

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

November 2003

GCE A AND AS LEVEL

MARK SCHEME

MAXIMUM MARK: 30

SYLLABUS/COMPONENT: 9701/05

**CHEMISTRY
Practical 2**



Page 1	Mark Scheme	Syllabus	Paper
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N.B. Boxed references within this marking scheme relate to the accompanying booklet of Standing Instructions

Question 1

Experiment 1

Tables 1.1 and 1.2

Give **one mark** if all weighings are to at least two decimal places, temperatures to at least one decimal place and the subtraction is correct in each table. (1)

Table 1.2 – Accuracy

Calculate $\frac{\text{temperature rise}}{\text{mass of FB2}}$ for the Supervisors values – work to 2 d.p. Record this one the front of the Supervisor's script and as a ringed total below Table 1.2 on each Candidate's script.

Calculate the same ratio for each candidate and calculate the difference to the Supervisor value. Award accuracy marks for differences as follows:

Mark	Difference / °C
4	0.00 to 0.15
3	0.15+ to 0.20
2	0.20+ to 0.30
1	0.30+ to 0.45
0	Greater than 0.45

(4)

- (a) Give **one mark** for **50 x 4.3 x Δt** and **appropriate unit (J/kJ)**
No mass of sodium carbonate to be included. Ignore sign in (a) (1)
- (b) Give **one mark** for a calculation showing moles of HCl and moles of sodium carbonate (correct use of 106) and
 Reference to 2:1 ratio from the equation (1)
- (c) Give **one mark** for $\frac{\text{answer to (a)}}{\text{correctly calculated moles of Na}_2\text{CO}_3}$ or

$\frac{\text{answer to (a)}}{0.5 \times \text{moles of HCl}}$ if Na₂CO₃ stated to be in excess

and **one mark** for

an answer correct to 3 significant figures using the numerical values in the expression in (c) (or correct value from (a) and (b) if no working given in (c))
(Do not penalise use of moles of Na₂CO₃ carried in calculator memory from (b))

and sign consistent with experimental results (+ sign required for endothermic reactions)

and unit (J mol⁻¹ or kJ mol⁻¹)

The second mark can be given providing the answer to (a) has been divided by a value for moles of Na₂CO₃ or moles of HCl calculated by the candidate. (2)

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Experiment 2

Table 1.3 and 1.4

Give **one mark** if all weighings are to at least two decimal places, temperatures to at least one decimal place and the subtraction is correct in each table. (1)

Table 1.4 – Accuracy

Calculate $\frac{\text{temperature rise}}{\text{mass of FB3}}$ for the Supervisor's values – work to 2 d.p. Record this on the front of the Supervisor's script and as a ringed total below Table 1.4 on each Candidate's script.

Calculate the same ratio for each candidate and calculate the difference to the Supervisor's value. Award accuracy marks for differences as follows:

Mark	Difference / °C
4	0.00 to 0.11
3	0.10+ to 0.20
2	0.20+ to 0.30
1	0.30+ to 0.50
0	Greater than 0.50

(4)

(d) Give **one mark** for $50 \times 4.3 \times \Delta t$ and

appropriate unit (J/kJ)

unless already penalised in (a)

Ignore sign in (d) (1)

(e) Give **one mark** for $\frac{\text{mass of NaHCO}_3}{84}$

Do not penalise a repeat error

in calculating M_r

e.g. repeated use of an incorrect A_r (1)

(f) Give **one mark** for $\frac{\text{answer to (d)}}{\text{answer to (e)}}$

and **one mark** for

an answer correct to 3 significant figures using the numerical values in the expression in (f)

(Do not penalise use of moles of NaHCO_3 carried in calculator memory from (e))

and sign consistent with experimental results (+ sign required for endothermic reactions) **and** unit (J mol^{-1} or kJ^{-1})

Do not penalise if missing mol^{-1} is only error and already penalised in (c)

The second mark can be given providing the answer to (d) has been divided by a value for moles of Na_2CO_3 or moles of HCl . (2)

(g) Give **one mark** for use of ΔH_1 and $2 \Delta H_2$.

Give **one mark** for $\Delta H_1 - 2 \Delta H_2$ in the final part of the calculation

Watch out for sign errors if the candidate has not stated $\Delta H_1 - 2 \Delta H_2$ (2)

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ASSESSMENT OF PLANNING SKILLS

Look for the following points in any part of the plan or carrying out of the plan and award **one mark** for each point

- (i) Weighs a sample, adds to known volume of water and measures change in temperature.
- (ii) Calculates energy change for volume of solution used *Numerical answers are required in parts (ii) to (iv).*
- (iii) Converts mass NaHCO_3 into moles.
- (iv) Calculates ΔH_4 including sign (*unless already penalised*).
- (v) Adds 2 ΔH_4 to the answer to (g).
Ignore any reference to ΔH_5 and ΔH_6 etc. by the candidate

Total for Question 1: 25

Question 2

ASSESSMENT OF PLANNING SKILLS

GRID 1A

Adds $\text{HCl}/\text{H}_2\text{SO}_4$ or any soluble chloride or soluble sulphate (or KI) to all three solutions	✓	No precipitate formed with FB 5 and with FB 6 (No change or no reaction acceptable)	✓
		White precipitate (yellow with KI) forms with FB 7 Indicated the presence of Pb^{2+}	✓
(Aqueous) ammonia added to the two solutions where no precipitate formed with the first reagent (FB 5 and FB 6) <i>This mark is lost if 2nd reagent is added to all three solutions</i>	✓	FB 5 gives a white precipitate soluble in excess ammonia Indicates the presence of Zn^{2+} FB 6 gives a white precipitate insoluble in excess ammonia Indicates the presence of Al^{3+}	✓

5

GRID 1B

Adds aqueous ammonia to all three solutions	✓	White precipitate formed with all three solutions	✓
		White precipitate formed in FB 5 dissolves in excess ammonia solution. Indicates the presence of Zn^{2+}	✓
Adds $\text{HCl}/\text{H}_2\text{SO}_4$ or any soluble chloride or soluble sulphate (or KI) to the two solutions where the precipitate formed with aqueous ammonia did not dissolve in excess of the reagent. <i>This mark is lost if 2nd reagent is added to all three solutions</i>	✓	FB 7 gives a white precipitate (yellow with KI) Indicates the presence of Pb^{2+} There is no precipitate/no change/no reaction with FB 6 Indicates the presence of Al^{3+}	✓

(5)

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GRID 2A

Adds Na_2CO_3 or NaHCO_3 to all three solutions	✓	White precipitates formed with all three solutions	✓
		Effervescence or CO_2 or gas turning lime water milky with FB 6	✓
		Indicates the presence of Al^{3+}	
(Aqueous) ammonia added to the two solutions where no effervescence was seen with the first reagent (FB 5 and FB 7) <i>This mark is lost if 2nd reagent is added to all three solutions</i>	✓	FB 5 gives a white precipitate soluble in excess ammonia Indicates the presence of Zn^{2+}	✓
		FB 7 gives a white precipitate insoluble in excess ammonia Indicates the presence of Pb^{2+}	

GRID 2B

Adds Na_2CO_3 or NaHCO_3 to all three solutions	✓	White precipitates formed with all three solutions	✓
		Effervescence or CO_2 or gas turning lime water milky with FB 6	✓
		Indicates the presence of Al^{3+}	
Adds $\text{HCl}/\text{H}_2\text{SO}_4$ or any soluble Chloride or soluble sulphate (or KI) to the two solutions where no effervescence was seen with the first reagent (FB 5 and FB 7) <i>This mark is lost if 2nd reagent is added to all three solutions</i>	✓	FB 7 gives a white precipitate (yellow with KI) indicates the presence of Pb^{2+} There is no precipitate/no change/no reaction with FB 5 Indicates the presence of Zn^{2+}	✓

(5)

GRID 3A

Adds $\text{HCl}/\text{H}_2\text{SO}_4$ or any soluble chloride or soluble sulphate (or KI) to all three solutions	✓	No precipitate formed with FB 5 and with FB 6 (No change or no reaction acceptable)	✓
		White precipitate (yellow with KI) forms with FB 7 Indicates the presence of Pb^{2+}	✓
Adds Na_2CO_3 to the two solutions where no precipitate was seen with the first reagent (FB 5 and FB 6) <i>This mark is lost if 2nd reagent is added to all three solutions</i>	✓	FB 5 gives a white precipitate Indicates the presence of Zn^{2+}	
		FB 6 gives a (white precipitate and) effervescence, CO_2 or a gas giving white precipitate with lime water. Indicates the presence of Al^{3+}	✓

5)

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GRID 3B

Adds aqueous ammonia to all three solutions	✓	<div data-bbox="772 255 1240 327">White precipitate formed with all three solutions ✓</div> <div data-bbox="772 327 1240 465">White precipitate formed in FB 5 dissolves in excess ammonia solution. Indicates the presence of Zn^{2+} ✓</div>
Adds Na_2CO_3 or $NaHCO_3$ to the two solutions where the precipitate formed with aqueous ammonia did not dissolve in excess of the reagent (FB 6 and FB 7) <i>This mark is lost if 2nd reagent is added to all three solutions</i>	✓	<div data-bbox="772 495 1240 600">FB 7 gives a white precipitate Indicates the presence of Pb^{2+}</div> <div data-bbox="772 600 1240 766">FB 6 gives a (white precipitate and) effervescence, CO_2 or a gas giving white precipitate with lime water. Indicates the presence of Al^{3+} ✓</div>

(5)

NB:

“Method marks” may be awarded from the plan (page 8) or from the observation table (page 9).

Observation marks are awarded from page 9.

Marks are given for positive experimental identification – not for identification by elimination UNLESS the tests have been fully explained in theory in the Plan on page 8.

Reduce the marks awarded by one for each additional reagent used.

Ignore ions listed in the conclusion.

Total for Question 2: 5

Total for Paper: 30