**FORM 4 END OF TERM 2-2022 EXAMINATION CHEMISTRY PAPER 3**

**MARKING SCHEME**

**CHEMISTRY PAPER 3**

**TERM 2 2022 MARKING SCHEME.**

**Table 1**

* **Complete table ……………… 2 mks**

Penalties / conditions

 Penalize ½ mk for each space not filled in the temperature row upto a maximum

* **Use of decimals – 1mk**

Accept whole numbers or decimals up to 1 dec place (either .0 or .5) or 2nddec. (, 25, .50 or .75) used consistently, otherwise penalize fully.

* **Accuracy ----------- 1 mk**

Compare the candidate’s first temperature reading to the school value (teacher’s first temperature reading)

 If within ± 2.0 oC, award 1mk, otherwise penalize fully.

* **Trend ----------1mk**

Award 1mk if temperature remains constant from 0 min to 1½ min , then a drop followed by a continous rise otherwise penalise fully

(a) 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 8 or 9 points correctly plotted for **1mk**
	+ If 5 or 7 points are correctly plotted award **½ mk**
	+ If less than 5 points are correctly plotted gives **Zero**
	+ Accept correct plots even if the axes are interchanged.

**The lines------------1mk**

Accept for ½ mark an extrapolated straight line passing through at least 2 correctly plotted points from time 0 min to 1½ min. Award another ½ mark for another extrapolated straight line passing through at least 2 correctly plotted points from time 2½ min to 5 min

(b) Showing on the graph √ ½ mk (extrapolation at time 2 minutes)

 - Stating the correct reading of ΔT√ ½ mk

 **Conditions**

* penalise√ ½ mk if not shown on the graph to obtain the value.
* Award 1mk if not shown on graph and not recorded but used correctly in the expression.(mcΔT)
* Award 0 mk if not shown on the graph and value stated is wrong.

(c) Heat change for the reaction

 ΔH = mc ΔT

 = $\frac{20×4.2×ΔT}{1000}$ **√½**

 =correct answer kJ **√½**

 **Penalties / conditions**

1. Accept answer given in joules /kilo joules ignore sign if given however penalize ½ for –ve
2. Otherwise penalize ½ mk for wrong units given

**PROCEDURE II**

TABLE 2 ……………..***Total 5 mks*** distributed as below

1. **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

1. **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

1. **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
2. **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
4. **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

**I**

 Average titre x 1.5 √½ mk =Correct answer√½ mk

 1000

 **Condition /penalties**

1. Penalise ½ mk for wrong Transfer (WT) of titre otherwise Penalise fully for strange value
2. 1.5 Must be transferred INTACT otherwise penalise fully
3. Penalises ½ mk for arithmetic error outside  2 units in the 4thdec. place
4. Accept rounding off of the answer to the 4thdec.place
5. Units may not be shown but it shown must be correct, otherwise penalise ½ mk for wrong units.

**(II)**

**i)** Moles of sodium hydroxide

 **=** $\frac{0.1×average volume }{1000}$

 = correct answer

**ii)**  Moles of NaOH: HCI = 1:1 √½ mk

 Moles of HCI in 25cm3 = correct answer (i) above.√½

**iii)** Moles of HCI in 250cm3

 = $\frac{answer\left(ii\right)×250}{25}$√½

 = correct answer √½

**iv)** Moles of HCI in 20cm3 of solution G.

 = $\frac{2×20}{1000}$√½

= correct answer √½

(v) Moles of hydrochloric acid that reacted with solid F

 = Answer (iv) - Answer (iii) √½

 = correct answer √½

c) Molar enthalpy of reaction between solid F and one mole of hydrochloric acid

 = $\frac{1 ×anwer \left(c\right)}{answer (v)}$√½

 = correct answer (+ve) kJ/mol

 ( penalise ½ mk for ΔH not shown / wrong i.e given as –ve)

**Conditions /penalties**

1. Penalise ½ mk for wrong Transfer (WT) of Answer (ii), otherswisepenalise fully for strange value
2. Penalise ½ mk for an arithmetic error outside ± 2 units in the 4thdec. place
3. Same as (iv) in II above
4. Same as (v) in II above

**IV** Moles in 100cm3 of solution T

 Answer 111 x 100 √½ mk = Correct Answer√ ½ mk

 25

 **Conditions/ penalties**

1. penalise ½ mk for arithmetic error outside  2 units in the 4thdec. place
2. Penalise ½ mk for wrong transfer / rounding off of answer 111
3. Same as (IV) in 11 above
4. Same as (V) in 11 above
5. Moles ratio for reaching of Mg to H2SO4 is 1:1

Moles of H2SO4 used in procedure 1

Answer 1 (d)

Answer 1 (d) + Answer iv √ ½ mk = Correct Answer √½ mk

**Conditions / penalties**

1. Penalise ½ mk for WT of Answer 1 (d) or answer (iv) or for both otherwise penalise fully for strange value.
2. Penalise ½ mark for arithmetic error outside ± 2 units in the 4thdec. place.
3. Molarity of solution Q - H2SO4

 $\frac{1000×answer \left(iv\right)}{50}$ √½ mk = Correct answer √ ½ mk

 **Conditions /penalties**

1. Penalise ½ mk for wrong Transfer of answer (ii) to (iv) otherwise penalize fully for strange value.

**Q2**

|  |  |
| --- | --- |
| Observations  | Inferences |
| A dissolves**√½** to form a colourless solution **√½**  |  Soluble salt/solid **√1**Coloured ions absent **√½** |

|  |  |
| --- | --- |
| Observations  | Inferences |
| No white precipitate **√1**  | Na+ or K+ or NH4+ ions present **√1****Note:** Penalize ½ mk for any contradictory ions up to a maximum of 1 mk  |

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| --- | --- |
| Observations  | Inferences |
| Burns with a yellow flame**√1****Accept:** Golden yellow if mentioned but **Reject: orange** colour or any other contradictory colour  | Na+ present **√1****Na+ present must have been mentioned as present in (ii) above**  |

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| --- | --- |
| Observations  | Inferences |
| A white precipitate formed **√1** | SO42- , SO32- , CO32- , CI- present. **√1****Penalize: √½**mk for each contradictory ion to a maximum of 1 mk  |

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| --- | --- |
| Observations | Inferences |
| A white precipitate formed **√½**Precipitate dissolves on adding HCI **√½** | SO32- , CO32-  present **√1** (If mentioned as present in 2(iv) above)**Accept for √½mk**SO42- , CI- absent  |

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| --- | --- |
| Observations | Inferences |
| Purple potassium manganate (VII) is decolorized/ turns colourised **√1****Effervescence**  | SO32-  present **√1**(If mentioned as present in 2(iv) above)**Accept for √½mk**CO32-  absent  |

Q3

|  |  |
| --- | --- |
| Observations | Inferences |
| Burns with a yellow/luminous **√½** sooty/smoky flame **√½**  |  =C=C= **√1** or -C≡C- **Note:** In absence of the above structure, accept inference given in words for FULL credit as * unsaturated organic compound
* Compound contains high carbon to hydrogen ratio.
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| --- | --- |
| Observations | Inferences |
| * Solid dissolves to form a colourless solution**√½**
* pH 2-3 **√½**

**Reject a range of pH** | Solid B is polar**√½** Solution is strongly acidic **√½** **Reject:** weak acid  |

|  |  |
| --- | --- |
| Observations | Inferences |
| Effervescence **√1** / bubbles of a colourless gasaccept fizzing for full credit  | -COOH **√1**/ R-COOH / H+/H3O+ present **Accept for ½ mk** Carboxylic acid /alkanoic acid  |

|  |  |
| --- | --- |
| Observations | Inferences |
| Purple potassium manganate (VII) is decolorized/ turns colourised **√1** |  =C=C= **√1** or -C≡C- **Reject:** R-OH mentioned present **Penalize fully for any contradictory functional group.** |