FORM FOUR CLUSTER KCSE MODEL5

CHEMISTRY PAPER 3 ANSWERS

TABLE 1

Volume of water in the boiling tube(cm^3)	4.0	6.0	8.0	10.0
Temperature at which crystals of solid A first appear (^0c)	78.0	65.0	52.0	40.0
Solubility of solid A (g/100g of water)	162.5	108.3	81.25	65.0

- Marks awarded as follows

-Completer table (C.T) =2

Use of decimal place(D) =1

-Accuracy (A) =½

-Trend (T) =½

-Calculating solubility(sb)

=2 TOTAL =06 marks ☐

-Distribution of marks
(i) Complete table = 2 marks

-4 readings; row 1 = 2 marks

-3 readings =1 ½ marks ☐

-2 readings =1 mark ☐

-1

reading

Condition

-Penalize temperatures above 850c and below 100c to a maximum of 1 mark.

(ii) Decimal places= 1 mark

-Decimal place mark is tied to row two (temperature)

-Accept whole number used throughout for 1 mark.

-One decimal place used consistently with 0 or 5 as the second decimal otherwise penalize fully.
(iii)Accuracy = ½

-Compare the candidate's first reading when 4.0 cm3of water is used with the school value;

-Value within c 02☐ of the school value = ½ mark

-Value outside c 02☐ of the school value = 0 mark

iv) Trend =½ mark

-Temperature readings in row two must have a continuous drop for (=½ mark)

☐ Any other trend in temperature readings= (0 mark)

(v)Solubility

- Row three= (2 marks)

-4 entries/calculations @ ½ mark= 2 marks ☐

-Each entry to be marked and indicated by a tick to confirm. Conditions ☐

-Penalize ½ mark for wrong units used.

-Ignore if no units are used.

d(ii) Graph

-Labelling both axes (A) =(½mark)

-Scale (S) = (½mark)

-Plots (P) = 1 mark)

-Curve (C) =(1 mark)

Distribution of marks

(i)Labelling axes =

(½mark)

-Both axes labelled with correct units= (½mark)

-Ignore if units not indicated.

-Penalize fully if;

-Axes are inverted

-Wrong units are used

-Only one axis is

labelled. (ii)Scale =

(½mark) ☐

-Plotted points must cover ¾of the space given.

-Scale covered should accommodate all the points.

-The scales should be regular and consistent. Penalties

-Penalize fully if the area covered is less than ½ the required space.

-Penalize for the inconsistencies.

-Penalize fully if the scale does not accommodate all the points. (iii)Plots = 1 mark

-3-4 correctly plotted points = 1 mark

-2 correctly plotted points = ½ mark

-1 plotted point =0 mark

N/B: Accept plots on inverted axes indicated under plots.

Accepts plotted points in regular and consistent intervals and scale and award appropriately. Point 108.33 to plotted as 108.3and 81.25 plotted as 81.3 or in between 81.2 and 81.3
(iv)Curve =1 mark

- Accept a smooth curve joining at least 3 correctly plotted points one of which must be 162.5 at 4.0 cm3of water. Penalty

-Reject a curve of wrongly calculated values in row

III. d(iii) Reading from the curve/graph for (1 mark).

☐

-Accept the reading if it is shown on the graph but reading is wrong for (½mark)

-Accept the correct reading without showing on the graph for (1
mark) Penalty

-Penalize (½mark) for wrong units attached to the final answer.

-Reject or penalize fully if the reading is from a wrong graph.

b) **Table II**

Titre	I	II	III
Final burette reading (cm^3)	20.5	41.0	20.5
Initial burette reading (cm^3)	0.0	20.5	0.0
Volume of solution Solution B used(cm^3)	20.5	20.5	20.5

i) Average volume of solution B used $= \frac{20.5 + 20.5 + 20.5}{3} = 20.5cm$

- Complete table (CT) = 1 mark

-Decimal place(D) =1 mark

=Accuracy (A) =1 mark ☐

-Principal of averaging (PA = 1mark

-Final accuracy (FA) = 1 mark

TOTAL =05
marks
Distribution
1. Complete table = 1 mark ☐

-Complete table with 3 titration = 1 mark

-Incomplete table with 2 titration = ½mark

-Incomplete table with one titration.= 0 mark Penalties

-Penalize ½mark once for;

-Wrong arithmetic.

-Inverted table.

-Burette reading beyond 50.0cm3

2. Use of decimal (1 mark)

-Tied to the 1st and 2nd rows only.

-Accept one or two decimal places used consistently.

-Accept 2 decimal places only if the 2nd decimal is 0 or 5 otherwise penalize fully.

3. Accuracy (1 mark)

-Compare any of the candidate's titre values with the school value (S.V);

-If any titre is within 1 .0

-of the school value = 1 mark

- If any titre of beyond 1 .0

-but within 2 .0☐ of school value = ½mark

N/B: If there is wrong arithmetic, compare the school value with the worked out value and award accordingly. 4. Principle of Averaging (1mark)

The values averaged must be shown and must be consistent;

-3 consistent values averaged = 1 mark ☐

-3 titrations done but only two are consistent and averaged = 1 mark

Two titrations are done and are consistent and averaged = 1 mark
Penalty

-Penalize ½mark for answers with arithmetic errors outside 2

-units in the second decimal place.

-Penalize ½mark for no working but correct answer.

5. Final Accuracy(1 mark)

i. Compare the candidate's correct averaging titre with school value (S.V); ☐ If within 2 .0☐ from the school value = 1 mark

☐ If outside the 2 .0☐ s.v = 0 mark

ii. Number of moles of Sodium hydroxide $\frac{0.5\times Av(i)}{1000}$ √½

N/B – Penalize ½mark for averaged volume not transferred as required.
-Correct units must be used.
-Ignore if the units are not indicated.

iii. Number of moles of solution A=½ x A (ii)√½=correct answer √½ 1

N/B -Penalize ½mark if Aii not transferred appropriately.
-Answer should have at least 4 d.ps unless divides to an exact value.
-Penalize fully for storage values.
-Ignore units if missing BUT if used should be correct or penalize ½mark for wrong units.

iv. 25 cm^3 of solution A =Aiii

250 $cm^3$of solution A $=\frac{250}{25}\times Aiii$ √½=correct answer√½=C.Aiii

R.r.m=$\frac{6.5}{C.Aiii}$ √½=correct answer=C.A (iv)

Or

R.f.m of A= $\frac{6.5}{250}\times 1000 = 26g/mole$

$\frac{1200}{25}\times Aiii$ =correct answer

N/B: -6.5 should be transferred intact otherwise penalize fully.
-Ignore units otherwise penalize ½ mark if wrong units are used.
-Answer in (iv) should be between 100 and 250 otherwise penalize ½mark for answer outside the range.

v. $90+18n$=A(iv)√½

$18n = A(iv)-90$

n=$\frac{A(iv)-90}{18}$ =correct answer√½ 1

N/B

Conditions

-n must be a whole number otherwise penalize fully for the answer.
-Penalize fully if the answer has units. 20

2.

a)(i)

Observations	inferences
- Gas √½ which turns moist red litmus blue given off	- $NH^{+}_{4(aq)}$ √1(Tied to red litmus turning blue
- Colourless vapour which condenses on the cooler parts of the test tube to colourless liquid√½	-Hydrated salt/contains water of crystallization√1(tide to vapour condense to liquid.
- White sublimate forms √½	- NH^{+}_{4}
- The gas given off which turns moist blue litmus red	-Acidic gas
- Brown residue/solid forms√½	

N/B (i) Observation

☐ Credit½mark each to a maximum of 2 marks

☐ Ignore mention of any anions as present.

☐ Reject; NH3 gas produced. Water given off

☐ Award 0 mark in the inferences if incomplete observation.

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ii) Observation	Inferences
-Yellow/brown solution forms on addition of hydrogen peroxide.√½	Fe^{2+} is oxidized to Fe^{3+} or $Fe^{2+}_{aq} \rightarrow Fe^{3+}_{(aq)}$
-A brown precipitate form insoluble in excess sodium hydroxide√½	-Fe^{3+}formed√1
Acc ppt or suspension/solid	2
	Reject solution/solid contains Fe^{3+}or Fe^{3+} present

b)i)

Observation	Inferences
A white ppt formed/√1	SO_3^{2-} √ SO_4^{2-} √1
A white suspension/solid	CO_3^{2-} N/B all 3mentioned=1mk
	2 mentioned=½mk
	1 mentioned=0 mk

N/B: Penalize ½ mark for each contradiction to a maximum of 2 marks

ii)

Observation	Inferences
-Effervescence/bubbles of gas seen √½	SO_3^{2-} , CO_3^{2-} √
-White ppt dissolves/disappears.√½	2

Note:

-Accept ion if correctly inferred in b(i) above otherwise ignore.

-Correct inference tied to either of the observation of both.

-Penalize½ mark for each contradictory ion to max of 1 mark.

-In each case symbol formulae must be correctly written otherwise penalize fully.

iii)

Observation	Inference
-Acidified potassium chromate (vi) changes from orange to green√1	SO_3^{2-} √1

✓ Credit subject to having been correctly inferred in b(ii)

✓ Penalize fully for any contradiction otherwise ignore mention of R-OH as present.

3.

a)

Observation	Inferences
✓ The liquid brown with a blue flame	-Saturate organic compound present or –C-C- of organic Compound with low C:H ratio or absence of unsaturated organic compound or –C= C– or –C≡C– absent Reject C=C or C≡O OR Hydrocarbon or word eg C to C, double bond absent

b)

Observation	Inferences
✓ No effervescence /no bubbles/no fizzing√1	R-COOH/-COOH/ H^+ absent√1 2
✓ Reject no hissing on its own	-Acc liquid E not acidic for (½mark)
Ignore –doesn't dissolve/no reaction	-Ignore - H_3^+O absent