TEACHER.CO.KE SERIES 22

Kenya Certificate of Secondary Education

CHEMISTRY

PAPER 3

MARKING SCHEME

Procedure 1 (a) – Table 1

(a) Complete table (½ mark)

- Final temperature must be lower than initial temperature otherwise penalize fully.

- For initial temperature values $\geq 40^0$ or $\leq 10^0$ are treated as unrealistic values 0^00 penalize (½ mark)

(b) Complete table (½ mark)

- Accept all readings in whole numbers or 1 d.p either '0' – '5' used consistently.

- Reject inconsistently.

(c) Accuracy (½ mark)

- Compare students value (initial value) with S.V. and if within $\pm 2^0$C award (½ mk) otherwise award zero.

(a) ΔT = Final temperature – initial temperature.

NB: (Insist on the correct answer as per the table).

(b) (i) $\Delta H = MC\Delta T$

$= 40 \times 4.2 \times \Delta T$

= C.A.J

Conditions

- Accept an error of $\pm$ 2 units in the 3rd digit if answer is in J or 3rd d.p if in KJ, otherwise penalize (½ mark).
- Award 1 mark for correct substitution and ignore the formular.
- Penalizde (½ mark) for wrong units shown, otherwise ignore units.
- Don't penalize if ΔH sign is missing or omitted.

(b) (ii) 2g $\longrightarrow$ ans c (i) above.

126g $\longrightarrow$?

$$= \frac{\text{Ans c (i)} \times 126}{2}$$

= C.A. J/mol

Conditions

- If wrong units are given or omitted in final answer, penalize (½ mark)
- Accept arithmetic error of $\pm$ 2 units in the 4th digits if in joules OR 2nd d.p if in KJ.
- Correct sign (+ve) must be shown for ΔH_1, otherwise penalize (½ mark)
- Do not penalize of ΔH sign is missing or not shown.

Procedure II (b) – Table II

NB: The marking of table II is done as that of table I except for complete table, the final temperature must be higher than the initial temperature.

Calculations

(a) ΔH = Final temperature – initial temperature

(b) (i) $\Delta H = 80 \times 4.2 \times \Delta T$

= C.A.J

Conditions

Accept an error of $\pm$ 2 units in the 4th digit if answer is in joules or 3rd d.p if answer is in KJ. Other conditions remains as for b(i) in procedure (a)

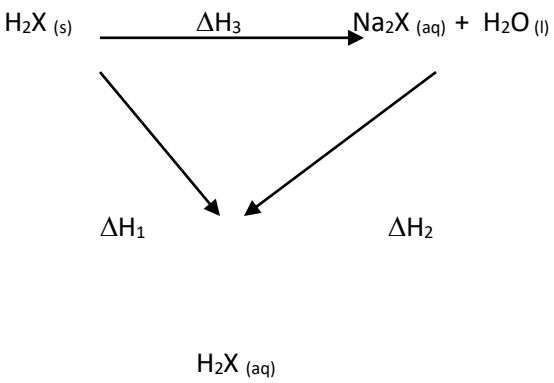
(ii) Moles reacting $= \frac{0.5 \times 40}{1000} = 0.02$ moles

$\Delta H_2 = \frac{\text{Ans b (i)} \times 1}{0.02}$

$= C..AJ$

(c) $\Delta H_3 = \Delta H1 - \Delta H_2$

$= C.A.J$



Conditions

- Negative (-ve) value must be shown on correct answer otherwise penalize (½ mark).
- Correct units must be used i.e J/mol OR KJ/mol otherwise penalize (½ mark).
- Penalize (½ mark) for wrong answer.
- For correct substitution without formula, you will credit (1 ½ marks) as step II.

NB: Capital J and small k MUST be used

Procedure II – Table III

(i) TITRATION

Consider the table below.

	I	II	III
Final burette reading	15.2	30.4	45.8
Initial burette reading	0.0	15.4	31.0
Titre volume (cm^3)	15.2	15.0	14.8

Marks are awarded as follows:

A. Complete table award 1 mark

(i) Complete table with 3 titrations done award 1 mark

(ii) Incomplete table with two titrations done – award ½ mark

(iii) Incomplete table with only one titration done – award 0 mark

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Penalties

(i) Wrong arithmetic
(ii) Inverted table
(iii) Burette readings beyond 50.0cm^3 unless explained
(iv) Unrealistic titre values i.e below 1.0cm^3 or in hundreds

NOTE: Penalize ½ mark each to a maximum of ½ mark i.e penalize ½ mark once.

B. Decimal place award 1 mark

(i) Accept only 1 or 2 d.p used consistently, otherwise penalize FULLY i.e. award zero.

(ii) If 2 d.p are used the 2nd d.p. MUST be either "0" or "5" otherwise penalize fully.

(ii) Accept inconsistently in the use of zeros as initial burette e.g 0.0, 0.00,0.000 etc

NB: Decimal place is tied to 1st and 2nd rows ONLY of the table.

C. Accuracy award 1 mark

Compare the candidates titre values with the school values (S.V) and tick the chosen value if it earns a mark.

Conditions

(i) If at least is within $\pm$ 0.1 of the S.V award – 1 mark
(ii) If no value is within $\pm$ 0.1 of the S.V but at least one value is within $\pm$ 0.2 of the S.V award ½ mark
(iii) Otherwise award zero mark.

NOTE: If there is arithmetic error in the table, compare the S.V with the correctly worked out titre value and award accordingly.

D. Principles of averaging – 1 mark

Values averaged must be shown and must be within $\pm$ 0.1 of each other

Conditions

(i) If 3 consistent titrations are done, are consistent and averaged – award 1 mark.
(ii) If 3 titrations are done but only 2 are possible and are averaged – award 1 mark.
(iii) In only 2 titrations are done, are consistent and averaged – award 1 mark
(iv) If 3 titrations are possible and only 2 are averaged – award 0 mark.
(v) If only 3 titrations are done, are inconsistent and are averaged – award 0 mark.
(vi) If only 2 titrations are done, are inconsistent and are averaged – award 0 mark.
(vii) If only 1 titration done – award 0 mark

Penalties

(i) Penalize ½ mark for wrong arithmetic in average titre value if error is outside $\pm$2 units in the second decimal place.
(ii) Penalize 1/2mark if no working is shown but correct answer is given.
(iii) Penalize fully if no working and if answer shown is wrong.
(iv) Accept rounding off value (average titre value) to 2 d.p otherwise penalize ½ mark for rounding off to 1 d.p or whole number.

NOTE: (i) Accept answer (average titre) to 1 d.p or whole number if it works out exactly and credit fully.

E. Final answer – 1 mark

(Tied to correctly averaged titre value)

Compare the candidates correct average titre value with S.V and

(i) If within $\pm$ 0.1 of S.V – award 1 mark

(ii) If within $\pm$ 0.2 of S.V – award ½ mark

(iv) If beyond $\pm$ 0.2 of S.V – award 0 mark

NOTE:

(a) Where there are two possible pairs of titres that can be averaged, use the pair that is closest to the S.V and credit accordingly.
(b) If wrong values are averaged pick the correct vales if any following the principles of averaging, average and award accordingly.

(b) **Calculations**

$\frac{0.2 \times \text{average titre}}{1000}$ √ ½

= C.A. √ ½

Penalties

- For wrong transfer of average titre, penalize ½ mark
- If an arithmetic error which is beyond $\pm$ 2 units in the 5th d.p is omitted penalize ½ mark.
- Accept rounding off to 4th or 5th d.p.
- If units are not shown

NB: Ignore if units are not shown

(c) Moles of B in $15cm^3$ = $\left(\frac{15}{1000} \times 0.5 \right)$ √ ½

= 7.5×10^{-3}mol

$250cm^3 \longrightarrow 7.5 \times 10^{-3}$mol

$25cm^3 \rightarrow ?$

$= \frac{7.5 \times 10^{-3} \times 25}{250}$ √ ½

$= 7.5 \times 10^{-3}$ mol √ ½ 1 ½

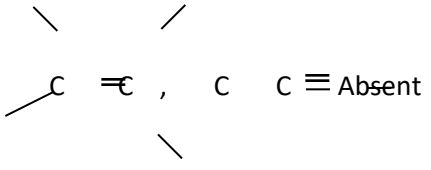
(d) $\frac{}{\text{Ans (c)}}$ √ ½ = C.A √1

Conditions / Penalties

- For wrong transfer if ans (c) or (b) penalize (√ ½ mark)
- If strange values are used / is used award zero.
- The answer must be rounded off to a whole number, otherwise penalize fully.

Question 2 (a)

	Observation	Inferences
2 (a) (i)	Blue ppt / residue, colourless filtrate ½ mark	Cu^{2+} present Condition: - Each inference tied to the observation penalize full for any contradiction ½ mark
(ii)	No white ppt formed / no effervescence / no bubbles 1 mark	Absence of SO_3^{2-} or CO_3^{2-} ½ mark
(iii)	White ppt, soluble in excess ½ mark	Zn^{2+}, Pb^{2+} or Al^{3+} √ ½ For all 3 give 1 mk, 2 give ½ mk

(iv)	White ppt insoluble in excess 1 mk	Pb^{2+} or Al^{3+} Accept Zn^{2+} absent ½ mk
(v)	No white ppt formed - Accept filtrate remains colourless - Rej. No observable change No ppt formed – No change ½ mk	Al^{3+} present Accept, Pb^{2+} absent ½ mark
(vi)	White ppt formed Colourless filtrate ½ mark	SO_4^{2-} present penalize if SO_3^{2-} or CO_3^{2-} mentioned as absent ½ mark
	Blue ppt dissolve Dissolve blue solution Penalize ½ mk if solution not mentioned ½ mk	Cu^{2+} present ½ mark
(b) (i)	Burns with a luminous / sooty / smoky flame ½ mark	Unsaturated hydrocarbon Accept C ⋹ or C C — ═ Rej C ⊆, C C ═ 1 mark
(ii)	Partially soluble in water ½ mark	Polar hydrocarbon ½ mark
(iii)	$KMnO_4$ solution remain purple Rej: solution turns purple, solution remains purple	 C ═C , C C ≡ Absent
(iv)	pH = 5.0	Weak acid 1 mark

	Penalties Reject pH value below 4.0 Reject value in words Accept pH value range 4.0 – 6.5	Accept – COOH Reject words such as acid / acidic / organic acid / H^+ ions If the term 'weak is not mentioned penalized fully.