233/3
CHEMISTRY
PAPER 3
PRACTICAL

MARKING SCHEME

1. Table 1 6 marks

Volume of water in the boiling tube (cm^3)	Temperature at which crystals of solid A first appear	Solubility of solid A (g/100g water)
4	66.0	112.5
6	58.0	75.0
8	52.0	56.25
10	45.0	45.0

Column 1 4 marks
Distributed as follows:

(i) Complete table 2 marks
- Complete table with 4 readings 2 marks
- Incomplete table with 3 readings 1 ½ marks
- Incomplete table with 2 readings 1 mark
- Incomplete table with 1 reading 0 mark

(ii) Use of decimals 1 mark
- Accept unit if all readings are recorded consistently either as whole numbers or to 1 d. place of 0.0 or 0.5, otherwise penalize fully.

(iii) Trend ½ mark
- Award ½ mark for a continuous drop in temperature readings in column I, otherwise penalize fully.

Column II 2 marks
- Award ½ mark for each value of solubility correctly calculated, otherwise penalize fully.
- Ignore units in grams if attached to correct answer, otherwise penalize if wrong units are attached.

(iv) Graph 3 marks
Distributed as follows:-

(i) Labelling of axes ½ mark
- Penallise fully for any inversion of axis.
-Penallise fully if wrong units are given or shown BUT ignore if not attached.
- Penalise fully if only one axis is labeled.

(ii) Scale 1 mark
- Area covered in units should be at least ¾ of the total big square of the grid, given on both vertical and horizontal axis, otherwise penalize fully.
- Scale intervals must be consistent, otherwise penallise fully.

- Scale chosen must accommodate all plots, otherwise penallise fully.

(iii) Plotting 1 mark

- Award 1mark for 3 or 4 points correctly plotted.
- If there are only 2 correctly plotted points, award ½ mark.
- Accept plots even when axis are interchanged.

(iv) Curve 1 mark

- Award 1 mark for a smooth rising curve joining at least 3 correctly plotted points of which one must be at 112.5 / 4.0cm^3 of water.
- Reject a curve obtained from wrong calculated values in column II.

d in (T) 1 mark

- Accept correct reading with or without showing on the graph.
- If shown on the graph but reading is wrongly read, or absent award ½ mark for showing.
- Penallise ½ mark for wrong units otherwise ignore if not shown.
- Reject any reading and showing from a wrong graph e.g exchange of axis, wrong plotting at volume of 4.0cm^3.

d in (J) 2 marks

Solubility at 50^0C = correct reading √ ½
Solubility at 30^0C = correct reading
Mass of crystals = correct ans √ ½

(e) (i) Table 2 5 marks

	I	II	III
Final burette reading	30.0	30.0	30.0
Initial burette reading	0.0	0.0	0.0
Volume of solution B used	30.0	30.0	30.0

Distributed as follows:-

(a) Complete table 1 mark

Conditions
(i) Complete table with 3 titrations 1 mark
(ii) Incomplete table with 2 titrations ½ mark
(iii) Incomplete table with 1 titration 0 mark

Penalties

- Wrong arithmetic
- Inverted tables.
- Values beyond 50.0cm^3 unless explained
- Unrealistic values i.e values below 1.0cm^3 and above hundreds

NB: Penalise ½ mark each to a maximum of ½ mark (penallise once)

(h) (i) Decimals 1 mark (Tied to 1st and 2nd rows only)

Conditions

- Accept 1 or 2 dp used consistently
- Accept 2 d.p only if the 2nd place of decimal is "0" or "5".
- Allow inconsistency of zeros i.e 0.0, 0.00 or 0 in the initial values

NB: Penallise fully if any of the conditions is not met.

c) Accuracy 1 mark

Compare any of the titre readings with school values (S.V) tick (√) the chosen value on the table.

Condition

- If any value is within ± 0.1 1 mark
- If any value is within ± 0.2 ½ mark
- If not within ± 0.2 0 mark

NB: If there is a wrong arithmetic or subtraction compare the S.V with the worked out correct value and ward accordingly.

d) Principles of averaging 1 mark

Values averaged MUST be shown and must be within ± 0.2 of each other.

Conditions

- If 3 consistent values are averaged 1 mark
- If 3 titrations alone, only 2 possible and averaged 1 mark
- If 2 titrations alone, and are consistent and averaged 1 mark

NB: Award 0 mark if averaging involves.

- 3 consistent values but only 2 averaged
- 3 inconsistent values are averaged.
- 2 inconsistent values are averaged.

c) Final answer 1 mark (Tied to correctly averaged titre)

- If within ± 0.1 S.V 1 mark
- If within ± 0.2 S.V ½ mark
- If beyond ± 0.2 of S.V 0 marks

Calculations

II) Moles of $KMnO_4$ = $\frac{0.06 \times \text{titre}}{1000}$ √ ½

= correct answer √ ½

Conditions

(i) Penalise ½ mark for wrong transfer of titre, otherwise penallise fully for strange figure.

(ii) 0.06 must be transferred initial otherwise penalize fully.

III) Moles of A in $25.0cm^3$ = $\frac{\text{Ans in (II)} \times 5}{2}$

= correct ans

Conditions : As in II above

IV) RFM of A 2 marks

Moles in $250cm^3$ = $\frac{\text{an in III} \times 250}{25}$ √ ½

= correct ans

RFM = $\frac{4.5}{9}$ √1

= Correct answer √ ½

OR

Mass in $25cm^3$ = 0.45g √ ½

RFM = $\frac{0.45}{\text{Moles in part III}}$ √1

= Correct answer √ ½

OR

Mass in $1000cm^3$ = 4.5 x 4 = 18g

Molarity of A = $\frac{1000 \text{ x ans III}}{25}$ √ ½

RFM = $\frac{18}{\text{Molarity}}$ √1

= correct ans √ ½

Penalties

(i) Penalise fully if 4.5 is not used intact

(ii) Reject if RFM is less than 108 and greater than 162.

(iii) Penallise ½ mark for any units used or attached to the final answer e.g g

(iii) Determining the value of X 2 marks

RFM of H_2O = 18 √ ½

18x = ans (IV) – 90

x = $\frac{\text{ans (IV)} - 90}{18}$ √

= correct answer √ ½

OR

RFM of H_2O = 18 √ ½

x = $\frac{\text{ans (IV)} - 90}{18}$ √1

= correct ans √ ½

OR

90 +18x √ ½ = ans (IV)

x = $\frac{\text{ans (IV)} - 90}{18}$ √1

= correct ans √ ½

OR

x = $\frac{\text{ans (IV)} - 90}{18}$

= correct ans

Penalties

- Penallise ½ mark if units given or attached to final answer.

NB: For all calculations, any working beyond the expected answer penalize fully.

3.

	Observations	Inferences
3. (a) (i)	- Red residue when hot. - Yellow residue when cold - Brown gas. - Cracking sound. - Blue litmus paper turns red. - Red litmus paper retains its colour. - Glowing splint relights. *NB: Award ½ mark each upto a maximum of 1 mark*	- NO_3^- present √ ½ - Acidic gas present √ ½
(ii)	- Blue litmus paper retains its colour. - Glowing splint goes off. - Colourless gas with a pungent smell. - Red litmus paper turns blue *NB: Award ½ mark each upto a maximum of 1 mark*	NH_4^+ present √1
(iii)	White sublimate formed on cooler part of the test tube √1	G sublimes √1
b) (i)	- M dissolves to form a colourless solution √1	- M is polar or - M is soluble in water √1
(ii) I)	White precipitate formed √1	CO_3^{2-}, SO_4^{2-} or SO_3^{2-} present 3 ions 1 mark 2 ions ½ mark 1 ion 0 mark
II)	White precipitate √ ½ , insoluble √ ½ (1 mark)	SO_4^{2-} present √1
c) (i)	Burns with a blue flame √1	- Saturated organic compound √1 or - Organic compound with low C : H ratio √1 or - Absence of unsaturated organic compound √ OR C C absent √1 OR C C absent √ Or C C present √1 <u>REJECT</u> (i) C C or C C absent (ii) Carbon – carbon double bond or carbon – carbon triple bond

(ii)	- No effervescence / No bubbles / No fizzing √1 <u>Ignore</u> - Does not dissolve / No reaction. <u>Reject</u> No hissing on its own	- Absence + H^+ or R – COOH √1 <u>Accept</u> Is not acidic / liquid not cidic Ignore: Absence of H_3O^+
(iii)	$K_2Cr_2O_7$ changes colour from orange to green √1 Or Solution changes from orange to green. <u>Reject:</u> Solution turns green	R OH present √1 <u>Reject</u> (i) Alcohol written in words (ii) OH *NB: Penalise fully for any contradictory functional groups and structures.*