MUMIAS WEST JOINT EVALUATION - 2022
CHEMISTRY PP3 MARKING SCHEME

Table I – 6 MARKS

Volume of water in the boiling tube (cm^3)	Temperature at which crystals of solid P first appear (^{0}C)	Solubility of solid P (g/100g) of water
4	68.0	112.5
6	64.0	75.0
8	62.0	56.25
10	50.0	45.0
12	48.0	37.5

DISTRIBUTED AS FOLLOWS:

COLUMN 2 – 4MARKS

I A) COMPLETE TABLE – 2 MARKS (Applicable to column 2 on temperature readings only)

- Award ½ mark for each temperature reading to a maximum to 2marks

Penalties

- *Penalize ½ mark for the unrealistic values (above 100ºc or below 20ºc)*

B) DECIMAL – ½ Mark (Applicable only to column 2)

*- Award ½ **mark** for temperatures consistently recorded to **whole numbers or 1dp (.0 or .5)** otherwise award **0 mark**.*

C) ACCURACY – ½ Mark (Tied to the reading on column 2 row 1)

- Award ½ mark for the candidate's within the range of ±2 units of the school value otherwise award 0mark.

D) TREND – 1mark (Tied to temperature readings only)

- Award 1 mark for continuous decrease in temperature otherwise, award 0mark.

COLUMN 3 – 2MARKS

- *Award ½ mark for each correct calculation of solubility to maximum of 2marks*
  Conditions and Penalties
- *Penalize ½ mark ONCE for any value rounded off to whole number.*
- *Penalize ½ mark for any missing or wrong value of solubility*

GRAPH – 3MARKS

A) Axes – ½ mark

Conditions

- Award ½ mark if all axes are correctly labeled
- Units may be included or not. If units are included must be correct, otherwise award 0mark for axes

B) SCALE - ½ mark

- Correctly plotted points MUST cover ¾ of the grid provided for ½ mark

- The scale MUST be linear in both axes otherwise award 0 mark for the wrong scale.
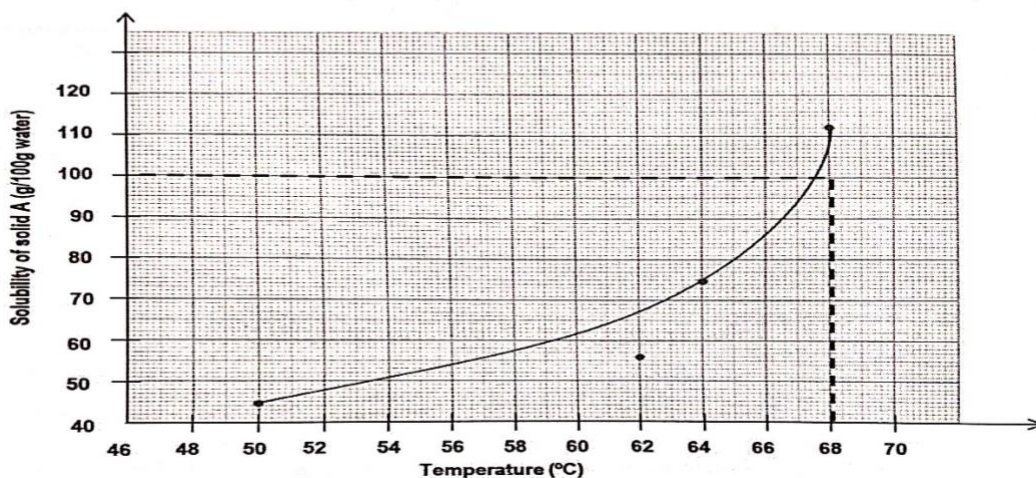
C) PLOTTING – 1 MARK

- All 5 points plotted correctly …….1mark

- 3-4 points plotted correctly …………. ½ mark

- 1-2 points plotted ……………….. 0mark

NOTE

Award 0 mark for points plotted on a wrong scale.

D) CURVE - 1MARK

- Award 1 mark for a curve showing continuous increase in solubility with increasing temperature.

- Award 0 mark for use of a straight line.

ii) – Award 1mark for the correct reading from a correct graph

- *The student to give the temperature when solubility is 100g/100g of water.*

Conditions

- *Award ½ **mark** for correct showing and ½ **mark** for correct reading*
- *If the candidate has not shown on the graph, but correct reading is given, award **1mark***
- *If the candidate shows but does not give the correct reading, award ½ mark.*

*iii) The candidate to give the solubility when the temperature is 55^0c for **1mark**.*

- *Award ½ **mark** for correct showing and ½ **mark** for correct reading*
- *If the candidate has not shown on the graph, but correct reading is given, award **1mark***
- *If the candidate shows but does not give the correct reading, award ½ **mark**.*

TABLE II - 5MARKS

Titre number	I	II	III
Final burette reading (cm^3)	17.5	17.5	17.5
Initial burette reading (cm^3)	0.0	0.0	0.0
Vol. of soln. P used cm^3	17.5	17.5	17.5

Marking points
A) Complete table (CT) …………………………………………..1mark

The table should be completed.
Penalize ½ mark for the following errors if any occurs.
- *Arithmetic error in subtraction.*
- *- Values recorded beyond 50cm3*
- *- Inversion of table*
- *Penalize ½ mk only on any one of these errors.*

B) Decimal point (d.p)…………………………………………...1mk
- o *All values to be recorded to 1d.p or*
- o *All values to be recorded to 2dp second decimal value being 0 or 5 only*
- o *Award 0-mark if whole numbers used or more than 3dp are used or inconsistency in the number of d.p*

C) Accuracy mark (AC)………………………………... 1mark

- *Consider any one candidates' titre if within ± 0.10cm³ of school value award 1mk.*
- *If it is ±0.11 to 0.20 award ½ mark. If beyond 0.20cm³ award 0mk*

D) Principle of Averaging (P.A)…………………………..1Mark

- *Three titres to be averaged if within ±0.2cm³ to one another.*
- *Two titres can only be arranged if they are consistent.*
- *N/B- If a student averages two titres when three are consistent award 0mk.*
- *If a student averages three inconsistent values, award 0 mark*

E) Final answer (F. A)…………………………………………..1Mark

- *If averaged titre is within 0.0 to 0.10cm³ of S.V award 1mk*
- *If within 0.11 to 0.2cm³ of s.v award ½ mk*
- *If beyond 0.20cm³ award 0mk.*

  Summary
  Complete table (CT)   = 1mk   Type equation here.
  Correct use of decimals (dp) = 1mk
  Accuracy (AC)   = 1mk
  Averaging (PA)   = 1mk
  Final answer   (FA)   = 1mk)
                                5mks

N/B – For school value (SV), teacher to perform practical to obtain school value.

CALCULAIONS

I) Marked on the Table

II) Moles of sodium hydroxide in 25cm3 = $\dfrac{0.2 \times 25}{1000}$ *1 mark*

$= 0.005$ *1mark*

III) Moles in 250cm3 = $\dfrac{4.5}{126}$ *½ marks*

$= 0.0357$ *½ mark*

Moles of P in 25cm3   = $\dfrac{Average\ volume \times 0.0357}{250}$ *½ mark*

= correct answer (III) ½ mark

IV) $\dfrac{0.005}{Ans\ (III)}$ *1 mark*

= Ans (IV) ½ Mark

Value of 'n' = Ans (IV) (Given as a whole number) ½ Mark

- *The value of n MUST be written as a whole number to earn a mark.*
- *The number of moles MUST be given to at least 4dp unless it divides completely. OTHERWISE penalize ½ mark for correct answer.*

QUESTION 2 – 9 MARKS

a) Place all of solid A in a boiling tube. Add about 8cm^3 of distilled water and shake. Divide the solution formed into 4 portions.

Observations	Inferences
- *Solid dissolves to form a colourless solution…* **½ mark** - *Accept for* **FULL** *credit a colourless solution formed.* - *REJECT: Colourles liquid.* ($^1/_2$ mark)	- Soluble compound - $Cu^{2+,}$ Fe^{2+}, Fe^{3+} absent N/B: Accept any of the inferences for FULL credit. - Penalize FULLY for any contradictory inference. ($^1/_2$ mark)

b) To the first portion, add sodium hydroxide drop wise until in excess

Observations	Inferences
  - *White ppt ½ soluble ½ in excess* *(1mark)*	Zn^{2+}, $Al^{3+,}$ Pb^{2+} 1mark - *Award 1mark for 3 ions mentioned* - *Award ½ mark for 2 ions mentioned* - *Award 0 mark for 1 ion mentioned* - *PENALIZE ½ mark for any contradictory ion to a maximum of 1mark.* *(1 mark)*

c)   To the second portion, add ammonia solution drop wise until in excess.

Observations	Inferences
  - *White ppt ½ insoluble ½ in excess* *(1 mark)*	- *Al^{3+}, Pb^{2+} present* - *Award ½ mark for each ion* - *PENALIZE ½ mark for any contradictory ion to a maximum of 1 mark.* - *Accept the two ions only if they are mentioned in (b) above.* *(1mark)*

d) To the third portion, add 3 drops of sodium chloride solution

Observations	Inferences
- No white ppt. **REJECT** - *No ppt* - *No change* - *Colourless solution formed* (1 mark)	- *Al^{3+} present* - ***ACCEPT*** *for ½ mark* ***Pb^{2+} absent*** - *Penalize FULLY for any contradictory ion.* *(1mark)*

e) To the fourth portion add about 3 drops of barium nitrate followed by 4 drops of dilute nitric (V) acid

Observations	Inferences
- ***White precipitate ½ that does not dissolves ½ in addition of nitric (V) acid.*** - ***OR white ppt persists on addition of HNO_3*** *(1 mark)*	- **SO_4^{2-} present** - **PENALIZE FULLY** for any contradictory ion. (1mark)

QUESTION 3 – 9MARKS

a) Scoop about a third of the solid B using a metallic spatula and ignite it on the non-luminous flame of the Bunsen burner

Observations	Inferences
- Burns with a yellow **sooty/smoky** flame ---1mark (1mark)	- $=C=C=$ OR - $C\equiv C-$ present - Accept unsaturated organic compound for **FULL** credit. - PENALIZE FULLY for any contradictory functional group. (1/2mark)

b) (i) Place the remaining solid B in a clean boiling tube, add about 10cm³ of distilled water and shake. Divide the resulting solution into six (3) portions

Observations	Inferences
- **_Solid dissolves to form a colourless solution._** (**_1mark_**)	- **_Polar compound_** (**_1 mark_**)

ii)   To the first portion of the solution, add 2 drops acidified potassium manganite (vii) and warm

Observations	Inferences
- Purple KMnO4 changes to colourles/ is decolourises (1 mark)	$=C=C=$ / $-C\equiv C-$ **½ mark**, R-OH **½ mark** present - PENALIZE ½ mark for any contradictory ion to a maximum of 1mark. (1mark)

iii)   To the third portion of the solution, add 2 drops of acidified potassium dichromate (VI)

Observations	Inferences
- Orange colour of acidified **$K_2Cr_2O_7$** persists/ does not change to green....**1mark** (1 mark)	- R-OH absent.........1mark **Note:** - PENALIZE FULLY for any contradictory ion (1 mark)

iv) **To the fourth portion, add in the whole of solid sodium hydrogen carbonate provided**

Observations	Inferences
- *Effervescence/ bubbles of a colourless odourless gas .....1mark* *(1mark)*	- *R – COOH present.... ½ mark* ***Note*** - *Penalize FULLY for any contradictory ion.* - *REJECT: H^+, H_3O^+* *($^1/_2$mark)*

..............................THIS IS THE LAST PRINTED PAGE…............