

FORM FOUR CLUSTER KCSE MODEL 2

CHEMISTRY PAPER 3 ANSWER

1. A) Complete table

i) Complete table with 3 titrations done (1mk)

ii) Incomplete table with 2 titrations done ($\frac{1}{2}$ mk)

i) Incomplete table with only one titration done. (0 mk)

Penalties

-Wrong arithmetic / subtraction -Inverted table

-Burette reading beyond 50.0 cm³

- un reactive titre value i.e below 1.0 cm³ NOTE: Penalise for each to a maximum penalty of ($\frac{1}{2}$ mark)

(B) Use of decimals used consistently, otherwise penalize fully. If 2 decimal places are used the 2nd decimal place must be a 0 or 5 otherwise penalise fully.

(C) Accuracy Compare candidates titre value with the school value conditions

i) If atleast one value is within 0.1 cm³ [1mk]

ii) If NO value is within ± 0.2 cm³ of SV but atleast one is within ± 0.2 cm³ of SV ($\frac{1}{2}$ mk)

iii) If NO VALUE is within ± 0.2 cm³ of SV. (0mk)

(D) Principles of averaging Values averaged must be shown and must be within ± 0.2 of each other. NOTE

i) If 3 values are possible but only 2 are averaged. ($\frac{1}{2}$ mk)

ii) If 3 titration are done , are inconsistent and yet averaged. (0mk)

iii) If only 2 titrations are done, are inconsistent and averaged. (0mk) (0 mk)

PENALTIES

i) Penalize for wrong arithmetic if error is outside ± 2 units in the 2nd decimal place.

ii) Accept rounding off of answer to decimal place, otherwise penalize for rounding to 1 decimal place or to a whole number where 2 or more decimal places were obtained.

NOTE:

Accept answer if it works out exactly to 1 decimal place to a whole number.

(E) Final answer (tied to correct answer average titre) (1 mark) Compare the candidate's CORRECT AVERAGE TITRE with school value, SV.

i. If it is within ± 0.1 cm³ of SV (1 mark) ii. If is not within ± 0.1 cm³ of SV but it is within ± 0.2 cm³ of SV ($\frac{1}{2}$ mark)

iii. If it is beyond ± 0.2 cm³ of SV (0 mark)

SUMMARY

Completer table CT= 1

Decimals D =1

Accuracy A=1

Principle of averaging PA=1

FINAL ANSWER FA=1

TOTAL =5

CALCULATIONS

$$\begin{aligned} \text{b) } \text{RFM of K}_2\text{CO}_3 &= 39 \times 2 + 12 + (16 \times 3) = 138 \\ \text{Concentration of solution R} &= \frac{5.56}{138} = 0.040289855 \\ &= 0.04003 \text{ mol dm}^{-3} \end{aligned}$$

Conditions/ penalties

- i. 5.56 must be transferred intact, otherwise penalize and NO MARK for the final answer if a "STRANGE" Figure is used.
- ii. Accept round off answer to 3 decimal places, otherwise penalize ½ mark
- iii. Ignore arithmetic error if within +- 2 unit in the 3rd decimal place, otherwise penalize ½ mark for wrong answer.
- iv. Units may not be shown, but if shown MUST be correct, otherwise penalize ½ mark for wrong units.

c) Moles of K_2CO_3 used = $\frac{\text{answer in (ii)} \times 25}{1000}$ (½ mark) correct answer ✓ ½ 1

Ratio 1:1

Moles of acid used = $\frac{\text{answer in (ii)} \times 25}{1000}$ ½ mark)

Conditions

- Accept answer given to at least 4 decimal places otherwise penalize ½ mk.
- Penalize for wrong transfer of Ans I (e) Units may not be shown but if shown must be correct, otherwise penalize ½ mk for wrong units,

(ii) Heat evolved = $MC\Delta T$ NB: For (Answer II b (ii) + 25) $\times 4.2 \times \Delta T$

Conversion of volume into mass = answer ½ mk

Molar heat of neutralization =

$$\frac{\text{Answer II B II} + 25 \times 4.2 \times \Delta T}{2 \times \text{ANSWER iic (i)}}$$

NOTE:

- Accept the correct transfer of ΔT even if rejected previously unless it was rejected as 'strange '
- Penalize for wrong transfer of Ans II b OR ΔT or both.
- Accept answer given to at least 1 decimal place, otherwise penalize.
- Penalize for wrong units or if not shown.
- Accept the use of abbreviation i.e KJ/Mol or KJmol⁻¹.
- Negative sign expected on the " final answer" otherwise penalize if omitted.
- Where division by 1000 is not shown or implied, penalize on the " final answer"
- For all the calculations, penalize fully if the candidate continues working beyond the expected answer.

2. a) Observation -inference

Blue ppt residue ✓ ½ - Cu^{2+} ions present ✓ ½

-Colourless filtrate ✓ ½ present ✓ ½ ✓ ½

-Coloured ions absent in filtrate. ✓ ½

b) (i) White ppt ✓ ½ dissolves ✓ ½ in excess Al^{3+} Zn^{2+} Pb^{2+} Zn^{+} present ✓ ½ ✓ ½

(ii) White ppt insoluble in excess NH_3 Al^{3+} Pb^{2+} present or Zn^{2+} absent

or

c) No white ppt ✓ Al^{3+} present ✓ ½

Pb^{2+} absent ✓ ½ 2

d) White ppt ✓ 1 SO_4^{2-} present ✓ 1 2

3. a) Observation

Melts into ✓ ½ colourless liquid ✓ ½

Inferences

-Unsaturated org. compd Burns with smoky/sooty flame

-Long chain hydrocarbon 2

b(1) Observation

-Acidified KMnO_4 is decolourised ✓ 1

Inference

ROH present ✓ ½

(ii) Observation

pH of A/5 ✓ 1

Inference

Weakly acidic ✓ 1 2

(iii) Observation

Effervescence/bubbles ✓ 1

Inference

$\text{H}^+/\text{H}_3\text{O}^+/\text{R-COOH}/\text{-COOH}$ present 2