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: 2012**

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:

Solution coded **K1**: sulfuric acid of unknown concentration

Solution **K2**: sodium hydroxide, 4.00 g NaOH in 1 dm^3

Phenolphthalein indicator

(i) The colour change observed is **pink to colourless**. This occurs because phenolphthalein is pink in basic solution and turns colourless when neutralized by the acid.

(ii) The volume of the pipette used is **25.0 cm^3**, which is standard in titration to transfer a known volume of base (K2).

(iii) If the average titre is 25.0 cm^3, then the average volume of K1 used to neutralize K2 is **25.0 cm^3**.

(iv) Balanced chemical equation:

H_2SO_4 (aq) + 2NaOH (aq) → Na_2SO_4 (aq) + $2H_2O$ (l)

(v) Ionic equation:

$2OH^-$ (aq) + $2H^+$ (aq) → $2H_2O$ (l)

(vi) Molar mass of NaOH = 23 + 16 + 1 = 40 g/mol

Concentration of K2 = 4.00 g/dm^3 ÷ 40 g/mol = 0.1 mol/dm^3

Moles of NaOH in 25.0 cm^3 = 0.1 × 25.0 ÷ 1000 = 0.0025 mol

From the balanced equation, 2 mol NaOH reacts with 1 mol H_2SO_4

So moles of H_2SO_4 = 0.0025 ÷ 2 = 0.00125 mol

Volume of acid used = 25.0 cm^3 = 0.025 dm^3

Concentration of H_2SO_4 = 0.00125 mol ÷ 0.025 dm^3 = **0.05 mol/dm^3**

2. You are provided with:

- Y1: 0.1 M hydrochloric acid
- Y2: magnesium ribbon
- Stopwatch and thermometer

(i) Room temperature is approximately **298 K**.

(ii) Effervescence is caused by the release of **hydrogen gas (H_2)** during the reaction between magnesium and hydrochloric acid.

(iii) Sample data table:

Experiment	Temperature (°C)	Temperature (K)	Time (s)
1	30	303	60
2	40	313	40
3	50	323	27
4	60	333	18
5	70	343	10

(iv) Balanced chemical equation:

$Mg\ (s) + 2HCl\ (aq) \rightarrow MgCl_2\ (aq) + H_2\ (g)$

(v) Ionic equation:

$Mg\ (s) + 2H^+\ (aq) \rightarrow Mg^{2+}\ (aq) + H_2\ (g)$

(vi) The graph of temperature (K) against time (s) would show that as temperature increases, reaction time decreases. This indicates a faster reaction rate.

(vii) Conclusion: Higher temperature increases the kinetic energy of particles, leading to faster collisions and a faster reaction.

3. You are given a salt coded **W**.

(i) Sample table of results:

Test	**Observation**	**Inference**
Appearance	White crystalline solid	Likely ionic salt
Heating	Brown fumes evolved	Suggests nitrate (NO_3^-)
Solubility in water	Soluble	Soluble ionic compound
NaOH (few drops)	Brown precipitate formed	Fe^{3+} likely
NaOH (excess)	Precipitate remains	Confirms Fe^{3+}
Aqueous ammonia (few drops)	Brown precipitate	Confirms Fe^{3+}
Aqueous ammonia (excess)	No further change	Fe^{3+} confirmed
$Ba(NO_3)_2$ + dilute HNO_3	No precipitate	No SO_4^{2-} or CO_3^{2-}
$AgNO_3$ + HNO_3	No precipitate	No Cl^-, Br^- or I^-

(ii) Balanced equation for NaOH test:

$Fe^{3+}\ (aq) + 3NaOH\ (aq) \rightarrow Fe(OH)_3\ (s) + 3Na^+\ (aq)$

(iii) The cation is **Fe^{3+}** and the anion is **NO_3^-**, so salt **W** is **iron(III) nitrate ($Fe(NO_3)_3$)**.

(iv) Reaction with sodium carbonate:

$2Fe(NO_3)_3\ (aq) + 3Na_2CO_3\ (aq) \rightarrow 2Fe_2(CO_3)_3\ (s) + 6NaNO_3\ (aq)$