Mark scheme

June 2003

GCE

Chemistry

Unit CHM3/P

Exercise 1   Mark scheme   Skill assessed **Implementing** (2)

1. <u>Points assessed by supervisor **during the practical examination**</u>

(i)	use of the **pipette**	1	empties under gravity	
		2	transfers from pipette without spillage	7 scoring points
		3	touches surface with pipette	any **6 = 2 marks**
(ii)	use of the **burette**	4	correct use of burette	any **3 = 1 mark**
(iii)	use of the **thermometer**	5	bulb immersed	
		6	stirs mixture	
(iv)	general	7	does not require additional sample	

2. <u>Points assessed from candidate's **written report**.</u>

(i) the **recording** of results
results recorded clearly and in full in the table   **1 mark**
Notes   * *if you can read it, it is clear*
              * *full means completes row correctly, with no entry at 4 minutes*

(ii) the awareness of **precision**
temperatures recorded appropriately and consistently   **1 mark**
Notes   *precision*   * *allow one error*

(iii) The **accuracy** of the temperature rise, measured against a teacher value
temperature rise is within 5% of target value   **4 marks**
temperature rise is within 8 % of target value   3 marks
temperature rise is within 10 % of target value   2 marks
temperature rise is within 15% of target value   1 mark
Notes   * *ensure temperature rise is determined correctly*
              * *if value entered by the candidate is wrong, underline the wrong value*
                and write the correct value by the side
              * *use the **corrected** value to assess accuracy*
              * *if staff value is wrong or missing use a group average; complete a*
                discrepancy form
              * *when calculating a group average ignore wild data*

Total 8 marks

CHM3/P

Exercise 1   Mark scheme   Skill assessed **Analysing (3)**

(a) the **plotting** of the **graph**
    plots points for 0-4 minutes correctly
    plots points for 5-10 minutes correctly   7 scoring point
    straight line through the points before addition   any 6 = 2 marks*
    line through the points after addition is   smooth   any 3 = 1 mark
                                            best fit
    extrapolation back is a natural extension of the drawn line   * must include
    reads the temperature rise correctly from the graph   correct extrap.

   Notes   * *If graph does not cover **half** of the paper **maximum score is 1 mark;***
                    do not penalise again under nomenclature
             * *If the graph plot goes off the squared paper **maximum score is 1 mark;***
                    do not penalise again under nomenclature
             * *If axes unlabelled use data to decide that temperature is on y axis*
             * *Allow **one** incorrectly plotted point*
             * *"Correct extrapolation" means correct line to 4 minute ordinate*

                                                     Total 2 marks

Exercise 2　　　　　　Mark scheme　　　　　　Skill assessed **Analysing** (3)

Q1　　temperature rise 11.2 - 11.4 °C　　　　　　　　　　　　**1 mark**

Q2　　2.34 to 2.48 kJ　allow answer in J
Q3 (a) 0.0191 mole　　　　　　　　　　　　　　　　　　**all 4 = 2 marks**
　　(b) 0.0200 mole　　　　　　　　　　　　　　　　　　any 2 = 1 mar
Q4　　-122　to -125　kJ mol^{-1}
　　Notes　* *Consequential marking from candidate's endpoint*

Q5　　**errors**　　　　balance　　　0.8%　　　　　　4 scoring points
　　　　　　　　　　pipette　　　0.2%　　　　　　any **3 = 1 mark**
　　　　　　　　　　thermometer　0.9% based on 11.3°
　　　　　　　　　　total error　　1.9%
　　Notes　　* *Allow errors to 2 or 3 dp, and overall error as integer or 2 or 3 dp*
　　　　　　　* *Allow thermometer error on any of the temperatures from the table*
　　　　　　　* *Consequential marking for overall error*
　　　　　　　* *Penalise doubled errors **once***
　　　　　　　* *Lose mark if answers wrong because (x 100) missing from calculations;*
　　　　　　　　don't penalise again in awarding the nomenclature mark

The appreciation of **precision**
　　quotes temp rise to 1 dp　　　　　　　　　　　　3 scoring points
　　quotes q to　3 significant figures　　　　　　　　any **2 = 1 mark**
　　quotes molar enthalpy change to 3 significant figures

The correct use of **nomenclature** and **terminology**　　　　2 scoring points
　　calculations clear with logical layout　　　　　　　**both = 1 mark**
　　uses terminology accurately
　　Notes　　　* *Incorrect units mean the nomenclature mark is lost*
　　　　　　　* *Don't penalise missing units*

　　　　　　　　　　　　　　　　　　　　　　　　Total　6　marks

Exercise 2   Mark scheme   Skill assessed   **Evaluating (4)**

Q1. ignores results at 5 and 8 minutes   3 scoring points
   other results on decent straight line   any **2 = 1 mark**
   technique good/ results consistent or reliable

Q2. difference is 97   2 scoring points
   97 against 219 is a 44.3% error   **both = 1 mark**
   Notes   * *Consequential marking from Q4 of Analysis*
             * *Difference must be clearly stated, or appear in calculation*
             * *Lose mark if the candidate answers a different question*

Q3. appreciates heat loss main source of error   **1 mark**
   appropriate improvement to reduce heat loss eg   more lagging   **1 mark**
                                                better calorimeter

Q4 appropriate source of error   eg original temperature of acid & unequal   **1 mark**
                                      temperature rise too small
                                      reaction too slow
   appropriate improvement   eg equilibrates reagent temps   **1 mark**
                                 higher reagent concentrations
                                 use excess zinc
   Notes   * *Do not penalise additional answers unless they contradict*

                                                        Total   6 marks

Exercise 3   Mark scheme   Skill assessed **Planning** (1)

(a) the **scale** of working used
     appreciates 1:1 reaction   2 scoring points
     realises alkali should be approx 0.05 mol dm^{-3}

(b) the **method** used
     rinses equipment
     pipette 25 cm^3 of standard sodium hydroxide into conical flask   12 scoring points
     adds acid solution from burette
     few drops of phenolphthalein
     dropwise at end point
     pink colour just disappears
     note burette reading
     swirls mixture
     repeats titration
     at least 2 concordant results
     any **2** standard precautions for an accurate result e.g. touch surface with
     pipette, fill jet space etc
     Notes   * *ignore additional apparatus unless contadictory - lose apparatus point(s)*
                    * *if method is clearly unworkable CE means no points scored in this section*

(c) the **use of results**
     averages concordant titres   4 scoring points
     calculate moles of NaOH
     calculate moles of acid
     calculates concentration of acid

(d) the **appreciation** of **likely hazards** and **safety precautions**
     acid and alkali are corrosive   **max** 2 scoring points
     uses a pipette filler
     eye protection

GRADING

20 scoring points	18 - 20	scores	8 marks
	16 - 17	scores	7 marks
	14 - 15	scores	6 marks
	12 - 13	scores	5 marks
	9 - 11	scores	4 marks
	6 - 8	scores	3 marks
	3 - 5	scores	2 marks
	1 - 2	scores	1 mark