233/3 CHEMISTRY (2018)
KCSE *Trial Exam*
MARKING SCHEME

	1st	2nd	3rd
Final burette reading (cm^3)	24.6	34.7	24.7
Initial burette reading (cm^3)	0.0	10.0	0.0
Titre (cm^3)	24.6	24.7	24.7

CT 1mk
DP 1 mk
AC 1 mk
PA 1 mk
FA 1mk
Total 5 mks

TITRATION TABLE: 5 MKS.
Marks distributed as follows:

(a) Complete table (CT) 1 mk

Conditions:

(i) Complete table with 3 titrations. 1 mk.
(ii) Incomplete table with 2 titration's. ½ mk
(iii) Incomplete table with 1 titration. 0 mk

Penalties:

(i) Wrong arithmetic / subtraction.
(ii) Inverted table.
(iii) Unrealistic values from the burette e.g below 1.0ml or above 50ml.
Penalize ½ mk each to a maximum of ½ mk.

Conditions

(i) 1 d.p used consistently.
(ii) If two d.p used, the d.p must be 0 or 5.
Penalize fully if any of the conditions is NOT met.

(b) Accuracy (AC) 1mk
Compare the candidate's readings with the school value/centre value (S.V/C.V)

NB If there is wrong arithmetic in the table, compare the school value with the correct titre and award accordingly.

(d) Principles of Averaging PA (1mk)

-Values averaged must be consistent within +0.2cm^3 of each other.

Conditions

(i) If three or two consistent values are averaged 1 mk
(ii) If only two titrations are done and are inconsistent and are average 0mk

Penalties

(i) Wrong arithmetic's i.e error beyond +0.2 units in the 2nd D.P eg 19.67 given as 19.64, penalize ½ mk.
(ii) If no working shown, but the answer given is correct, penalize ½ mk.
(iii) If no working shown, and the answer given is wrong, penalize fully.
(iv) If the value is rounded off to the 1st D.P, penalize ½ mk e.g 22.66 rounded off to 22.7.
(v) Allow rounding off to the 2nd D.P,e.g 36.125 to 36.13 or 19.666 to 19.67
NB: Where the candidate's values divide exactly to one D.P, accept it and award fully.
e.g $\frac{21.9 + 23.0 + 23.1}{3}$ = 23 cm^3

(c) Final Answer (FA) 1 mk
Compared to the school value and tied to the average candidates average titre.

Conditions

(i) If within +0.1cm^3 of the S.V / C.V 1 mk.
(ii) If not within +0.1cm^3 but is within +0.2cm^3 of the S.V / C.V ½ mk.

(iii) If beyond +0.2cm^3 of S.V,0 mk.

NB**:** *If wrong values were averaged, pick the correct ones and award accordingly e.g. If the S.V / C.V given is 19.65, and the candidates titre values are 19.6, 19.3, 19.4 Pick values to give the candidate MAXIMUM credit.*

Hence pick

$\frac{19.6 + 19.4}{2} = 19.5$

BUT NOT

$\frac{19.3 + 19.4}{2} = 19.35$

- Incase there was wrong subtraction in the table use the correct values. (Do the subtraction)

Q (ii) Moles per litre of B = $\frac{\text{Mass in g per litre}}{\text{RMM}}$

½ mk ½ mk

$\frac{6.3}{126} = 0.05$ M 1 mk

Q (iii) $2NaOH_{(aq)} + H_2C_2O_{4(aq)} \longrightarrow Na_2C_2O_{4(aq)} + 2H_2O$ ½ mk

Mole ratio of NaOH (aq) : $H_2C_2O_{2\,(aq)}$ is 2:1 Respectively

No. of moles of $H_2C_2O_{4\,(aq)}$ used

$=\frac{24.67}{1000} \times 0.05 + 1.2335X10^{-3}$ moles ½ mk

Hence No. of moles of $NaOH_{(aq)}$ used = $1.225X10^{-3}X2$

$= 2.467 \times 10^{-3}$ moles ½ mk

25cm^3 of $NaOH_{(aq)} \longrightarrow 2.45 \times 10^{-3}$ moles

1000cm^3 NaOH $\longrightarrow$?

$? = \frac{1000X\ 2.467X10^{-3}}{25}$

$= 0.0987M\ ^1/_2$mk 2mks

No. of Moles of $H_2C_2O_{4\,(aq)}$ used =

$\frac{\text{Average titre X Ans in Q 1 (i)}}{1000}$ = Ans (a) ½ mk

No of moles of NaOH used + 2X Ans (a)

25cm^3 of NaOH $\longrightarrow$ 2X Ans (a) ½ mk

1000cm^3 $\longrightarrow$ of NaOH ?

$? = \frac{1000\ X\ 2\ X\ \text{Ans (a)}}{1000}$ = Molarity ½ mk

TABLE II

	1st	**2nd**	**3rd**
Final burette reading (cm^3)	26.0	36.8	37.5
Initial burette reading (cm^3)	0.0	10.4	11.4
Titre (cm^3)	26.0	26.4	26.1

CT 1mk
DP 1 mk
AC 1 mk
PA 1 mk
FA 1mk

05 mks

Conditions and penalties: are as in table I

(i) Average titre in table I : $\frac{26.0 + 26.1}{2} = 26.05cm^3$

(ii) Concentration of dilute HCl, solution D in mol^{-1}:

$NaOH_{(aq)} + HCl_{(aq)} \longrightarrow NaCl_{(aq)} + H_2O_{(l)}$

Mole ratio 1:1 respectively

$\frac{25 \times 0.0987}{1000} = 2.4675 \times 10^{-3}$ moles= No. of moles of D used in the exp.

2.467×10^{-3} moles ⟶ in 26.05cc

? ⟶ in 1000cc

? $= \frac{1000 \times 2.4675}{26.05} \times 10^{-3}$ ($^1/_2$mk) = 0.0947216M ½ mk $1^1/_2$ mks

2.5 x Ans in (iii) of procedure I = Ans b. moles
1000 ½ mk

Ans. b moles ⟶ 26.05cc

? ⟶ 1000cc

? = $\frac{1000 \times \text{Ans. b moles}}{\text{Average titre in Table II}}$ ½ mk = Molarity of D ½ mk

Conditions and penalties: are as in (iii) of procedure I

(iii) Concentration of A in Mol^{-1}

Solution D is a derivative of solution A

$1000cm^3$ of D ⟶ 9.47216×10^{-2} moles

100cc of D ⟶ ?
½ mk

? $= \frac{100 \times 0.0947216}{1000} = 9.47216 \times 10^{-3}$ moles ($^1/_2$ mk)

100 cm^3 of solution D has an equal No. of moles of solution A:

Hence $10cm^3$ ⟶ 9.47216×10^{-3} moles

1000 cm3 ⟶ ?
½ mk

? = $\frac{1000 \times 9.47216}{10} \times 10\text{-}3$

= 0.947216 M 2mks
½ mk

Procedure III

Table III

Time (sec)	0	30	60	90	120	150	180	210	240	270	300
Temp (^oC)	23.0	24.0	26.0	27.0	29.0	31.0	32.0	32.0	31.5	30.5	30.0

Marks distributed as follows:

(i) Complete table with 11 readings 1mk.

(ii) Penalise ½ mk if all readings given in the table are constant.

FIRST row.

(iii) For the temperature readings showing continuous increase without a constant, penalise ½ mk for any reading above 45.0 ^{o}c to a maximum of ½ mk.

(iv) Penalise ½ mk and treat reading before candidates constant/ drop in temperature reading which are less than 15.0 ^{o}C as unrealistic to a maximum of ½ mk.

(v) For initial temp, treat temp. Below 10^{o}C and those above 40^{o} C as unrealistic and penalise ½ mk once.

(vi) If the candidates reading starts with a constant, penalise ½ mk maximum and then award marks accordingly.

ii) Use of decimals ½ mk

Conditions and penalties

Accept ONLY if all readings are recorded CONSTANTLY as whole numbers or ONE decimal point of .0 or .5 other wise penalise fully.

iii) Accuracy (AC) ½ mk

Compare candidates FIRST READING with the SCHOOL VALUE / CENTRE VALUE.

If within + 2^{o}C of the S.V /C.V award ½ mk otherwise penalise fully.

iv) Trend 1 mk

Graph 3mks

Marks distributed as follows

(a) L.A ½ mk

Conditions / Penalties

(i) Penalise fully for inverted axis.

(ii) Penalise fully for wrong units: if no units are given ignore and award fully .

(iii) If only one axis is labelled / units given, condition (ii) above is applied.

(b) Scale ½ mk

(i) Area occupied by the ACTUAL plots MUST be at least ¾ of the graph paper provided.

(ii) Scale intervals MUST be constant / consistent.

(iii) The scale chosen must be able to accommodate all the plots / points.

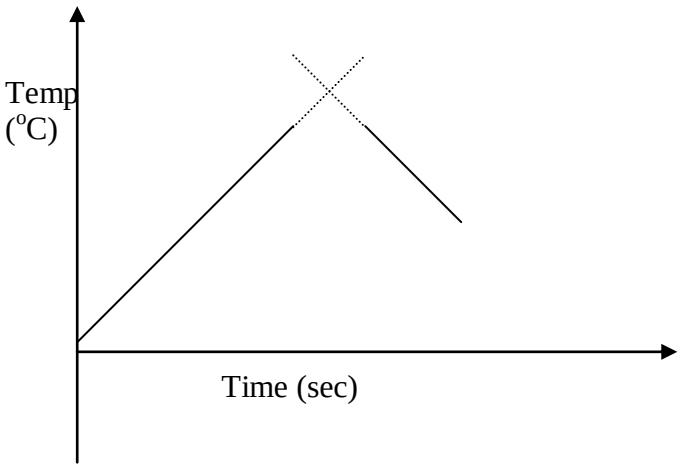
(c) Plotting 1mk

(i) Award 1mk if at least 10 points are correctly plotted.

(ii) Award ½ mk if only 7-9 points are correctly plotted: otherwise if less than 7 points are plotted correctly: award 0 mk.

(iii) If scale intervals are inconsistent then accept plots if any within the FIRST interval only.

(iv) Accept plots even if the axis are inverted and award accordingly.



Award 1mk for an extrapolation

Otherwise penalise fully

(i) Heat of reaction in this exp.

$\triangle H = MC\triangle T$

$\triangle T = 32.5 = 23.0 = 9.5\ ^oC$

½ mk ½ mk

$\triangle H = \frac{40 \times 4.2 \times 9.5}{1000} = -1.596$ kJ (1 mk)

(ii) Moles of M used

1mole ⟶ -1600 KJ

? ⟶ -1.596 KJ

$? = \frac{1 \times -1.596\ KJ}{-1600 KJ} = 9.975 \times 10^{-4}$ moles

(½ mk) (½ mk) (1 mk)

(iii) The mass of metal M

1 mole of metal M ⟶ 24g

9.975×10^{-4} moles ⟶ ?

$? = 9.975 \times 10^{-4} \times 24 = 0.02394$g

½ mk ½ mk (1 mk)

2 a)

Observation	Inferences
- Colourless vapour condense on the cooler part of test tube½mk - A colourelss gas with a pungent smell evolved - Gas changes red litmus ½ blue. - " Has no effect on✓ ½ blue litmus	- Contains water of crystallization (Hydrated salt) - NH_4^+ ion present

b.i)

Observation	Inferences
- Green ppt formed ✓½ insoluble in excess - Gas evolved turns moist red litmus paper blue - Gas evolved has not effect on blue litmus	- Fe^{2+} present✓ ½ - NH_4^+ present✓ ½

ii)

Observation	Inferences
- green ppt formed½mk - insoluble in excess ½mk	F^{2+} present ✓½

iii)

Observation	Inference
-White ppt ✓½ -Insoluble on warming	SO_4^{2-}, SO_3^{2-}, or CO_3^{2-} present. N/B i) If 3 mentioned ✓ 1 ½ mk ii) If 2 mentioned ✓ 1mk iii) If 1 mentioned ✓½ ½ mk Penalise each contradictory ion ½ to a maximum 1mk

iv)

Observation	Inferences
-White ✓½ ppt	SO^2_4 present✓½

- insoluble in Hydrochloric ✓½ acid	

3

Observations	Inferences
Solid disolves√½mk	Soluble salt√½mk

(i)

Observations	Inferences
White precipitate √½mk White precipitate dissolves√½mk	$Al^{3+}Zn^{2+}$ Pb^{2+} present√½mk Al^{3+} Zn^{2+} Pb^{2+} present√½mk

ii)

Observations	Inferences
White precipitate in drops √½mk White precipitate does not dissolve√½mk	$Al^{3+}Zn^{2+}$ Pb^{2+} present√½mk Al^{3+} Pb^{2+} present√½mk

iii)

Observations	Inferences
Yellow precipitate√1mk	Pb^{2+}confirmed present√1mk

iv)

Observations	Inferences
White precipitate √½mk	Pb^{2+} present√½mk