Name ……..……...…… **Index No…….……**

School ……... **Candidate's Signature ……**

Date …….....……..

233/3
CHEMISTRY
PAPER 3
(PRACTICAL)
$2\frac{1}{4}$ HOURS

INSTRUCTIONS:

- Write your name and index number in the spaces provided above.
- Answer **ALL** the 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	25 ½	
2	14 ½	
TOTAL SCORE	40	

This paper consists of 8 printed pages

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

1. You are provided with the following:
    - Sulphur (VI) acid, solution M.
    - 0.5M sodium hydroxide, solution N.
    - Magnesium turnings (metal) solid S (0.1872g, accurately measured).

You are required to determine the concentration of Sulphuric (VI) acid in moles per litre.

Procedure I

i) Measure $50cm^3$ of solution M using a clean measuring cylinder and place it in a $100cm^3$ beaker.

ii) Stir the solution gently with a thermometer and take its temperature after every half minute.

iii) Tabulate your results as shown in the table below.

Time (min)	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
Temperature (^oC)													

(3 marks)

iv) After one and half minutes, add all of the solid S at once.

v) Stir the mixture gently with the thermometer and record the temperature of the mixture after every half minute as shown in the table upto the sixth minutes. Keep the solution for use in procedure II.

a) Write the equation of the above reaction. (1 mark)

……..

……..

b) Derive the ionic equation. (1 mark)

……..

……..

c) Use the results in the tale to determine the highest change in temperature (ΔT) for the reaction. (1 mark)

……..

……..

……..

……..

d) Calculate the heat change for the reaction using the expression.

Heat change = Mass of solution x 4.2 x ΔT joules. (Assume density of solution = 1.0g/cm^3)

(2 marks)

……..

……..

……..

……..

e) Given that the molar heat of reaction of Sulphuric (VI) acid with solid P is 323KJ Mol^{-1}, calculate the number of moles of Sulphuric (VI) acid that were used during the solution.

(2 marks)

……..

……..

……..

……..

……..

f) Determine the concentration of the sulphuric (VI) acid used as solution M. (2 marks)

……..

……..

……..

……..

Procedure II

i) Place all the solution obtained in procedure I in a clean 100cm^3 measuring cylinder.

ii) Add distilled water to make 100cm^3 of solution.

iii) Transfer all the solution into a beaker and shake well.

iv) Label the resulting solution as Z.

v) Fill a burette with solution N.

vi) Pipette 25cm^3 of solution Z into a clean conical flask.

vii) Add 2 – 3 drops of phenolphthalein indicator and titrate with solution N.

viii) Record your results as shown in the table below, repeat the titration two more times, tabulate your results as shown below.

	1	2	3
Final burette reading (cm^3)			
Initial burette reading (cm^3)			

Titre volume of solution N used (cm^3)			

(3 marks)

a) Determine the average volume of solution N used. (1 mark)

……..

……..

……..

……..

b) Write the equation of reaction for the above case. (1 mark)

……..

……..

c) Derive ionic equation for the above reaction. (½ marks)

……..

……..

……..

d) Calculate the number of moles of sodium hydroxide used as solution N. (1 mark)

……..

……..

……..

……..

e) Determine,

i) The moles of Sulphuric (VI) acid in $25cm^3$ of solution Z. (2 marks)

……..

……..

……..

……..

ii) The moles of Sulphuric (VI) acid in $100cm^3$ of solution Z. (2 marks)

……..

……..

……..

……..

f) Use the results from (e) of table 1 and (e) of table II above to calculate the total number of moles of sulphuric (VI) acid in $50cm^3$ of solution M. (1 mark)

……..

……..

……..

……..

……..

g) Calculate the concentration in moles per litre of Sulphuric (VI) acid as solution Z. (2 marks)

……..

……..

……..

……..

……..

2. You are provided with solid F. Carry out the tests below, write your observations and deductions in the spaces provided.

Place all solid F provided in a dry boiling tube. Add about $15cm^3$ of distilled water. Shake well, warm to dissolve completely.

Observations	Inferences
(1 mark)	(1½ mark)

Divide the resulting solution into 5 portions.

i) To the first portion add solid J provided.

Observations	Inferences
(1 mark)	(1 mark)

ii) To the second portion add about 0.5g of sodium carbonate provided.

Observations	Inferences

(1 mark)	(2 marks)

iii) To the third portion add two drops of bromine water.

Observations	Inferences
(1 mark)	(2 marks)

iv) To the fourth portion add three drops of acidified potassium manganate (VII).

Observations	Inferences
(1 mark)	(1 mark)

v) To the fifth portion add two drops of universal indicator solution.

Observations	Inferences
(1 mark)	(1 mark)