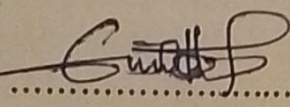


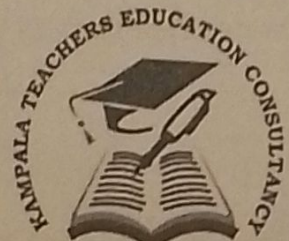
Candidates' Name: Mr. BUSULWA JULIUS JJAAJA CHEM  
0705517234  
0779856274

Signature: 

Random No.					Personal No.		

(Do not write your school / Center name or Number anywhere on this booklet)

**545/3**  
**CHEMISTRY**  
**Paper 3**  
**July / Aug 2024**  
**2 ½ HOURS**



**KAMTEC EXAMINATIONS BOARD**  
**Uganda Certificate Of Education**  
**CHEMISTRY**

**Paper 3**

**TIME: 2 hours 30 minutes**

ENJOY A PRACTICAL =  
WEEKEND AS WE ARE  
WAITING FOR THE  
CBC CHEM SEMINAR  
ON 27/09/2024 AT  
BUKOTO SS IGANGA

**INSTRUCTIONS TO CANDIDATES**

*This paper consists of one compulsory 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. A Graph paper will be provided*

*Mathematical tables and silent non-programmable scientific calculators may be used.*

*You are not allowed to use reference books.*

*Candidates are advised to carefully read the item, make sure they have all the apparatus and chemicals they may need and then plan appropriately before starting. .*

**FOR EXAMINER'S USE ONLY**

ITEM	SCORE(S)	EXAMINER'S SIGNATURE
1		



### Item 1

In a local village around Sukuru subcounty, in Tororo district, the water discharged into the valley dams from small industries contains traces of sulphuric acid which is unfavourable to the fresh water fish. The industry managers have been advised to use solution  $\text{KA}_1$  to neutralize the acid in the water without affecting the life of fish. This is because the reaction between  $\text{KA}_1$  and sulphuric acid may produce amounts of heat which is unfavourable, yet fresh water fish thrives well only if the heat change of  $2.47 - 2.52\text{kJ}$  occurs in water.

You are provided with the following;

Solution  $\text{KA}_1$

Solution  $\text{KA}_2$  is a sample of the acidic fresh water.

Some apparatus

### Task

- (a) Design an experiment you can use to determine the amount of heat evolved in this reaction.

Aim: Experiment to determine the amount of heat evolved in the reaction between  $\text{KA}_1$  and  $\text{KA}_2$

Variables

Dependent	Temperature of the	P03
Independent	Volume of $\text{KA}_1$	P02
Controlled	Volume of $\text{KA}_2$ / Sample of	

Hypothesis

The temperature of reaction will increase as  $\text{KA}_1$  is added to  $\text{KA}_2$

Tools

- Plastic beaker
- Thermometer
- Measuring cylinder

Procedure © 2024 Kampala Teachers Education Consultancy Examinations

TURN OVER

- The initial temperature of  $\text{KA}_1$  and  $\text{KA}_2$  are noted and recorded using a thermometer
- Using a measuring cylinder  $15\text{cm}^3$  of  $\text{KA}_2$  was measured into a plastic beaker.
- Using another measuring cylinder  $5\text{cm}^3$  of  $\text{KA}_1$  was measured and then



transferred into a beaker containing  $15\text{cm}^3$  of  $\text{KA}_2$ . Immediately a thermometer is put in reaction mixture.

d) The mixture is stirred with thermometer and the maximum temperature obtained is noted and recorded.

e) Procedures (c) to (d) are repeated by adding  $\text{KA}_1$  at regular intervals of  $5\text{cm}^3$  such that volumes of  $\text{KA}_1$  added equals to  $10\text{cm}^3$ ,  $15\text{cm}^3$ ,  $20\text{cm}^3$ , ~~and~~  $25\text{cm}^3$ ,  $30\text{cm}^3$ ,  $35\text{cm}^3$ ,  $40\text{cm}^3$  and  $45\text{cm}^3$ .

f) The results are tabulated including the temperature change ( $\Delta T$ )

Risk	Mitigation
The acid pouring into skin burns	wearing personal protective equipments.

(b) carry out the experiment you can use to determine the amount of heat evolved.

Initial temperature of  $\text{KA}_1 = 24.0^\circ\text{C}$   
 Initial temperature of  $\text{KA}_2 = 24.0^\circ\text{C}$

$$\text{Average Initial temperature} = \frac{24.0 + 24.0}{2} = 24.0^\circ\text{C}$$

Volume of  $\text{KA}_2$  used =  $15.0\text{cm}^3$

Volume of $\text{KA}_1$ used ( $\text{cm}^3$ )	0	5	10	15	20	25	30	35	40	45
Maximum temperature attained $^\circ\text{C}$	24.0	29.0	31.0	33.0	34.0	35.0	36.0	37.0	36.0	35.0
Temperature change	0.0	5.0	7.0	9.0	10.0	11.0	12.0	13.0	12.0	11.0

Volume at maximum temperature =  $35.0\text{cm}^3$

Maximum temperature change  $\Delta T = 13^\circ\text{C}$ .

(c) Analyse your results and hence draw possible conclusion.

$$\begin{aligned}\text{Heat evolved} &= Mc \Delta T \\ &= (15 + 35) \times 4.2 \times 13 \\ &= 2730\text{J} \\ &= 2.73\text{kJ}\end{aligned}$$

Conclusion: Based on the heat evolved, at maximum temperature, the Industry manager should add the volume of  $\text{KA}_1$  less than  $35\text{cm}^3$  to neutralize  $\text{KA}_2$  such that less heat is evolved.

Graph = 02  
~~24.0~~