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 **ANSWERS** **Year: 2018**

Instructions

1. This paper consists of two questions.

2. Answer all questions.

1. You are provided with the following:
X: 0.5 M sulphuric acid solution
Y: Monovalent metal hydroxide made by dissolving 4.00 g of MOH in distilled water to make 1 dm^3 solution

(a)(i) The colour change at the end point was from yellow to orange or red (methyl orange indicator).
(ii) 25.00 cm^3 of X_1 was required to completely react with 25.00 cm^3 of Y.

(b) Write a balanced chemical equation for the reaction between X_1 and Y.

$H_2SO_4(aq) + 2MOH(aq) \text{----> } M_2SO_4(aq) + 2H_2O(l)$

(c) Calculate the following:
(i) Molarity of X_1 = 0.5 M (already given)
(ii) Molarity of Y:
Mole ratio = 1 mol H_2SO_4 reacts with 2 mol MOH
Moles of H_2SO_4 = 0.5 × 0.025 = 0.0125 mol
Moles of MOH = 2 × 0.0125 = 0.025 mol
Volume of Y = 25 cm^3 = 0.025 dm^3
Molarity of Y = 0.025 ÷ 0.025 = 1.0 mol/dm^3
(iii) Atomic mass of M:
Moles of MOH in 1 dm^3 = 1.0 mol
Mass = 4.00 g
Atomic mass = 4.00 ÷ 1.0 = 40 g/mol
Metal M is potassium (K)

(d) Identify metal M and write its electronic configuration.
Metal M is potassium (K)
Electronic configuration: 2:8:9

(e) State two properties of each of X and Y.

X (sulphuric acid):
- Strong acid
- Turns blue litmus red

Y (potassium hydroxide):
- Strong base
- Turns red litmus blue

2. You are provided with the following:
H_1: 0.25 M $Na_2S_2O_3$
H_2: 2 M HCl

Distilled water, stopwatch, thermometer

(a) Fill Table 1.

Exp. No	Temperature (°C)	Time (s)	Rate (1/t) s^{-1}
1	70	18	0.0556
2	60	26	0.0385
3	50	35	0.0286
4	40	50	0.0200
5	Room temp (25)	65	0.0154

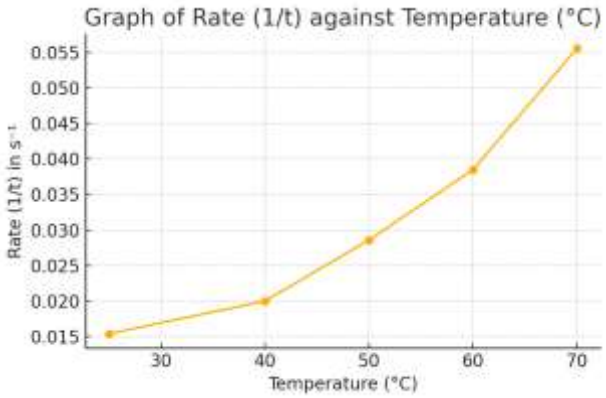
(b) Write a balanced equation for reaction between H_1 and H_2.

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

(c) Which product causes the solution to cloud the letter X?

Sulphur (S) is the product that caused the solution to become cloudy.

(d) Plot a graph of rate (1/t) against temperature.



(e) What conclusion can you draw from this experiment?
As temperature increased, the rate of reaction increased. This confirmed that temperature positively affects the rate of chemical reactions by increasing kinetic energy and frequency of collisions.

3. Sample N is a simple salt containing one cation and one anion.

S/N	Experiments	Observation	Inference
a	Appearance of solid sample	White crystalline solid	Ionic salt
b	Heated sample	No water droplets	No water of crystallization
c	Added dilute HCl to sample	Effervescence observed	Presence of carbonate (CO_3^{2-})
d	Flame test	Brick-red flame	Calcium ion (Ca^{2+})
e(i)	Added NaOH	White precipitate formed	Ca^{2+} confirmed
e(ii)	Added $MgSO_4$, then warmed	White precipitate formed	Confirmed CO_3^{2-} ion

Conclusion:
(i) The cation is Ca^{2+} and the anion is CO_3^{2-}
(ii) The sample N is calcium carbonate
(iii) The chemical reactions are:
(b) $CaCO_3(s)$ + heat ----> no change (heat-stable salt)
(c) $CaCO_3(s) + 2HCl(aq) \longrightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$
(iv) Uses of sample N:
- Used in manufacturing of cement
- Used to neutralize acidic soils