Name ………………………………………………………….Index No………………………………….

Candidates signature ……………………………………. Date…………………………………………….

233/3

CHEMISTRY

Paper 2 ¼

(Practical)

2 ¼ hours

**ARISE AND SHINE TRIAL 1 EXAMINATION -2022**

Kenya Certificate of Secondary Education (K.C.S.E)

**Instructions to candidates.**

1. Write your name and index number in the spaces provided above.
2. Answer all questions in the spaces provided in the question paper.
3. Mathematical tables (KNEC) and silent electronic calculators may be used.
4. All workings must be clearly shown where necessary.
5. Candidates should answer the questions in English.

For examiners use only.

|  |  |  |
| --- | --- | --- |
| Question | Maximum score | Candidate’s score |
| 1 | 22 |  |
| 2 | 10 |  |
| 3 | 8 |  |
| Total score | 40 |  |

1. (a). You are provided with

(i). 0.3g of metal F.

(ii). 100cm3 of 1.0M hydrochloric acid solution labelled as solution G.

(iii). 120cm3 of 0.1M sodium hydroxide solution, labelled as solution H.

(iv). Screened methyl orange indicators solution.

You are required to determine the Relative Atomic Mass of metal F.

Procedure

(a). Using a burette, measure 50.0cm3 of solution G into a clean 250ml beaker.

(b). Add the WHOLE AMOUNT of F provided into the beaker containing 50.0cm3 of solution G and stir well with a glass rod until ALL the solid metal reacts completely.

(c). Transfer the mixture left in the beaker after the reaction into a 250ml Volumetric flask. Rinse the beaker as well as the glass rod with distilled water and transfer ALL the rinsings into the volumetric flask. Make up the volume of the solution in the volumetric flask up to the calibration mark with distilled water, cover the flask with a stopper, shake well and label as solution Q.

(d). Fill a clean burette with solution Q.

(e). Pipette 25.0cm3 of solution H into a 250ml conical flask, add 3 drops of screened methyl orange indicator solution and titrate against solution Q from the burette.

A change in colour of the mixture from green to pink marks the end point of titration.

Record your results in table 1.

(f). Repeat the titration TWO more times to complete table I.

Table I

|  |  |  |  |
| --- | --- | --- | --- |
| Titration | 1 | 2 | 3 |
| Final burette reading, cm3 |  |  |  |
| Initial burette reading,cm3 |  |  |  |
| Volume of solution Q used,cm3 |  |  |  |

(4 marks)

Average volume of Q used, cm3 ………………………………………………….. (1 mark)

(g). Calculate:

(i). Calculate the number of moles of HCl in 50.0cm3of solution G. (1 mark)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(ii). Determine the number of moles of NaOH in 25.0cm3 of solution H. (1 mark)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(iii). Determine the number of moles of HCl in the average volume of solution Q useD in the titration. (1 mark)

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(iv). Calculate the moles of HCl left unreacted after the reaction between F and solution G. (1 mark)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(vi). Determine the moles of HCl that reacted with metal F. (1 mark) ………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(vi). Given that metal F forms a divalent cation, determine the moles of metal F that reacted with hydrochloric acid. (1 mark)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(vii). Determine the Relative Atomic mass of metal F. (1 mark)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1(b). You are provided with

(i). 2.00g of solid K.

(ii). A thermometer

(iii). Distilled water

(iv). Boiling tube

(v). Hot water bath.

You are required to determine the temperatures at which solutions of known concentrations of compound K becomes saturated and plot solubility curve.

Procedure.

(a). Transfer the whole amount of solid K supplied to you into clean dry boiling tube.

(b). Using a burette, add 5.0cm3 of distilled water into the boiling tube with solid K

(c) Put the boiling tubeinto a beaker of hot water bath and warm the boiling tube, while continuously stirring the content with thermometer, until the crystals of K dissolve/disappear

(DO NOT BREAK THE THERMOMETER)

(d). Remove the boiling tube from the hot water bath and allow the content to cool slowly while stirring with the thermometer. Not the temperature at which crystals

FIRST form/reappear and record this temperature in Table 2.

(e). Add a further 2.00cm3 of distilled water from the burette into the boiling tube containing the mixture and repeat steps (c) and (d) above. Continue this way until the volume of water added to boiling tube is 5.00cm3.

(f). Complete Table 2 by calculating the solubility of compound K in water at different temperatures.

|  |  |  |
| --- | --- | --- |
| Total volume of  water added (cm3) | Temperature at which  crystals first appear (oc) | Solubility of compound K  in water (g/100g water) |
| 5.00 |  |  |
| 7.00 |  |  |
| 9.00 |  |  |
| 11.00 |  |  |
| 13.00 |  |  |
| 15.00 |  |  |

(6 marks)

(g). On the grid provided plot a graph of solubility of compound K (vertical axis) against temperature.

(3 marks)



(h). From your graph determines the solubility of K in water at 25.0oc. (1 mark)

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2. You are provided with 10cm3 of solution R containing TWO cations and ONE anions carry out the tests below and record your observations and inferences in the spaces provided.

(a). Add 20cm3 of 2M sodium hydroxide to all of solution R provided. Shake well. Filter the mixture into a

conical flask. Retain both the filtrate and residue.

|  |  |
| --- | --- |
| Observation | Inference |
| (1/2 mark) | (1/2 mark) |

(b). To about 2cm3 of the filtrate, add 1cm3 of 2cm3 of 2M nitric acid. Retain the mixture.

Observation (1/2 )

Divide the mixture in (b) above into TWO portions

(i). To the FIRST portion, add aqueous sodium hydroxide solution drop wise until in excess.

|  |  |
| --- | --- |
| Observation | Inference |
| (1 mark) | (1 mark) |

(ii). To the SECOND portion, add 2M aqueous ammonia solution DROPWISE until in excess.

|  |  |
| --- | --- |
| Observation | Inference |
| (1 mark) | (1 mark) |

(c). To about 2cm3 of the filtrate, add 3 drops of 2M hydrochloric acid

|  |  |
| --- | --- |
| Observation | Inference |
| (1/2 mark) | (1/2 mark) |

(d). To about 2cm3 of the filtrate, add about 1cm3 of acidified Barium chloride solution

|  |  |
| --- | --- |
| Observation | Inference |
| (1/2 mark) | (1 mark) |

(e). To the RESIDUE add about 5cm3 of dilute nitric acid and filter into a clean test tube. To about 2cm3 of this filtrate add 2M aqueous. Ammonia solution dropwise until in excess and filter into clean test tube.

|  |  |
| --- | --- |
| Observation | Inference |
| (1 mark) | (1 mark) |

3. You are provided with solid Z.

Carry out tests below. Write your observations and inferences in the spaces provided.

(a). Scoop a little of solid Z (using a clean spatula and burn it in a |Bunsen burner flame.

|  |  |
| --- | --- |
| Observation | Inference |
| (1 mark) | (1 mark) |

(b). To the remaining portion, add about 6m3 of distilled water and shake. Divide the mixture into two portions

|  |  |
| --- | --- |
| Observation | Inference |
| (1 mark) | (1 mark) |

(c). To the second portion, add the whole of sodium carbonate provided.

|  |  |
| --- | --- |
| Observation | Inference |
| (1 mark) | (1 mark) |

(d). To a little amount of Z, add sodium carbonate.

|  |  |
| --- | --- |
| Observation | Inference |
| (1 mark) | (1 mark) |