PROPOSED ASSESSMENT GRID /SCORING GRID

Trial 1

1st FEB 2024

CHEMISTRY DEPARTMENT 2024

S.4 PRACTICAL TRIAL ONE

CHAPTER: REACTION RATES (CHEMICAL KINETICS)

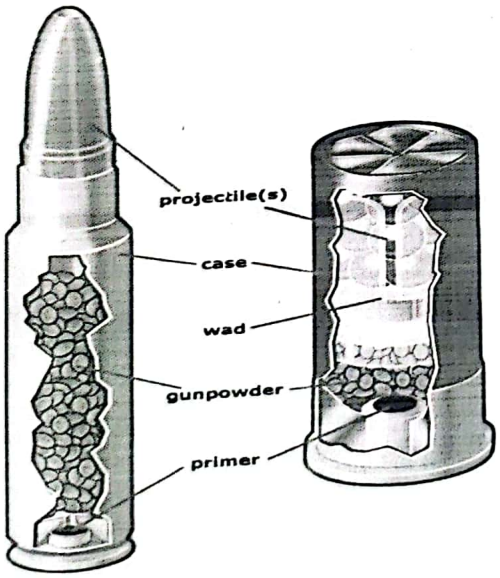
DURATION: 2HRS

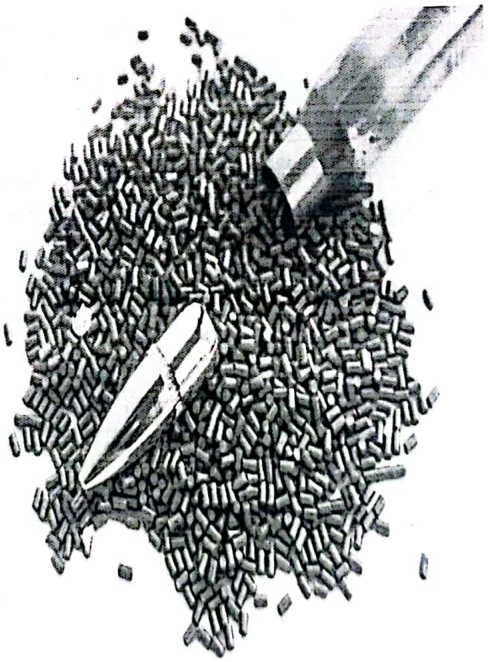
NAME KIBUGO DENNIS ..... STREAM.....

SIGNATURE Kib .....

Question one

The armoury unit of one armed forces in Uganda uses amorphous sulphur to manufacture gunpowder. This sulphur is cheaply obtained from a reaction of sodium thiosulphate solution and hydrochloric acid and these are available in the unit stores. However, the management of the unit found out that concentration could be having an effect on the rate of formation of sulphur from the above raw materials, hence a need to minimise their consumption.





Equation for the reaction

$$Na_2S_2O_{3\,(aq)} + 2HCl_{(aq)} \longrightarrow 2NaCl_{(aq)} + S_{(s)} + SO_{2\,(g)} + H_2O_{(l)}$$

Task;

(a) As a chemistry student, plan and design an investigation in order to guide armoury unit team to verify their observation.

BASIS OF ASSESSMENT + ASSESSMENT GRID.

① AIM; An experiment to investigate the effect of Concentration on the rate of reaction between sodium thiosulphate and hydrochloric acid

Aim with all key words ---- 02
Aim with few key words ---- 01
Incorrect aim OR No aim stated -- 00

② Variables in the experiment;

Dependent variable	Time taken for the cross to dissappear
Independent variable	Volume of sodium thiosulphate solution
Controlled variable	Volume of Hydrochloric acid being controlled by maintaining it constant.

All 3 variables ---- 03
Only 2 variables ---- 02
Only 1 variable ---- 01
No variable ---- 00

③ Hypothesis;

The rate of reaction between sodium thiosulphate solution and hydrochloric acid is affected by Concentration.

With all key words stated ---- 02
With no key words ---- 01
Incorrect hypothesis | No hypothesis given -- 00

④ Requirements for the experiment;

5 conical flasks; 1 measuring cylinder; 1 stop clock; Distilled water; 5cm³ Hydrochloric acid; Sodium thiosulphate solution

Any 2 relevant materials -- 01
No material stated ---- 00

⑤ Procedure of the experiment

(a) Label conical flasks A, B, C, D and E.

(b) Add 50, 40, 30, 20, and 10 cm^3 of Sodium thiosulphate solution to conical flasks labelled A, B, C, D and E respectively.

(c) Add 10, 20, 30 and 40 cm^3 of distilled water to conical flasks labelled B, C, D and E.

(d) Make a visible cross on a white piece of paper using a marker pen.

(e) To the conical flask A on a white piece of paper, add 5 cm^3 of hydrochloric acid and simultaneously start the stop clock.

(f) Swirl the mixture in the flask and note the time taken for the cross to dissappear.

(g) Repeat procedures (e) and (f) with conical flasks B, C, D and E in each case.

Relevant procedure and Coherence ---- 02
Relevant procedure, No coherence ---- 01
Wrong procedure OR No procedure stated ---- 00

KIBUGO

⑥ Risks and mitigation; — safety precautions.

Risk	How it is mitigated.
- Acid spills and contact to the skin	- Careful handling of the acid
- Cuts from broken glass ware	- Wearing hand protective gear
- Poisonous fumes during experiment	- Wearing mask protection.

Any 1 Risk and how its mitigated 02
Any 1 Risk, No mitigation 01
No Risk 00

(b) Present your data and analyse it to guide the armoury team.

⑦ Presentation of data;

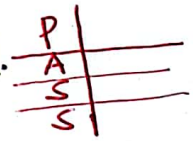
Conical flask	A	B	C	D	E
Volume of acid used (cm^3)	5	5	5	5	5
Volume of thiosulphate (cm^3)	50	40	30	20	10
Volume of water added (cm^3)	0	10	20	30	40
Time taken for the cross to dissappear (s)					
Rate of reaction, $\frac{1}{t}$ (s^{-1})					

} $\frac{1}{t}$ values should be to 3dp.

Any 3 correct columns 03
2 correct columns 02
1 correct column 01
No data presented 00

⑧ Data analysis and interpretation;

See graph attatched.



(c) From your data interpretation and analysis above, make a conclusion that can guide the armoury team on effect of concentration on rate of reaction between sodium thiosulphate and the acid.

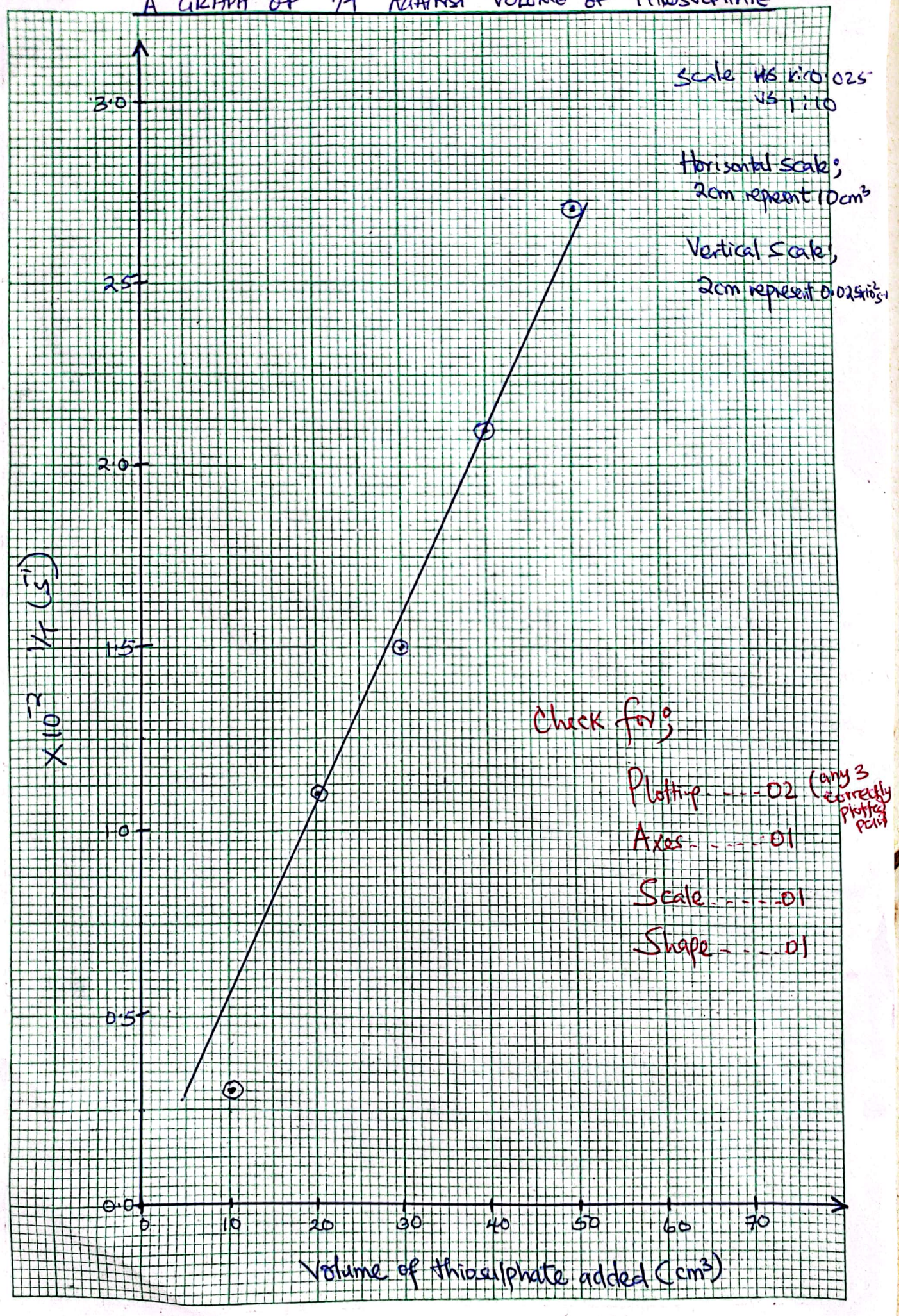
The graph shows as volume of thiosulphate increases, the rate of reaction ($\frac{1}{t}$) increases

⑨ Conclusion; The higher the concentration of sodium thiosulphate, the higher the rate of reaction, thus the rate of reaction between Sodium thiosulphate and hydrochloric acid is affected by Concentration

END.

KIBUGO

We shall reach there ..... !!


A GRAPH OF 1/T AGAINST VOLUME OF THIOSULPHATE
Scale HS 1:0.025
VS 1:10
Horisontal scale;
2cm represent 10cm³
Vertical Scale;
2cm represent 0.025x10⁻²S⁻¹
1/T (y)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
10
20
30
40
50
60
70
Volume of thiosulphate added (cm³)
Check for;
Plotting ---02 (any 3 correctly Plotted Pts)
Axes ----01
Scale ----01
Shape ----01