that intersect, provided that the first two points are used for one of the lines and the second two points for the second line.

Give 1 mark for each straight line which has been extrapolated so that it passes through the 'origin'.

Curves score zero

(c) Highest temperature from the graph. This must be from the point of intersection of the two straight lines. (1)

(d) Corresponding values for the volume of P and Q (both correct). (1)

Candidates who fail to score in (c) can score in (d), provided the values correspond to the temperature given in (c).

(e) Concentration of sodium hydroxide in Q. (2)
Method (1) answer (1)

Candidates who give the incorrect volumes in (d) can score consequentially.

There are no marks for the correct evaluation of an incorrect expression, answers are required correct to two significant figures.

Candidates with the correct answer but no working score (1).

Solution S (copper sulphate + ammonia)

Test 1 Blue ppt (1)
Ppt turns brown or black (1)
Gas turns litmus blue (1)
Ammonia produced (1)

allow solid, suspension, powder but not substance, particles, deposit, residue, sediment, gelatinous, insoluble for precipitate

Test 2 blue ppt [ppt (1) colour (1)] (2)

soluble in excess acid (1)
blue solution (1)

allow colourless or pale green or blue

Test 3 White ppt [ppt (1) colour (1)] (2)

Insoluble in acid (1)
Dark blue solution becomes paler or colourless (1)

Blue ppt turns to a white ppt scores (2)

Test 4 Pale blue ppt allow any colour of ppt or even turns cloudy etc (1)

Soluble in excess (1)
Colourless or pale blue solution (1)

Test 5 No reaction

White ppt (2)
Brown or yellow solution (2)

Give one mark each for ppt and brown/yellow and an additional mark for linking white to the ppt and brown/yellow to the solution

Solution becomes colourless or white ppt (1)

Conclusion

The ions are SO_4^{2-}
requires a ppt in Test 3 which does not dissolve when acid is added
NH_4^+
requires ammonia named or tested for in Test 1
Cu^{2+} Any two ions to score, (-1 for names)

All points to score up to a paper mark of 40.

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June 2004

GCE A LEVEL

MARK SCHEME

MAXIMUM MARK: 60

SYLLABUS/COMPONENT: 5070/04

CHEMISTRY
Paper 4 (Theory 2 (A2 Core))

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1 (a) Pippette (1)
(b) Saftey bulb (1)
(c) To prevent liquid entering the mouth (1) [3]

2 (a) It is flammable or very reactive with oxygen or water in the air (1)
(b) Hydrogen (1) pops in a flame (1)
(c) Sodium moves around the surface, inflames, dissolves, reacts violently.
[Any two (2)]
(d) Sodium hydroxide (1)
(e) Blue (1)
(f) $2Na + 2H_20 \longrightarrow 2NaOH + H_2$ [balanced (1)]
(or balanced reaction based on half quantities) [8]

3 (a) Syringe (1)
(b) Turns lime water milky (1)
(c) (i) 0.005 **(ii)** 0.01 (1) **(iii)** No (1)
reaction shows that one mole of calcium carbonate requires two moles of hydrochloric acid (1).
(d) 0.005 x 24 = 0.12dm^3 (1)
(e) 0.12dm^3 (1) Magnesium carbonate (0.0059 moles) will be in excess thus volume of CO_2 will be based on HC*l* as before (1). [9]

4 to 8 (b), (a), (c), (b), (d) 1 mark each [4]

9 (a) 6.96 g (1)
(b) colourless or green to pink or purple (1)
(c)

25.9	48.6	32.4
0.0	23.3	6.9
25.9	25.3	25.5

1 mark for each correct row or column (3)

Mean value = 25.4 cm^3 (1)

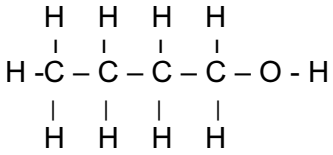
(d) 0.000508 (1) **(e)** 0.00254 (1)
(f) 0.0254 (1) **(g)** 3.86 g (1)
(h) 3.10 g (1) **(i)** 0.172 g (1)

[13]

10 **1** coloured solution (1)
2 blue precipitate (1) insoluble in excess (1)
3 blue precipitate (1) soluble in excess (1) forming a DEEP blue solution (1)
4 dilute nitric acid (1) aqueous silver nitrate (1) white precipitate (1)

Formula $CuCl_2$ (1)

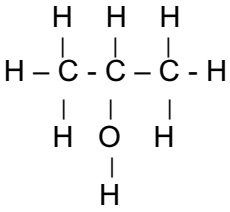
11 (a) (i) 0.46 g (1) **(ii)** 36.3 and 25.8 (1) rise in T = 10.5 (1)
(b) (i)



(1)

(ii) 74 (1)
(iii) 0.0062 moles (1)
(iv) 1693 kJ/mol (1)

(c) points correctly plotted (1), smooth curve (1).
(d) (i) 0.062 g (1) (please read candidate's graph)
(ii)



(1)

(e) To eliminate error due to heat losses,
to standardize the experiment or act as a control etc (1)

[12]