

BUKAKA CLUSTER EXAMINATIONS**CHEMISTRY PAPER 3****END OF TERM 1, 2025****FORM 4****Question 1.(a)PROCEDURE I****Table I**

Volume of water in boiling tube cm ³	Temp. at which crystals of M first appear °C	Solubility of solid M (g/100g of water)
4	74.0	150.0
6	65.0	100.0
8	54.0	75.0
10	47.0	60.0
12	41.0	50.0

TEMP
COLUMN

CT2

DP ½

AC ½

Td ½

Notes on marking table**CT =Complete table 2mk (temp. column only)**

2mks for all temp. values filled, 1 ½ mkfor only 4 to 5 entries made, 1mk for 3 entries and 0mk for only 2 or 1 values entered

Penalize ½ mk for all temp. readings above 80.0⁰ and below 10.0⁰C to a maximum of 1mk**D.P = Decimal point ½ mk**

All temp. values to be recorded as whole numbers OR with a decimal as 0 or 0.5 only, if any other figure is used award 0 mk for d.p

Accuracy.....½ mkCompare the candidates temp. reading at volume 4cm³ with that of the teacher.If ±2⁰C from the teacher's value award ½ mk, otherwise award 0**Trend ½ mk**

Award ½ mk for continuous temp. drop, otherwise penalize fully.

Solubility column 2 ½ mks (each correct value 1/2 mark)**1(b)Graph.....3mks****Labelled axis ½ mk**

Axis to be labeled with quantities and unit i.e. Temp in °C and solubility (g / 100g of water).

Scale..... ½ mkPlot to cover ²/₃ of the given grid.**Plots 1mk**

To be plotted accurately

Curve 1mk

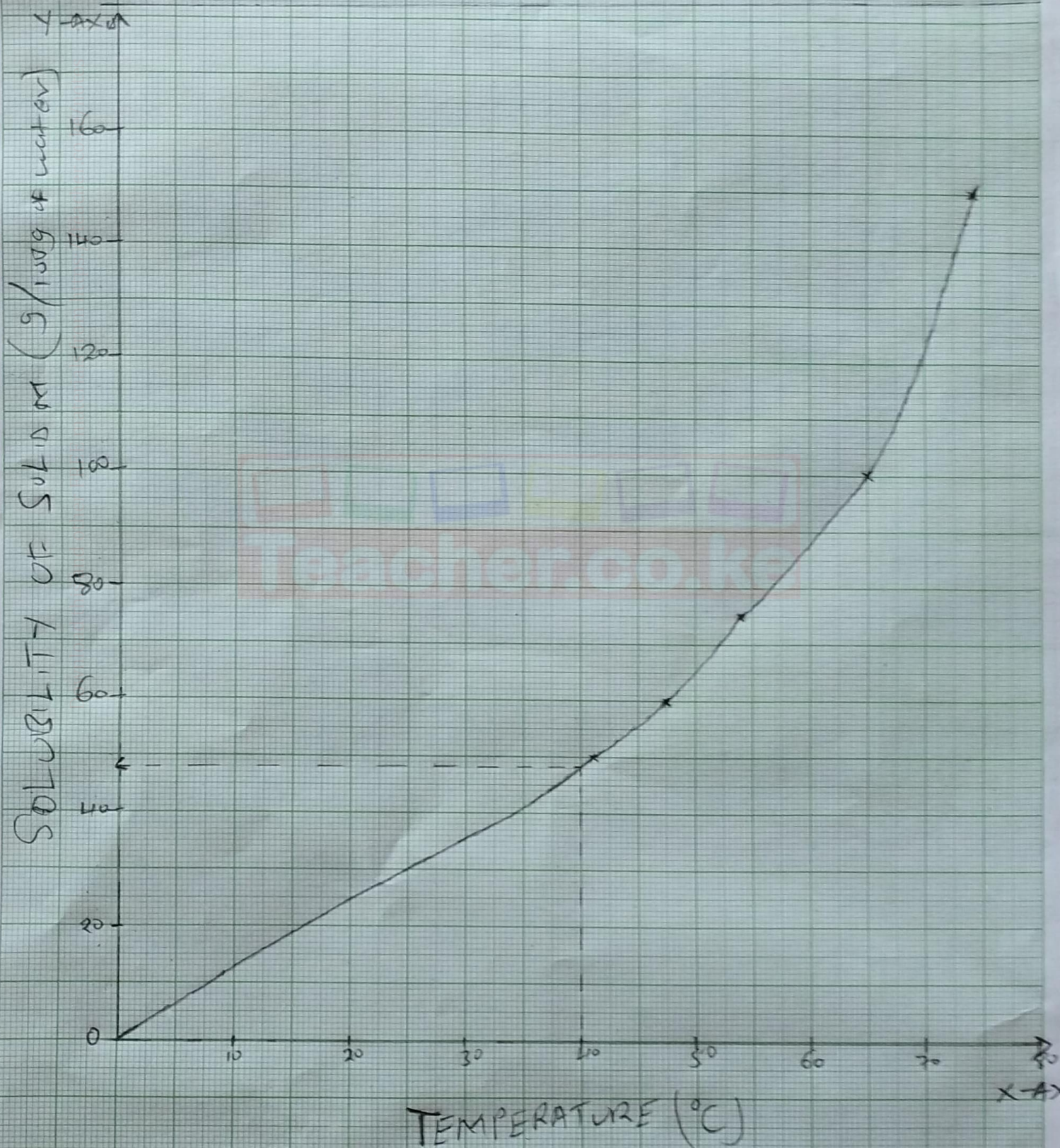
Plots to be joined to give a smooth curve increasing with increase in temp.

(i)Showing on the graph the solubility at 40 °C (only from a correct curve).....½ mk correct
 reading/showing 1/2mark for correct answer

48.0 °C +2 teacher's value

Total marks for Question 1a and b = 10mks

A GRAPH OF SOLUBILITY OF SOLID M (g/100g of water)
AGAINST CRYSTALLIZATION TEMPERATURE ($^{\circ}\text{C}$)



PROCEDURE II

Table II..... 5mks

	I	II	III
Final burette reading (cm ³)	12.2	12.2	12.2
Initial burette reading (cm ³)	0.0	0.0	0.0
Volume of M used (cm ³)	12.2	12.2	12.2

a) **Complete table..... 1mk**

Conditions

- i) Complete table with three titrations done 1mk
- ii) Incomplete table with two titrations done ½mk
- iii) Incomplete table with one titration done award zero

Penalties

- i) Wrong arithmetics (subtractions)
- ii) Burette reading beyond 50cm³ (unless explained)
- iii) Inverted table
- iv) Unrealistic titre values e.g. values less than 1.0cm³ or in hundreds

NB: penalise ½mk each to a maximum of ½mk

b) **Use of decimals 1mk**
(tied to 1st and 2nd rows only)

- i) Accept one or two d.p used consistently otherwise penalise fully ie award 0mk
i.e either all values recorded to 1 d.p OR all recorded to 2 d.p, second figure of the d.p being 0 or 5 only e.g. 23.60 , 24.75 not 21.36 , 22.57
- ii) Accept inconsistencies in use of zero's as initial burette readings e.g. 0, 00, 0.00 etc

c) **Accuracy..... 1mk**

Compare the candidates correct titre values with the school value mark

Award as follows;

- i) if at least one is within ± 0.1 of S.V 1mk
- ii) If none is within ± 0.1 of S.V but at least one is within ± 0.2 of S.V award ½mk
- iii) If none is within ± 0.2 of S.V 0mk

NB/ i) If there was wrong subtraction done in the table compare the correctly worked out values with the

S.V and award accordingly/

- ii) Where there are two possible S.V from teacher's results both values to be considered and the value closer to candidate's values used for comparison and award accordingly (both accuracy and F.A)

d) Principles of Averaging.....1mk

- i) If 3 consistent titre values done and averaged.....1mk
- ii) 3 titrations done, only two consistent and averaged.....1mk
- iii) if 3 titrations done inconsistent yet averaged 0mk
- iv) 3 consistent titrations done yet only 2 averaged 0mk
- v) if only 2 titrations done, inconsistent and averaged 0mk
- vi) if only 1 titration done.....0mk

NB: Consistent value are titre values within ± 0.2 of each other.

PENALTIES

- i) Penalise $\frac{1}{2}$ mk for wrong arithmetic error outside ± 2 units in the 2nd d.p
- ii) Penalise $\frac{1}{2}$ mk if no working is shown but answer given is correct
- iii) If no working is shown and answer given is wrong penalise fully and award 0mk
- iv) if working shown is wrong and answer given is correct award 0mk

eg $\frac{20.0+20.0 + 20.0}{3} = 20$ or $\frac{20 + 20+ 20}{3} = 20$

2

3

or $20 + 20 + 20 = 60$
 $60 \div 3 = 20$

NB: a) Accept rounding off or truncation of answer to 2dp otherwise penalise $\frac{1}{2}$ mk for rounding off to 1d.p

b) Accept the answer if it works out exactly to 1d.p or to a whole number.

e) Final Accuracy.....1mk

Compare the candidates correct average titre to the school value used in (c) above and award as follows:

- i) if within ± 0.1 of S.V 1mk
- ii) if not within ± 0.1 but within ± 0.2 $\frac{1}{2}$ mk
- iii) if not within ± 0.2 of S.V.....0mk

NB

- i) if there are two possible average titre values from the candidates results use the one close to the S.V and credit accordingly.

ii) if wrong averaging principles is used by the candidates pick correct values, average them and award accordingly

marks)
Calculate:

a) Average volume of M used. (1 mark)

$$\frac{12.2 + 12.2 + 12.2}{3} = 12.2 \text{ cm}^3$$

b) (i) The moles of sodium hydroxide solution N used. (1 mark)

$$\frac{0.2 - 1000}{12.2} \quad \frac{0.2 \times 25}{1000} \checkmark \frac{1}{2} \quad 0.005 \text{ moles} \checkmark \frac{1}{2}$$

(i) The moles of M used given that the mole ratio of M:N is 1:2 (1 mark)

$$\frac{2 - 0.005}{1} \times \frac{1 \times 0.005}{2} \checkmark \frac{1}{2} = 0.0025 \text{ moles} \checkmark \frac{1}{2}$$

(ii) The molarity of organic acid solution M. (1marks)

$$\frac{0.0025 - 12.2}{1000} \checkmark \frac{1}{2} \quad \frac{0.0025 \times 1000}{12.2} = 0.2049 \checkmark \frac{1}{2} = 0.2 \text{ M.} \checkmark \frac{1}{2}$$

(iii) The R.M.M of the organic acid. (2marks)

$$\frac{6g - 250}{\times 1000} \quad \text{R.M.M} = \frac{\text{mass g/l}}{\text{No of moles (molarity)}}$$

$$\frac{6 \times 1000}{250} \checkmark \frac{1}{2} \quad \frac{24}{0.2} \checkmark \frac{1}{2} = 24 \text{ g/l} \checkmark \frac{1}{2} = 120 \checkmark \frac{1}{2}$$

Correct answer in b(iii) AB

NOTE- Penalty/condition

1. Penalize $\frac{1}{2}$ mark for wrong units
2. All answers should be given to at least 4 d.p unless for terminating decimals to less than 4 d.p.
3. Penalize $\frac{1}{2}$ mark for wrong transfer of values, otherwise penalize fully for strange figures.

Marks for procedure II =10

Total marks for question 1 =20marks

Question 2. (11marks)

TABLE III

I)

Solution	Colour of Flame
Calcium Chloride	red $\checkmark \frac{1}{2}$ ($\frac{1}{2}$ mk)
Barium chloride	Pale- green $\checkmark \frac{1}{2}$ ($\frac{1}{2}$ mk)
Solution G	Golden yellow $\checkmark \frac{1}{2}$ ($\frac{1}{2}$ mk)

Award each ½ marks each

II)

(a)

Observation	Inference
- Solid G dissolves forming a colourless solution ✓ 1	- Soluble salt/compound present ✓ ½ - Absence of coloured ions of Fe^{2+} , Fe^{3+} , Cu^{2+}

(b)

Observation	Inference
(i) No white ppt 1mk	- Ca^{2+} , Mg^{2+} , Al^{3+} , Zn^{2+} , Pb^{2+} absent - 1mk for 5 cations - ½ mk for 3 cations - 0mk for 2or1 cation
(ii) No white ppt 1 mk	- SO_4^{2-} , CO_3^{2-} , SO_3^{2-} , Cl^- absent 1mk
(iii) Effervescence/Bubbles of a colourless gas with a pungent smell produced 1mk Moist red litmus paper changes blue ½ mk Moist blue litmus paper remains blue ½ mk`	NO_3^- present 1mk Penalize fully for any contradictory ion
(iv) Identity of solid G is sodium nitrate (NaNO_3)	

Total marks for question 2=11

Question 3

a) Solid melts and burns with a yellow sooty flame (1 mk)	$\text{C}=\text{C} / -\text{C}\equiv\text{C}-$ present (1mk)
B(i) Solid F dissolves forming a colourless solution 1/2mk	Polar organic ✓ compound / polar substance 1/2mk
ii) $\text{H}^+ / \text{KMnO}_4$ is decolourised 1mk	$\text{C}=\text{C} / -\text{C}\equiv\text{C}-$ $\text{R}-\text{OH}$ present 1mk
iii) Dissolve solid F in distilled water to form a solution. Dip the universal indicator paper in the solution and match the colour produced with PH chart and record its PH. 1mk	PH 4 OR 5 1mk
iv) PH 4 OR 5 , reject PH given as range 1mk	Weakly acidic 1mk

Total marks question 3 =9

