THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
DIPLOMA IN SECONDARY EDUCATION EXAMINATION

732/2B **CHEMISTRY 2B**

(ACTUAL PRACTICAL B)

Time: 3 Hours **ANSWERS** **Year: 2016**

Instructions.

1. This paper consists of **three (3)** questions.
2. Answer **all** questions
3. Question number 1 carries 20 marks and the rest carry 30 marks.
4. Cellular phones are **note** allowed in the examination room.
5. Write your **examination Number** on every page of your answer booklet(s).

1. You are provided with:

- **S1**: Sodium hydroxide (unknown concentration)
- **S2**: 3.65 g of HCl dissolved in 1 dm^3
- Methyl orange indicator

(a) The colour change is **yellow to orange-pink**, indicating the neutralization point between a strong acid and strong base.

(b) Balanced chemical equation:

$NaOH\ (aq) + HCl\ (aq) \rightarrow NaCl\ (aq) + H_2O\ (l)$

(c) Molar mass of HCl = 1 + 35.5 = 36.5 g/mol

Concentration of S2 = 3.65 ÷ 36.5 = **0.1 mol/dm^3**

(d) Moles of HCl in 25.0 cm^3 = 0.1 × 25 ÷ 1000 = **0.0025 mol**

(e) From the equation, mole ratio is 1:1

So, moles of NaOH = 0.0025 mol

(f) Volume of NaOH used = 25.0 cm^3 = 0.025 dm^3

Concentration in mol/dm^3 = 0.0025 ÷ 0.025 = **0.1 mol/dm^3**

Concentration in g/dm^3 = 0.1 × 40 = **4.0 g/dm^3**

(g) Reasons for using NaOH pellets:

NaOH pellets are **more stable and easier to store** than aqueous NaOH which absorbs CO_2 from air.

Using pellets allows the technician to **prepare a fresh, accurate concentration** of base as needed.

2. You are given:

W1: potassium iodide

W2: hydrogen peroxide

W3: sulfuric acid

Starch indicator

(a) The blue-black colour appears due to the formation of **iodine (I_2)**, which reacts with starch to form a blue-black complex.

(b) Completed table:

Temperature (°C)	Temperature (K)	Time (s)
25	298	72
35	308	52
45	318	36
55	328	24
65	338	14

(c) Net ionic equation:

$H_2O_2\ (aq) + 2I^-\ (aq) + 2H^+\ (aq) \rightarrow I_2\ (aq) + 2H_2O\ (l)$

(d) Graph: Plot temperature (K) on the x-axis and time (s) on the y-axis. The graph will show a **decreasing curve**, indicating that time decreases as temperature increases.

(e) Temperature increases the **rate of reaction**. This is because higher temperature gives particles more kinetic energy, increasing the number of effective collisions per second.

(f) At 15°C, the time would increase further beyond 72 seconds, possibly above 90 seconds, because **lower temperatures slow down reaction rates** by reducing the frequency and energy of collisions.

3. You are given salt **Y**.

(i) Table of observations and inferences:

Test	**Observation**	**Inference**
Appearance	Blue crystalline solid	Likely copper salt
Heating	Water droplets on tube walls	Hydrated salt present
NaOH (few drops)	Pale blue precipitate	Cu^{2+} present
NaOH (excess)	Precipitate remains	Confirms Cu^{2+}
Ammonia (few drops)	Light blue precipitate	Cu^{2+} confirmed
Ammonia (excess)	Deep blue solution forms	Strong confirmation of Cu^{2+}
$BaCl_2$ + HCl	White precipitate forms	SO_4^{2-} present
$AgNO_3$ + HNO_3	No precipitate	No halides present

(ii) The cation is **Cu^{2+}**, the anion is **SO_4^{2-}**. Salt Y is **copper(II) sulfate pentahydrate ($CuSO_4 \cdot 5H_2O$)**.

(iii) Reaction with barium chloride:

$CuSO_4\ (aq) + BaCl_2\ (aq) \rightarrow BaSO_4\ (s) + CuCl_2\ (aq)$

(iv) Distinguishing property:

The deep blue complex formed with excess ammonia is characteristic of transition metal (Cu^{2+}) coordination chemistry.