233/3 MARKING SCHEME

Table I **(5MKS)**

A) Complete table……..……..1mk

Conditions

Complete table with 3 titrations done……....1mk

Incomplete table with 2 titrations done……..…… ½

Incomplete table with 1 titration done……....…….0mk

B) Use of decimal……..…….1mk
(Tied to initial and final burette reading not titre value)

Conditions

i) Accept 1 or 2 decimal places used consistently, otherwise penalize fully
ii) If 2 decimal places are used, then the 2nd d.p must not be '0' or '5' otherwise penalize fully
iii) Accept inconsistent in the use of zero's as initial burette reading

C) Accuracy
Compare the candidate's correct titre values with s.v and award as follows;

i) If atleast with ±0.1 of s.vaward……..….1mk
If none is within ±0.1 but atleast one is within ±0.2 of s.v award ……..½
ii) If none is within 0.2
award……..…….0mk

D) Principle of averaging…….……1mk

Conditions

i) If 3 titrations are done, they are consistent and averaged……...……1mk
ii) If 3 titrations are done but only 2 are possible for averaging and averaged…..1mk
iii) If 2 titrations are done, and are consistent and averaged award……1mk
iv) If 3 inconsistent titration are done and averaged……....0mk
v) If 3 consistent titrations done but only two averaged……....0mk
vi) If only one titration done……...….0mk

Penalties

Penalize ½ marks for no working shown but the answer given is correct

If answer given is correct but from wrong values award……0mk

NB: Accept rounding off or truncation of the answer to the 2nd d.p

Accept answer if it works out exactly.

E) Accuracy

(Tied to correct average titre)

Compre the candidate correct average titre value with the s.v and award as follows:

i) If within ±0.1 of s.v……..1mk

If not within ±0.1 of s.v but within ±0.2 ……..….½

ii) If not within ±0.2……..……0mk

CALCULATION

b) Cocentration in moles per litre of NaOH in

i) Solution **N**

Moles of **L** reacting = Av. Titre x 0.128 √½ = Answer (a)

Moles of **N** in $25cm^3$ = answer (a)

$1000cm^3$ =?

$$\frac{1000cm^3 \text{ x answer (a)}}{25cm^3} = \text{correct answer (I)}$$

(ii) Solution **K**

Moles in $150cm^3$ = (correct answer (I) x 150) ÷ 1000 = Answer (b)√½

Answer (b) →$25cm^3$

? ←$1000cm^3$

(1000 x answer(b)) ÷ 25 √½ = correct answer II√1

Procedure II: Table II……..6mks

A) Complete table…….3mks

Complete table with all entries……..……3mks

i.e award ½ mk for each experiment done

Conditions

Treat initial readings of 0 or <100°C as unrealistic and penalize ½mk

Penalize ½mk if the initial temperature readings and final temperature readings are inverted

B) Use of decimal places……..……..1mk
(Tied to initial and final temperature)
Accept whole numbers or readings to 1 d.p of 0, .5 or two decimal places of .00, .25, .50 or .75 used consistently otherwise penalize fully.

C) Accuracy……1mk

Compare the candidate initial temperature readings with that of s.v
If within $\pm 2^0$C award……...……1mk
If outside $\pm 2^0$C penalize fully

D) Trend……1mk
Continuous rise upto maximum ½ followed by a drop in ΔT another ½ mk.

a) **Graph**……..…..3mk
   i) Labeling of axis……..…..½mk
   ii) Scale……...……..½mk
   iii) Plotting ……1mk

b) Volume of sodium hydroxide solution K required to neutralize carboxylic acid …1mk
Extrapolating graph with or without showing correct reading of V award……..….1mk
Extrapolated graph shown correctly the value of V on graph but reading is wrong/ missing award …….½

c) Volume of carboxylic acid solution M used in neutralization =
20-ans in (b)

d) i) Ratio between the volume of solution K and M

K	:	M
Ans(b)	:	ans c

ii. Concentration in moles per litre of carboxylic acid solution **M**

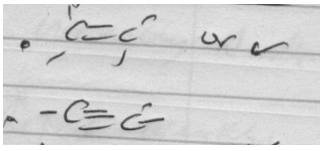
Moles of **K** = $\frac{\text{Answer (b) x correct answer1bII}}{1000}$

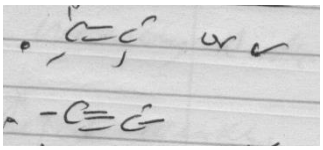
= correct answer d(ii) (a)

Moles of **M** = $\frac{\text{correct answer d(ii) (a)}}{\text{Answer (b)}}$ = correct answer

2.

Test 1	Expected observations
a) i) To solid M in a test tube/boiling tube, **add dilute nitric (V) acid** ½ **Test the gas** produced with a **burning splint** ½ Divide the resulting solution into portions for test (ii) and (iii) below.	**Bubbles ½/effervescence** of a colorless gas. Colorless gas that **put off a burning splint** is produced ½ **Reject** : fizzling Hissing colorless gas in its own
Test 2 To the 1st portion add **aqueous ammonia** dropwise until in excess ½	White½ precipitate insoluble in excess½ **Reject** :white solution
Test 3 to the second portion add aqueous **sodium iodide 1**	Yellow precipitate 1 **Reject** : any other color NB: for tests 1-3 penalize ½mk when a candidate uses wrong formula of reagent otherwise penalize fully for wrong reagents
2 b) **observations** **Test I** colorless gas that puts off a burning splint **Reject:** fizzing Sizzling Colorless gas on its own	**Inferences** **CO_3^{2-} present** Penalize fully for any other contradictory ion Inferences **Pb^{2+} Al^{3+} Zn^{2+} present.**

Test 2 **Observations** White precipitate½ soluble in excess ½ Alternative of 2(a) (ii) Test 2 Add aqueous sodium iodide to the first portion **Test 3** **Observations** To the second portion add aqueous sodium hydroxide drop-wise until in excess Alternative 2(b) Test 2 Adding sodium iodide No yellow precipitate	**Penalize** ½ for each contradictory ion NB: where the test in 2(a) was not given or wrong then 2(b) not score. Yellow precipitate **Reject** : contradctory colors White precipitate soluble in excess Pb^{2+} absent Penalize ½mk each for any contradictory ion to a maximum of 1mk NB: where in test 2, the candidate uses sodium iodide solution followed by aqueous sodium hydroxide in test 3, accept part (a) completely, part b test 2 (a) and 2 (b) but reject test 3 observations and inferences.
3) a) observations Melts into a colorless liquid½ Burns with smoky/sooty½// yellow flame i) partially dissolves ½to form colorless solution½	**Inferences**  Long chain organic compound

b i) slow effervescence //fizzing//formation of bubbles of colorless gas that puts off gas with pop sound	H^+/H_3O^+/-COOH
ii) orange colour of $H^+/K_2Cr_2O_7$ ½ persists// is retained NB**: Reject** colour of $H^+/ K_2Cr_2O_7$ is retained	R-OH Absent½
iii) red/ orange bromine water decolorized iv) Reject: bromine water turns colorless/decolorized	 **Accept:** unsaturated organic compound.
Iv Method Place $1cm^3$ of solution T ½ in a test-tube Add 1-3 drops of universal ½ indicator solution Match the colour obtained with the pH chart pH value 4 Reject: range pH 4-5	Inferences Weakly acidic½ Reject: weakly acidic