

THE UNITED REPUBLIC OF TANZANIA  
NATIONAL EXAMINATIONS COUNCIL  
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

032/2A

CHEMISTRY 2A  
ACTUAL PRACTICAL A  
(For Both School and Private Candidates)

Time: 2:30 Hours

Tuesday, 08<sup>th</sup> November 2016 a.m.

Instructions

1. This paper consists of **three (3)** questions. Answer **all** the questions.
2. Question 1 carries **twenty (20)** marks and the rest carry **fifteen (15)** marks each.
3. Qualitative Analysis Guidance Pamphlets may be used after a thorough check by the supervisor.
4. Cellular phones and calculators are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).

6. You may use the following constants:

Atomic masses:

H = 1, C = 12, N = 14, O = 16, Na = 23, Cl = 35.5.

1 litre = 1 dm<sup>3</sup> = 1000 cm<sup>3</sup>.

1. You are provided with the following solutions:

- Q:** Contains 36.5 g of hydrochloric acid in 1 litre of the solution;  
**P:** Contains 4.0 g of impure ammonium hydroxide per 0.25 dm<sup>3</sup> of the solution;  
Methyl orange indicator.

**Procedure:**

- Measure exactly 10 cm<sup>3</sup> of **Q** by using 10 cm<sup>3</sup> measuring cylinder and pour into 100 cm<sup>3</sup> measuring cylinder. Carefully add distilled water to 100 cm<sup>3</sup> mark then stir. Fill the resulting solution into a burette.
- Titrate **Q** against **P** using two drops of the indicator; obtain three accurate values. Record your results in a tabular form.

**Questions:**

- What if phenolphthalein indicator was used in place of methyl orange indicator for the titration of the given solutions? Give reasons for your answer.
  - \_\_\_\_\_ cm<sup>3</sup> of **P** required \_\_\_\_\_ cm<sup>3</sup> of **Q** for complete reaction.
    - Write a balanced chemical equation for the reaction between **Q** and **P**.
  - Showing your procedures clearly, calculate the percentage by weight of the impurity in the ammonium hydroxide.
2. You are provided with the following:
- BB:** A 0.25 M sodium thiosulphate solution;  
**DD:** A of 0.10 M hydrochloric acid solution;  
A stop watch/clock; a white plain paper with a cross and a thermometer.

**Procedure**

- Place a 100 cm<sup>3</sup> beaker on top of a cross on the plain paper provided such that the cross is visible through the solution when viewed from above.
- Prepare a water bath using a 250 cm<sup>3</sup> or a 300 cm<sup>3</sup> beaker.
- Measure exactly 10 cm<sup>3</sup> of **BB** and 10 cm<sup>3</sup> of **DD** and pour into separate boiling test tubes.
- Put the two boiling test tubes into the water bath in (ii) above and warm the contents to 40 °C.
- Immediately pour the hot solutions **BB** and **DD** into the 100 cm<sup>3</sup> beaker in (i) above and simultaneously start the stop watch/clock. Record the time taken in seconds, for the cross to disappear completely.
- Repeat procedure (iii) to (v) at different temperatures, 50 °C, 60 °C and 70 °C. Record your readings in a tabular form as shown in Table 1:

Table 1

| Temperature (°C) | Time (sec) | $\frac{1}{\text{time}} (\text{sec}^{-1})$ |
|------------------|------------|-------------------------------------------|
| 40               |            |                                           |
| 50               |            |                                           |
| 60               |            |                                           |
| 70               |            |                                           |

### Questions

- (a) (i) Record the room temperature.  
 (ii) Complete the table by filling the blank columns.
  - (b) Plot a graph of temperature against time from your results.
  - (c) Write a balanced ionic equation for the reaction between the dilute acid and sodium thiosulphate.
  - (d) What does  $\frac{1}{\text{time}}$  represent?
  - (e) From the obtained data, what do you observe about the effect of increasing temperature on the rate of the reaction?
3. You are provided with sample **R** containing one cation and one anion. Carry out the guided systematic procedure in the Table 2 to identify the cation and anion present in the sample **R**.

Table 2

| S/n | Experiments                                                                                             | Observation | Inference |
|-----|---------------------------------------------------------------------------------------------------------|-------------|-----------|
| (a) | Observe sample <b>R</b> .                                                                               |             |           |
| (b) | Heat sample <b>R</b> in a dry test tube.                                                                |             |           |
| (c) | Prepare a stock solution of sample <b>R</b> . Divide the resulting solution into six portions then add: |             |           |
|     | (i) dilute HCl solution in small quantities then in excess to the first portion.                        |             |           |
|     | (ii) small amount of concentrated H <sub>2</sub> SO <sub>4</sub> to the second portion, then warm.      |             |           |
|     | (iii) NaOH solution to the third portion, drop-wise till excess.                                        |             |           |
|     | (iv) dilute NH <sub>4</sub> OH in small amount then in excess to the fourth portion.                    |             |           |
|     | (v) FeSO <sub>4</sub> solution followed by conc. H <sub>2</sub> SO <sub>4</sub> to the fifth portion.   |             |           |
|     | (vi) KI solution to the sixth portion, warm then cool the mixture.                                      |             |           |

### Conclusion

- (i) Cation present in **R** is \_\_\_\_\_.
- (ii) Anion present in **R** is \_\_\_\_\_.
- (iii) The chemical formula for **R** is \_\_\_\_\_.
- (iv) Write the equations for the reactions that took place at experiments (b) and (c) (ii).