**FORM 4 MURANG’A EXTRA COUNTY SCHOOLS END OF TERM 1- 2023. CHEMISTRY PAPER 3**

**MARKING SCHEME**

1. (a) **TABLE I……………..*Total 5 mks* distributed as below**
* Complete table ----------------------------1mk
* Complete table with 3 titrations ------1mk

 Penalties

1. Unrealistic titre values i.e. values below 1cm3 or hundreds
2. Burette readings beyond 50cm3 unless explained
3. Inverted table
4. Wrong arithmetic

 N/B: Penalize ½ mk each for a maximum of ½ mk

* Decimals ----------1mk(Tied to the 1st and 2nd rows only)

 Should be 1 decimal place or 2 decimal places used consistently otherwise penalise fully.

The 2nd decimal place should either be a 0 or 5

* Accuracy ------------1mk
	1. If any titre value within ± 0.1 of the school value ---------------------------------award 1mk
	2. If any titre within ± 0.2 of the school value ½ mk
	3. If none of the titre values is within ± 0.2 of school value (s.v)-----------award 0mk
* Principles of Averaging -------------1mk

 Values to be averaged **MUST** be shown and **MUST** be within ± 0.2 of each other

Conditions

* 1. If 3 consistent values are averaged -----------1mk
	2. 3 titrations done only 2 are possible and averaged ---1mk
	3. 3 consistent values but only 2 are averaged award 0mk
	4. 3 inconsistent values are average award 0mk

Penalties

1. Penalise ½ mk for arithmetic error in answer outside ± 2 units in the 2nddec. Place.
2. Penalise ½ mk for **NO WORKING** shown but the answer is correct.
3. Accept rounding off to the 2nddec.places otherwise penalise ½ mk if answer is rounded off to 1stdec. place unless values divide exactly to 1 dec. place
* Final answer --------------------1mk

(Compared to school value (S.V) Tied to correct average titre)

* 1. If within ± 0.1 of S.V --------- award 1mk
	2. If within ± 0.2 of S.V -------- award ½mk
	3. If beyond ± 0.2 of S.V--------- award 0mk

**b)** (i) Moles of HCI in 50cm3 of solution B

 = $\frac{1.0 ×50 }{1000}㇢½=0.05 moles㇢½$

 (ii) Moles of NaOH in 25cm3 of solution C

 = $\frac{0.1×25}{1000}㇢½=0.0025 moles㇢½$

 (iii) Moles of HCI in average volume of solution D used

 Mole ratio of NaOH: HCI = 1: 1**㇢½**

 Therefore moles of HCI = moles of NaOH = 0.0025 moles. **㇢½**

**c)** (i) Moles of HCI in 250 cm3 of solution D.

 $\frac{0.0025 ×250 }{average volume }㇢½=correct answer. ㇢½$

 (ii) Moles of HCI that reacted with metal A.

 = 0.05 - answer **c (i)** above **㇢½**

 = correct answer **㇢½**

**d)** (i)Moles of A reacted:

 A + 2HCI → ACI2 + H2

 = answer **c (ii)** above ÷ 2 **㇢½**

 = correct answer **㇢½**

 (ii) Relative atomic mass of metal A

 = $\frac{0.3 }{answer d\left(i\right) above }㇢½$

 $=correct answer.㇢½$ ***(Reject answer in decimal places)***

**PROCEDURE II**

TABLE II ……………..***Total 5 mks*** distributed as below

**(a) Temperature column------------------------------------------------------------------------2½ mks)**

* + Completely filled table ……….. 1 mk
	+ decimals ………………………..1 mk

(Accept whole numbers or 1 d.p (.5) or 2 d.p (.25, 50 or .75)

* + Trend -----------------------------------½ mk

(Should be a continuous decrease in temperature with increase in volume of water added)

**(b) Solubility values------------------------------------------------------------------------------- 2½ mks)**

* + (Award ½ mk for each correctly worked out value of solubility)

 **NOTE**:

Penalize ½ mk each for wrongly worked out value of solubility up to a maximum of 2½ mks

**(c) Graph.**

**Labeling of axes (both) ----------------------------------------------------------------------------- ½ mk)**

* + Penalise ½ mk for wrong units used in any of the axis otherwise ignore if units not given.
	+ Penalise ½ mk for inverted axis
* Accept for ½ mk if no units shown on labeling.

**Scale ----------------------------------------------------------------------------------------------------½mk)**

* + Area covered by actual plots must be at least half of the big squares (y-axis) and half of the big squares ( x – axis)otherwise give zero.
	+ Scale used must be consistent on both axes, otherwise penalise fully.

**Plotting -------------------------------------------------------------------------------------------------1mk)**

* + Accept 5 points correctly plotted for **1mk**
	+ If 3 or 4 points are correctly plotted award **½ mk**
	+ If less than 3 are correctly plotted award **0mk**
	+ Accept correct plots even if the axes are interchanged.

**Curve -----------------------------------------------------------------------------------------------------1mk)**

(i) Award ½mk for extrapolation

 Award another ½ mark for correct reading.

 Penalize ½ mark for wrong units or no units given.

(ii) Correct solubility reading at 70oC – correct solubility reading at 45oC **㇢½**

 **=** correct answer **㇢½ (**Penalize ½ mark for wrong units or no units given)

(iii) Solubility of compound E increases with increase in temperature.

**QUESTION 2**

1.

|  |  |
| --- | --- |
| **Observations**  | **Inferences**  |
| Solid dissolves **㇢½** to form acolourless solution**㇢½** | Salt is soluble **㇢1****Accept for ½ mk –** Cu2+, Fe2+, Fe3+ absent  |

|  |  |
| --- | --- |
| **Observations**  | **Inferences**  |
| White precipitate **㇢½** that does not dissolve **㇢½** in nitric (v) acid. | **SO42- present ㇢½**(Penalize fully for any contradictory ion/s) |

|  |  |
| --- | --- |
| Observations  | Inferences  |
| White precipitate **㇢½** that does not dissolve **㇢½** in nitric (v) acid. | **SO42- confirmed**㇢½(Penalize fully for any contradictory ion given)  |

|  |  |
| --- | --- |
| Observations  | Inferences  |
| No white precipitate**㇢1****Accept for ½ mk** - No observable change - Solution remains colourless**Reject** No change.No reaction. i.e award zero mk.  | **K+, Na+ , Mg2+, Zn2+, Al3+ present** All five given -award 1 mk.Any 3 correct – award ½ mkLess than 3 given -award 0 mk.Penalize ½ mk each for any contradictory ion up to a maximium of 1 mk. Accept for ½ mk Ca2+,Ba2+,Pb2+ absent s |

|  |  |
| --- | --- |
| Observations  | Inferences  |
| White precipitate**㇢½** formed insoluble**㇢½** in excess  | Mg2+  present **㇢½** |

(vi)

|  |  |
| --- | --- |
| Observations  | Inferences  |
| White precipitate**㇢½** formed insoluble**㇢½** in excess  | Mg2+ present **㇢½** |

**QUESTION 3**

1. Burning a little solid G using a Bunsen burner flame.

|  |  |
| --- | --- |
| Observations  | Inferences  |
| Burns with a yellow㇢½ sooty ㇢½ flame – accept burns with a luminous flame for ㇢1 | =C=C= / -C≡C- present㇢1(for either) |

1. Add about 6cm3 of distilled water and shake.

|  |  |
| --- | --- |
| Observations  | Inferences  |
| Solid dissolves to form a colourless solution. ㇢½ | Solid is polar/ polar compound. ㇢½ |

1. To the 1st portion add acidified potassium manganate (VII) solution.

|  |  |
| --- | --- |
| **Observations**  | **Inferences**  |
| Purple acidified potassium manganate (VII) is decolourised. **㇢1** / changes to colourless  | =C=C= **/** -C≡C- present **㇢½** (for either)R-OH **㇢½** |

(d) To the 2nd portion add sodium hydrogen carbonate

|  |  |
| --- | --- |
| **Observations**  | **Inferences**  |
| Effervescence /bubbles /fizzing**㇢½** Reject: fissing/fizzling/hissing.  |  R-COOH**㇢½** or / H+ /H3O+* Reject fully any contradictory functional group. i.e. award 0 mk.
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