**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

=

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

=

(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.

(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

=

***(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**



|  |  |
| --- | --- |
| **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 mk  Less 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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