

Learners Name : ...**SCORING GUIDE**..... Stream .....

Signature ..... date .....

545/2

CHEMISTRY PAPER TWO

PRACTICAL PAPER

S.4 RESOURCE FUL EXAMINATIONS, 2024

2 HOURS

LOWER SECONDARY EDUCATION EXAMINATIONS

CHEMISTRY PAPER TWO

SENIOR FOUR

RESOURCE FUL EXAMINATIONS 2024

2 HOURS

### **INSTRUCTION TO LEARNERS**

- ✓ This paper consists of one compulsory examination item. Answers to this item are to be written in the spaces provided in this booklet. Use **blue** or **black** ink
- ✓ All working must be clearly shown. Graph paper will be provided.
- ✓ Silent non programmable scientific calculators may be used
- ✓ You are not allowed to use reference books i.e. textbooks
- ✓ Learners are advised to carefully read the item, make sure they have all the apparatus and chemicals they need and then plan appropriately before starting.

### **ITEM ONE**

Ngambo, a senior two drop out residing in Mbale works with Pembe Quality Products industry to earn a living. However, with the limited knowledge, Ngambo believes that the concept of learning chemical reactions is very important in Uganda and the world at large most especially in industries.

Pembe Quality Industries Uganda limited is a re-owned group of companies that deals in the manufacture of different things used in our homes such as soap, cooking oil, and so many others.

The administrators of the company are aiming at producing a new brand of soap using less time possible. They are wondering whether concentration will have any effect on their output or not. It has been discussed that the simplest way to get this clear is to study this using sodium thiosulphate and hydrochloric acid.

You have been assigned to design an investigation into this matter to assist Ngambo understand the concept.

## Theory

Sodium thiosulphate reacts with hydrochloric acid according to the following equation.



You are provided with the following solutions;

BA1 which is sodium thiosulphate solution

BA2 which is dilute hydrochloric acid solution.

TASK. As a S.3 chemistry learner,

a) Design an experiment you will carry out.

AIM. AN EXPERIMENT TO DETERMINE THE EFFECT OF CONCENTRATION ON THE RATE OF REACTION BETWEEN SODIUM THIOSULPHATE AND HYDRCHLORIC ACID

### VARRIABLES

INDEPENDENT VARRIBLE: Volume of BA1 ( volume of sodium thiosulphate)

DEPENDENT VARRIABLE: Time taken

CONTROLLED VARRIABLE : Volume of BA2 ( Volume of hydrochloric acid)

### HYPOTHESIS

Sodium thiosulphate reacts with dilute hydrochloric acid to form a sodium chloride salt, sulphur a yellow deposit and water with evolution of sulphur dioxide gas

Equation of reaction



### APPARATUS AND MATERIALS NEEDED

2 Measuring cylinders ( 100cm<sup>3</sup> and 10 cm<sup>3</sup>)

2 beakers

Stop watch

Conical flask

Distilled water

Solution BA1 of sodium thiosulphate

Solution BA2 of hydrochloric acid and plain white sheet of paper

## PROCEDURES

A cross is made on a plain sheet of paper provided using a blue pen.

40cm<sup>3</sup> of BA1 is measured using a 100cm<sup>3</sup> measuring cylinder into a clean conical flask.

10cm<sup>3</sup> of BA2 are measured using a 10cm<sup>3</sup> measuring cylinder and added into BA1 in the conical flask and the stop watch immediately started.

The mixture is swirled continuously to mix the two solutions and the conical flask placed on the cross on the sheet of paper until the cross just disappears while looking through the solution from above. At this moment, the time taken for the cross to just disappear is noted and recorded.

30cm<sup>3</sup> of BA1 is measured into the conical flask, 10 cm<sup>3</sup> of distilled water added to make the total volume, 10 cm<sup>3</sup> of BA2 is added to the flask and the stop watch immediately started., the mixture is swirled until the cross just disappears.

The time taken for the cross to disappear is noted and recorded.

The experiment is repeated with different volumes of BA1 ( 20,10) and filled with distilled water to make up the total volume of 40cm<sup>3</sup>.

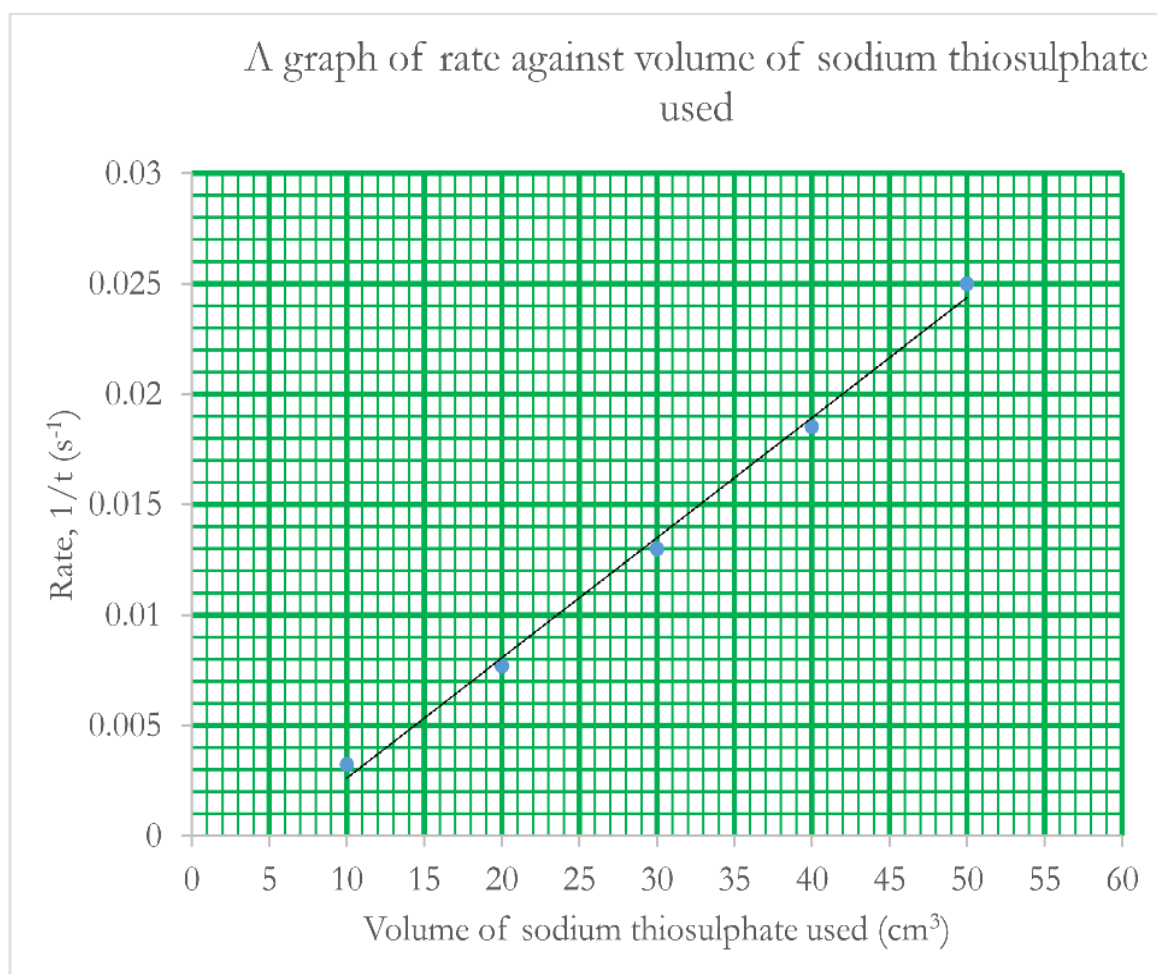
The results are recorded in a suitable table

## RISKS AND MITIGATIONS

RISK	MITIGATION
Acid pouring on skin	Put on lab coat, gloves, closed shoes
Solutions pouring on table	Taking proper measurements
Taking wrong time reading on stop watch	
Breakage of glass ware	Handling glassware with care
Chocking of the gas produced in the nose	Wear face mask to avoid inhalation of sulphurdioxide

ii) Carryout an experiment and record your findings.

<i>Volume of sodium thiosulphate used (cm<sup>3</sup>)</i>	<i>10</i>	<i>20</i>	<i>30</i>	<i>40</i>
<i>Volume of water added (cm<sup>3</sup>)</i>	<i>40</i>	<i>30</i>	<i>20</i>	<i>10</i>
<i>Volume of hydrochloric acid added (cm<sup>3</sup>)</i>	<i>5.0</i>	<i>5.0</i>	<i>5.0</i>	<i>5.0</i>
<i>Time, t (s)</i>	<i>310</i>	<i>130</i>	<i>77</i>	<i>54</i>
<i>Rate, <math>\frac{1}{t}</math> (s<sup>-1</sup>)</i>	<i>0.0032</i>	<i>0.0077</i>	<i>0.013</i>	<i>0.0185</i>



A graph of rate against volume of sodium thiosulphate used was plotted as shown above and is a straight line. This shows that the rate of the reaction increases with increase in concentration.

b) What deduction do you draw from your finding?

The concentration of the reactants really affect the rate of reaction. Therefore the concentration must be increased to have better results in a very short period of time.