

M/S.

Name: Class:

Adm.No.....

Date:

233/3

CHEMISTRY

Paper 3

END OF TERM TWO EXAM JULY 2019

Time: $1\frac{3}{4}$ hours

FORM THREE



SUNSHINE SCHOOL

Kenya Certificate to Secondary Education

CHEMISTRY PAPER 3

INSTRUCTIONS TO CANDIDATES

1. Write your name and admission number in the spaces provided above.
2. Sign and write the date of examination in the spaces provided above.
3. Answer all the questions in the spaces provided in the question paper
4. You are NOT allowed to start working with the apparatus for the first 5 minutes of the $1\frac{3}{4}$ hours allowed for this paper. This time is to enable you to read the question paper and make sure you have all the chemicals and apparatus that you may need.
5. All working MUST be clearly shown where necessary.
6. Mathematical tables and silent electronic calculators may be used.

FOR EXAMINER'S USE ONLY

| QUESTION | MAXIMUM SCORE | CANDIDATE'S SCORE |
|--------------------|---------------|-------------------|
| 1 | 12 | 12 |
| 2 | 12 | 12 |
| 3 | 6 | 6 |
| TOTAL SCORE | 30 | 30 |

This paper consists of 4 printed pages

1. You are provided with :

- Acid solution of H_nX containing 0.06 moles in 1 dm^3 , labeled solution A.
- Sodium hydroxide, solution B containing 4 g/l .
- Phenolphthalein indicator.

You are required to determine the basicity of acid A.

Procedure

Fill the burette with acid, H_nX solution A. Pipette 25 cm^3 of sodium hydroxide solution B and transfer it into a clean dry conical flask. Add 2 drops of phenolphthalein indicator. Titrate using the acid and record your results in the table below. Repeat the titration to obtain three consistent titres. (4 marks)

| | I | II | III |
|---|---|------|-----|
| Final burette reading (cm^3) | | | |
| Initial burette reading (cm^3) | | | |
| Volume of acid used (cm^3) | | 23.0 | |

$C_T = 1$
 $D = 1$
 $A_C = 1$
 $F_A = 1$
 $P_A = 1$

(a) Determine the average volume of acid A used. (1 mark)

$$\frac{t_1 + t_2 + t_3}{3} \quad \text{or} \quad \frac{t_1 + t_2}{2} \quad \text{or} \quad \frac{t_2 + t_3}{2} \quad \text{or}$$

(b) Calculate the concentration of sodium hydroxide solution B in moles per litre (Na = 23, O = 16, H = 1) (2 marks)

$$\text{molarity} = \frac{\text{m/l}}{M_r} = \frac{4}{40} \checkmark$$

$$= 0.1\text{ M} \checkmark$$

(c) Calculate the moles of sodium hydroxide used. (2 marks)

$$\text{moles} = \frac{V \times M}{1000}$$

$$= \frac{25 \times 0.1}{1000} \checkmark$$

$$= 0.0025 \text{ mol} \checkmark$$

(d) Calculate the moles of acid, H_nX used. (1 mark)

~~moles of acid~~

$$\text{mole of acid} = \frac{0.23 \times 0.06}{1000} \checkmark$$

$$= 0.00138 \text{ mol}$$

10

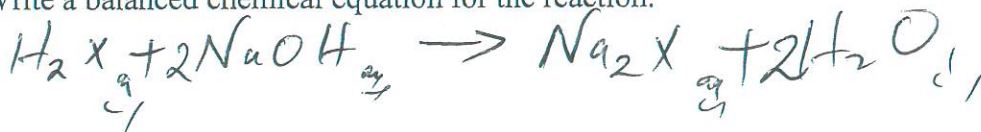
(e) Determine the basicity of acid H_nX .

(1 mark)

$$\text{Basicity} = \frac{\text{mln of Ben}}{\text{mln of acid}} = \frac{0.0025}{0.00138} = 1.811 \approx 2$$

(f) Write a balanced chemical equation for the reaction.

(1 mark)



2. You are provided with solid H.

a) Describe the appearance of the solid

(1 mark)

White crystalline substance

b) Carry out the tests below to identify the ions present in substance H. Fill your observations and Inferences in the table below.

| Experiment | Observations | Inferences |
|---|--|--|
| Scoop a spatula endful of solid H into a boiling tube and heat gently then strongly test for any gases produced | - Cracking sound - Brown gas produced - Blue litmus paper turns red - Orange residue which changes to yellow on cooling | NO_3^- Pb^{2+} Preliminary for contradiction ions. |
| (i) Dissolve a spatula endful of solid H in distilled water and stir. Divide the solution into 3 portions | Dissolves to form a colorless solution | Absent of elements ions: Ca^{2+} , Fe^{2+} , Fe^{3+} - Soluble salt |
| (ii) To the 1 st portion add 3 drops of barium nitrate solution | No white ppt | Absent of SO_3^{2-} , SO_4^{2-} , CO_3^{2-} |
| (iii) To the 2 nd portion add 3 drops of lead (II) nitrate solution. | No white ppt | Absent of Cl^- , SO_4^{2-} , CO_3^{2-} , SO_3^{2-} |
| (vi) To the 5 th portion add 3 drops of dilute hydrochloric acid. | White ppt soluble in warm water | Pb^{2+} |

14

3. You are provided with solid K. Carry out the tests below. Write your observations and inferences in the spaces provide.

| Experiment | Observations | Inferences |
|--|--|---|
| Using a clean metallic spatula, heat about one third of solid K in a Bunsen burner flame | Burns with a yellow sooty flame. (1mks) | $C=C'$ - - $C=C'$ (1mk) Pure |
| Dissolve the remaining portion of solid K into about 2cm ³ of distilled water | Dissolves to form a colourless solution. (1 mark) | POA (aq) (1 mark) |
| Add two drops of bromine water. | Yellow bromine water changes to colourless (1 mark) | $C=C'$ a - $C=C'$ ' ' Pure (1 mark) |