

NAME: ADM NO: CLASS:

TEACHER.CO.KE
CHEMISTRY
FORM 4
PAPER 3
TIME: 1 HR 25 MIN

Q1 = 11MKS

Q2 = 14MKS

Q1. You are provided with:

Solution A: Potassium Chromate VI

Solution B : 0.1mNa₂SO₃You are required to determine the number of moles dichromate VI ions (Cr₂O₇²⁻) in one litre of solution.**PROCEDURE**

Fill the burette with solution B. Pipette 25cm³ of solution A and transfer it into conical flask. Titrate until a permanent green colour is obtained. Record your results in table below and repeat the procedure to fill the table.

| | I | II | III |
|---|-----|------|------|
| Find burette readings | 8.0 | 15.5 | 23.0 |
| Initial burette readings | 0.0 | 8.0 | 15.5 |
| Volume of solution B (cm ³) | 8.0 | 7.5 | 7.5 |

1. Determine the average volume of solution B.

$$\frac{7.5 + 7.5}{2} = 7.5\text{cm}^3$$

CT√

D√

PA√

A± 0.1√

±0.2√

FA√

2. Calculate the number of moles of solution B.

$$\frac{1.0 \times 7.5}{1000}$$

$$= 0.00075\text{moles}$$

. Given that the ionic equation for the reaction between dichromate ion and sulphate is;



Calculate;

i) Number of moles of dichromate IV ion in 25cm³

$$\frac{0.00075}{3}$$

3

$$= 0.00025 \text{ moles}$$

ii) Moles of dichromate ion one litre of solution.

$$\frac{0.00025 \times 1000}{25}$$

$$= 0.01\text{moles/litre}$$

(5mks)

(2mks)

(2mks)

. You are provided with substance E, carry out the tests below and write your observations and inferences in the space provided.

a) Describe the appearance of substance E.

White crystalline solid// colourless crystalline solid.

b) Place one third of substance E in the test tube. Heat it strongly.

| Observation | inferences |
|--|--|
| colourless vapor on condenses on cover plots (1mk) | Hydrate salt// contains water of crystallization (1mk) |

c) Place remaining amount of E in boiling tube. Add about 10cm³ of distilled water and shake well. Retain the mixture for tests in d) below.

| Observations | inferences |
|--|---|
| Solid dissolved forming colorless solution (1mk) | soluble salt Absence of Fe²⁺, Fe³⁺, Cu²⁺ (1mk) |

d) Use about 2cm³ portion of the mixture obtained in (c) for tests (i) to (iv)

i) Add 2 to 3 drops of lead (ii) Nitrate to the mixture.

| Observation | inferences |
|-----------------------------------|--|
| White precipitate (1mk) | SO₄²⁻ SO₃²⁻ Present All=1√ CO₃²⁻ 3=√ Cl⁻ 2 or 1 = 0 (1mk) |

ii) Add 2 to 3 drops of barium Nitrate to second portion of the mixture.

| Observation | inferences |
|-----------------------------------|--|
| White precipitate (1mk) | SO₄²⁻ SO₃²⁻ All=1√ CO₃²⁻ 2=√ 1 = 0 (1mk) |

iii) Add five drops of dilute nitric (v) acid to the mixture in (ii) above

| Observation | inferences |
|---|---|
| White precipitate present (1mk) | SO₄²⁻ confirmed (1mk) |

iv) To the last portion, add few then excess drops of sodium hydroxide.

| Observation | inferences |
|--|--|
| White precipitate present Insoluble in excess√ (1mk) | Mg²⁺ √present (1mk) |

e) Give the formula of cation and anion present in substance E.

Cat ion **Mg²⁺**
Anion **SO₄²⁻**