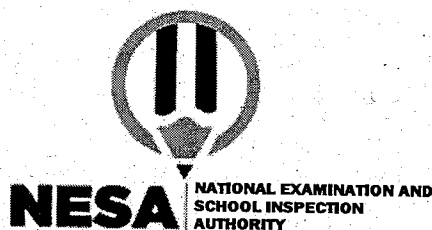


Chemistry III

015

29/07/2021 08:30 AM – 10:00 AM



ADVANCED LEVEL NATIONAL EXAMINATIONS, 2020-2021

SUBJECT: CHEMISTRY III PRACTICAL EXAM

COMBINATIONS:

- BIOLOGY-CHEMISTRY-GEOGRAPHY (BCG)
- MATHEMATICS-CHEMISTRY-BIOLOGY (MCB)
- PHYSICS-CHEMISTRY-BIOLOGY (PCB)
- PHYSICS-CHEMISTRY-MATHEMATICS (PCM)

DURATION: 1 hour 30 minutes

Marks:

/30

INSTRUCTIONS:

- 1) Write your name and index number on the answer booklet as written on your registration form, and **DO NOT** write your names and index number on additional answer sheets if provided.
- 2) Please read carefully before you start and make sure that you have all the apparatuses and chemicals that you may need.
- 3) This paper has one question.
- 4) Answer the question in this paper and record your answers in the spaces provided.
- 5) Non-programmable scientific calculators may be used.

BACK TITRATION: DETERMINATION OF PERCENTAGE PURITY OF Na₂SO₃
IMPURE SAMPLE

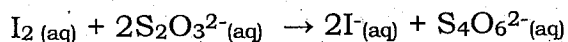
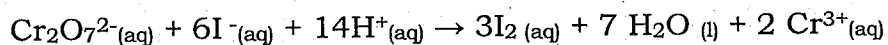
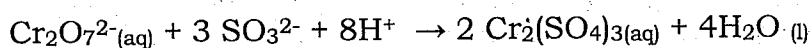
Titration of Na₂S₂O₃.5H₂O (0.1 mole/litre) against iodine (I₂) liberated by oxidation of iodide ions by K₂Cr₂O₇ = 0.02 mole/litre.

PROCEDURE:

- (i) Pour 100 ml of H₂SO₄ (1 mole/litre) solution in a beaker.
- (ii) Add 100 ml of K₂Cr₂O₇, (0.02 mole/litre) to the H₂SO₄ acid solution in the beaker.
- (iii) Add **0.3 g of Na₂SO₃ crystals** to the above 200 ml solution mixture of K₂Cr₂O₇ (0.02 mole/litre) and H₂SO₄ (1 mole/litre) then stir gently.
- (iv) Label this 200 ml solution mixture of K₂Cr₂O₇ (0.02 mole/litre) and H₂SO₄ (1 mole/litre) solution containing 0.3 g of Na₂SO₃ crystals as **P**.
- (v) Measure 50 ml of solution **P** using a measuring cylinder and pour it in an empty conical flask or beaker then add in it 25 ml of KI (0.2 mole/litre) solution.
Call (label) this solution as **Q**.
- (vi) Fill the burette with Na₂S₂O₃. 5H₂O (0.1 mole/litre) solution.
- (vii) Titrate the Na₂S₂O₃. 5H₂O (0.1 mole/litre) into the red solution (Q) until the solution turns orange.
- (viii) Add some drops (about a half dropper full) of starch solution in the orange **Q** solution of iodine in the conical flask to obtain a blue-black solution.
- (ix) Continue the titration of Na₂S₂O₃. 5H₂O (0.1 mole/litre) in the blue-black iodine solution **Q** above until the black colour discharges (disappears).
- (x) Record the volume of Na₂S₂O₃. 5H₂O used to reach equivalent point with **Q** in the table of results.
- (xi) Repeat the experiment **procedures v) to xi) 2 times** to get consistent results.

TABLE OF RESULTS (9 marks)

Experiment	1	2	3
Initial volume of FA3 (Na ₂ S ₂ O ₃ .xH ₂ O) (ml)			
Final volume of FA3 (Na ₂ S ₂ O ₃ .xH ₂ O) (ml)			
Volume of FA3 (Na ₂ S ₂ O ₃ .xH ₂ O) used(ml)			

Equations of the reactions:**Questions:**

- a) Calculate the average volume of S₂O₃²⁻ used in this titration. **(2 marks)**
- b) Calculate the number of moles of S₂O₃²⁻ used in the titrated volume.
(2 marks)
- c) Calculate the number of moles of Iodine (I₂) that reacted with S₂O₃²⁻ during titration.
(2 marks)

- d) Determine the number of moles of $\text{Cr}_2\text{O}_7^{2-}$ that reacted to produce the iodine (I_2) in 50 ml of solution Q. **(2 marks)**
- e) Determine the number of moles of $\text{Cr}_2\text{O}_7^{2-}$ in the 200 ml of solution P. **(2 marks)**
- f) Calculate the number of moles of $\text{Cr}_2\text{O}_7^{2-}$ (0.02 mole/litre) in the 100 ml of solution before adding **neither** 100ml H_2SO_4 (1 mole/litre) **nor** 0.3 g of Na_2SO_3 to it. **(2 marks)**
- g) Calculate the number of moles of $\text{Cr}_2\text{O}_7^{2-}$ (0.02 mole/litre) that reacted with Na_2SO_3 in the 0.3 g impure sample to obtain solution P. **(2 marks)**
- h) Determine the number of moles of Na_2SO_3 in 0.3 g impure sample. **(2 marks)**
- i) Calculate the mass of Na_2SO_3 in the 0.3 g of impure Na_2SO_3 **(2 marks)**
- j) Calculate the percentage composition of Na_2SO_3 in the 0.3g impure sample. **(3 marks)**