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: 2015**

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:

- **R1**: Potassium hydroxide (unknown concentration)
- **R2**: Sulphuric acid, 0.05 mol/dm³
- Phenolphthalein indicator

(a) The colour change observed at the end point is **pink to colourless**, indicating the base (R1) has been neutralized by the acid.

(b) Average volume of R2 used = **25.0 cm³**

(c) Balanced chemical equation:

$2KOH\ (aq) + H_2SO_4\ (aq) \rightarrow K_2SO_4\ (aq) + 2H_2O\ (l)$

(d) Moles of H_2SO_4 used = 0.05 mol/dm³ × 25.0 cm³ ÷ 1000 = **0.00125 mol**

(e) From the equation, 1 mol H_2SO_4 reacts with 2 mol KOH

So, moles of KOH = 0.00125 mol × 2 = **0.0025 mol**

(f) Volume of R1 used = 25.0 cm³ = 0.025 dm³

Concentration of R1 = 0.0025 ÷ 0.025 = **0.1 mol/dm³**

(g) Molar mass of KOH = 39 + 16 + 1 = 56 g/mol

Concentration in g/dm³ = 0.1 mol/dm³ × 56 g/mol = **5.6 g/dm³**

2. You are given:

- T1: sodium thiosulphate
- T2: hydrochloric acid

(a) The mark "+" disappears due to the formation of **sulfur precipitate**, which makes the solution cloudy and blocks the mark from view.

(b) Completed table:

Experiment	T1 (cm³)	Water (cm³)	T2 (cm³)	Time (s)
1	10	0	10	22
2	8	2	10	28
3	6	4	10	35
4	4	6	10	48
5	2	8	10	70

(c)

Balanced chemical equation:

$Na_2S_2O_3\ (aq) + 2HCl\ (aq) \rightarrow 2NaCl\ (aq) + H_2O\ (l) + SO_2\ (g) + S\ (s)$

Ionic equation:

$S_2O_3^{2-}\ (aq) + 2H^+\ (aq) \rightarrow H_2O\ (l) + SO_2\ (g) + S\ (s)$

(d) As the concentration of T1 (sodium thiosulphate) decreases, the **rate of reaction decreases**, leading to **longer reaction times**.

(e) Precautions:

- Ensure all solutions are measured accurately using clean apparatus
- Start timing immediately after mixing the reactants to get reliable time readings

3. You are given salt **Z**.

(i) Observations and inferences:

Test	**Observation**	**Inference**
Appearance	White crystalline solid	Ionic salt
Heating	Brown fumes, smell of NO_2	Presence of nitrate
Solubility	Soluble in water	Confirms ionic nature
NaOH (few drops)	White precipitate formed	Possibly Pb^{2+} or Al^{3+}
NaOH (excess)	Precipitate remains insoluble	Confirms Pb^{2+}
Ammonia (few drops)	White precipitate	Confirms Pb^{2+}
Ammonia (excess)	No change	Confirms Pb^{2+}
$BaCl_2$ + HCl	No precipitate	No sulfate or carbonate
$AgNO_3$ + HNO_3	No precipitate	No halide present

(ii) Cation is **Pb^{2+}**, anion is **NO_3^-**, hence the salt is **lead(II) nitrate ($Pb(NO_3)_2$)**.

(iii)

With NaOH:

Pb^{2+} (aq) + 2NaOH (aq) → $Pb(OH)_2$ (s) + $2Na^+$ (aq)

With heat:

$2Pb(NO_3)_2$ (s) → 2PbO (s) + $4NO_2$ (g) + O_2 (g)

(iv) To distinguish it from a chloride, **add $AgNO_3$** to a fresh solution:

- A chloride would form a **white precipitate** of AgCl
- Nitrate gives **no precipitate**, confirming it is not a chloride