

Name

Index No.....

School

Candidate's Signature

Date

233/3

CHEMISTRY

PAPER 3

(PRACTICAL)

TIME: $2\frac{1}{4}$ HOURS

INSTRUCTIONS:

- Write your name and index number in the spaces provided above.
- Answer **ALL** questions in the spaces provided.
- You are **NOT** allowed to start working with the apparatus for the first 15minutes of the $2\frac{1}{4}$ hours allowed for this paper. This time will enable you read through the question paper and make sure you have all the chemicals and apparatus required.
- Mathematical tables and electronic calculators may be used.
- All working **must be** clearly shown where necessary.

FOR EXAMINER'S USE ONLY

Question	Maximum score	Candidate's score
1	23	
2	17	
TOTAL SCORE	40	

This paper consists of 8 printed pages
Candidat

es should check to ensure that all pages are printed as indicated and no questions are missing

1. You are provided with:-

- Aqueous Sulphuric acid labelled solution A.
- Solution B containing 8.0g per litre of Sodium carbonate.
- Aqueous solution of substance C labelled solution C.

You are required to determine:-

- Concentration of solution A.
- Enthalpy of reaction between Sulphuric acid and substance C.

PROCEDURE

A. Using a pipette and a pipette filler, place 25.0cm³ of solution A into a 250ml volumetric flask. Add distilled water to make 250cm³ of solution. Label this solution D. Place solution D in a burette. Clean the pipette and use it to place 25.0cm³ of solution B into a conical flask. Add 2 drops of methyl orange indicator provided and titrate with solution D. Record your results in table 1. Repeat the titrations two more times and complete the table.

Table 1

	I	II	III
Final burette reading			
Initial burette reading			
Volume of solution D used			

(4 marks)

Calculate the:-

- (i) Average volume of solution D used. (1 mark)

.....

.....

.....

.....

- (ii) Concentration of sodium Carbonate in solution B (Na=23.0, O=16.0, C=12.0) (1 mark)

.....

.....

.....

.....

(iii) Concentration of Sulphuric (VI) acid solution D.

(2 marks)

.....

.....

.....

.....

.....

(iv) Concentration of Sulphuric (VI) acid solution A.

(1 mark)

.....

.....

.....

.....

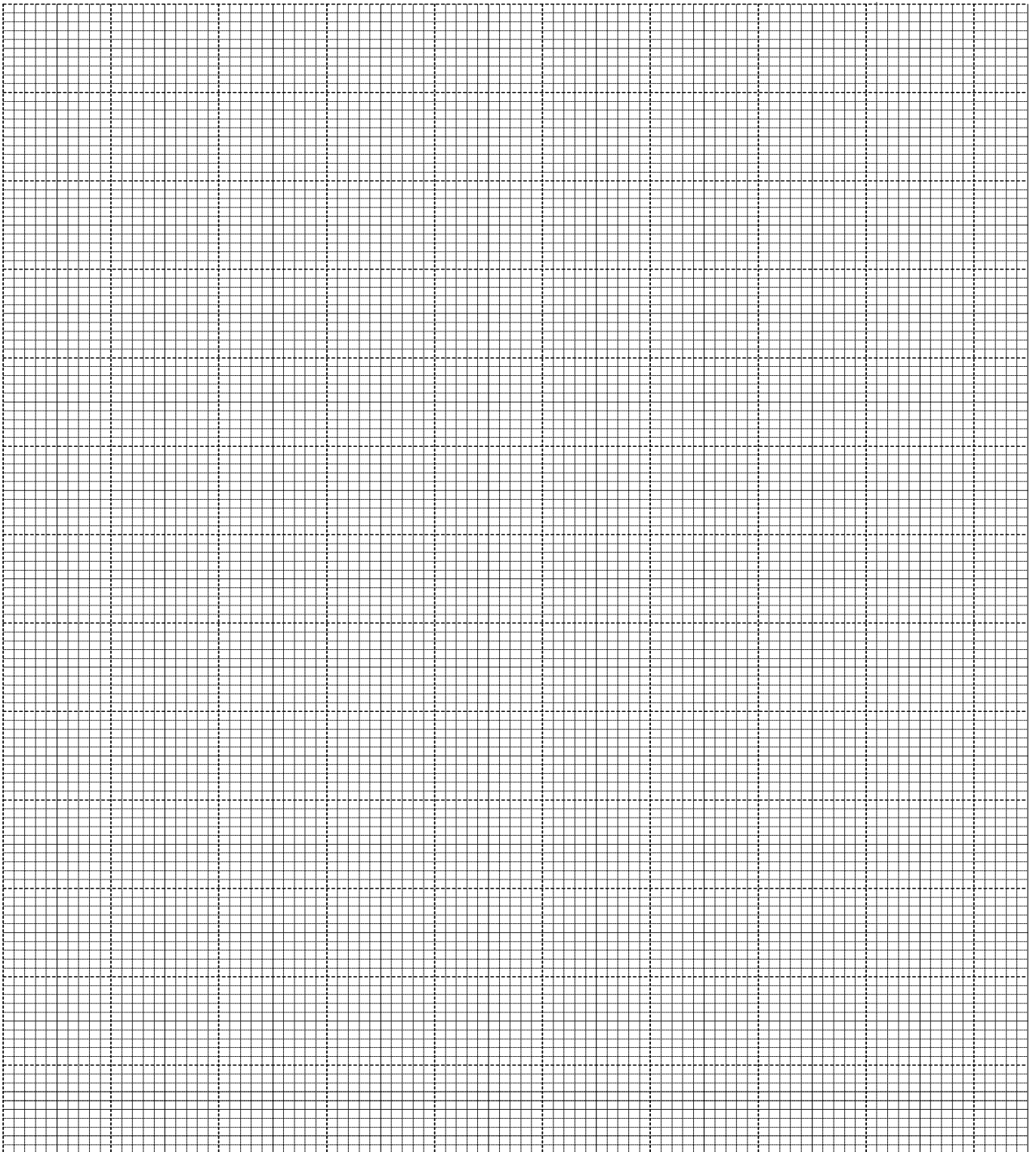
B. Label six test tubes as 1, 2, 3, 4, 5 and 6. Empty the burette and fill it with solution A. From the burette, place 2cm^3 of solution A into test tube number 1. From the same burette, place 4cm^3 of solution A in test tube 2. Repeat the process for test tube numbers 3, 4, 5 and 6 as shown in table 2. Clean the burette and fill it with solution C. From the burette place 14cm^3 of solution C into a boiling tube. Measure the initial temperature of solution C to the nearest 0.5°C and record it in table 2. Add the contents of test tube 1 to the boiling tube containing solution C. Stir the mixture with the thermometer. Note and record the highest temperature reached in table 2. Repeat the process with the other volumes of solution C given in table 2 and complete the table.

Table 2

Test tube number	1	2	3	4	5	6
Volume of solution (A) cm^3	2	4	6	8	10	12
Volume of solution (C) cm^3	14	12	10	8	6	4
Initial temperature of solution C ($^\circ\text{C}$)						
Highest temperature of mixture ($^\circ\text{C}$)						
Change in temperature, ΔT ($^\circ\text{C}$)						

(6 marks)

(i) On the grid provided, draw a graph of ΔT (vertical axis) against volume of solution A. (3 marks)



(ii) From the graph, determine:-

I) The maximum change in temperature.

(1 mark)

.....
.....
.....
.....

II) The volume of solution A required to give the maximum change in temperature. (1 mark)

.....

.....

.....

.....

.....

(iii) Calculate the:-

I) Number of moles of sulphuric acid required to give maximum change in temperature. (1 mark)

.....

.....

.....

.....

.....

II) Molar enthalpy of reaction between sulphuric acid and substance C (in kilojoules per mole of sulphuric acid). Assume the specific heat capacity of the solution is 4.2 J/g/k and density of solution is 1.0g/cm³. (2 marks)

.....

.....

.....

.....

.....

.....

2. You are provided with solution E. Carry out the tests below and record your observations and inferences in the spaces provided.

a) Place 2cm³ of solution E in a test tube, add 2M NaOH dropwise until in excess.

Observation	Inference
(1 mark)	(2 marks)

b) Place 2cm^3 of solution E in a test tube and add two drops of Sodium sulphate solution.

Observation	Inference
(1 mark)	(1 mark)

c) Place 2cm^3 of E in a test tube and add three drops of solution B used in question 1.

Observation	Inference
(2 marks)	(1 mark)

d) To about 2cm^3 of E add about 2cm^3 of 2M NaOH and warm. Test the gases produced with both blue and red litmus paper.

Observation	Inference
(2 marks)	(1 mark)

e) To about 2cm^3 of E add about 2 drops of Barium nitrate.

Observation	Inference
(1 mark)	(1 mark)

f) To about 2cm^3 of E add 2 drops of lead (II) nitrate and warm.

Observation	Inference
(2 marks)	(2 marks)