Kenya Certificate of Secondary Education
233/3
CHEMISTRY
PAPER 3

1. Procedure 1
Table 1

Table 1	I	II	III
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution A used (cm^3)			

Complete table✓(1mk)
Penalize to a maximum of 1/2mk for

- Inverted table
- Wrong arithmetic
- Burrette readings beyond $50cm^3$ except where explained
- Unrealistic titre values (below $1cm^3$) and above $50cm^3$

Use of decimals ✓(1mk)

- Accept for 1mk;
- One decimal or 2 decimal places throughout otherwise penalize fully
- If 2 decimal places are used; the second digit after the decimal is either '0' or 5 otherwise penalize fully.

Accuracy
Compare with the school/ teachers titre values if any

- Within ± 0.1 of T.V✓½mk
- Within ± 0.2 of T.V✓½mk
- Non-within ± 0.2 of each other T.V✓(0mk)

Averaging

- If 3 averaged and within± 0.2 of each other✓(1mk)
- If 2 averaged and within± 0.2 of each other ✓(1mk)
- Averaging outside the range± 0.2 (1mk)

PROCEDURE I
TABLE I

a) Average volume of solution A $= \frac{3\ titre\ values\ within \pm 0.2}{3}$ ✓ ½ mk
=correct answer ✓ ½ mk
or $\frac{2\ titre\ values\ within \pm 0.2}{2}$ ✓ ½ mk
Correct answer ✓ ½ mk

b) Moles of solution A used
0.1M NaOH ⟶ 0.1 moles in $1000cm^3$
if $1000cm^3$=0.1moles✓½mk
$25cm^3$= ?
$\frac{25cm^3}{1000} x 0.1moles = 0.0025$ ✓ ½ mk
$NaOH_{(aq)}+HCl_{(aq)} \longrightarrow Na\ Cl_{(aq)}+H_2O_{(l)}$

mole ratio base:Acid=1:1✓ ½ mk

Mole of HCl solution A that reacted with NaOH=0.0025 ✓ ½ mk

c) Concentration of solution A in moles per litre.

=Ans(a) contains 0.0025moles (Ans b) ✓ ½ mk

$1000cm^3$ = ?

$=\frac{1000cm^3}{Ans\ (a)} x0.0025\ moles$

Correct answer. ✓ ½ mk

Procedure II

Table 2	I	II	III
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution A used (cm^3)	16.0	16.0	16.0

a) Average of volume of solution A

$=\frac{3\ titre\ values\ within \pm 0.2}{3}$ ✓ ½ mk

correct ans✓ ½ mk

b) $H^+_{(aq)}+HCO_3^-{}_{(aq)} \longrightarrow H_2O_{(l)}+CO_{2(g)}$✓(1mk)

c) i) Morality of sodium hydrogen carbonate in mols/l

Moles of solution A used

$=\frac{ans(c)procedure\ 1xans(a)procedure\ II}{1000}$ ✓ ½ mk

Mole ratio acid: Hydrogen carbonate

1:1

Moles of sodium hydrogen carbonate solution C used

$=\frac{Ans(c)procedure\ Ix\ Ans\ (a)procedure\ II}{1000}$ ✓ ½ mk

Therefore

Molarity of $NaHCO_3$ $=\frac{1000xans(c)procedure\ Ix\ ans\ (a)procedure\ II}{1000x25}$ ✓ ½ mk

$=\frac{Ans.(c)procedure\ I\ x\ Ans\ (a)procedure}{25}$

= Correct answer ✓ ½ mk

Procedure II

c) ii Mass of sodium hydrogen carbonate in moles/l

RMM of NaHCO3=23+1+12+(16x3)

=36+48

=84

.: , Mass of $NaHCO_3$ in the mixture in grammes per litre

= 84x ans (c) (i) √ ½ mk

= correct answer ✓½mk

iii) Mass of NaCl in the mixture

= 10-ans (c ii) ✓½mk

= Correct Ans✓½mk

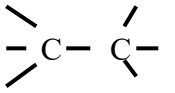
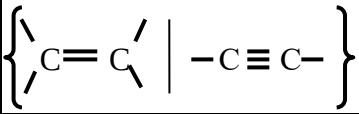
iv) % purity of $NaHCO_3$ = $\frac{ans\ (c\ ii)x100}{10}$✓½mk

Qn2. I

a) Observations	Inference
– Colorless liquid forms on cooler sides of test tubes – Colorless gas produced which relights a glowing splint Each 1/2mk max 1	Solid F is hydrated $^1/_2$mk NO_3^- ions present ½ mk

b) Observation	Inference
i) White ppt✓$^1/_2$mk ii) White ppt✓$^1/_2$mk insoluble in excess✓$^1/_2$mk iii)No white precipitate formed 1mk	Al^{3+},Zn^{2+} or Pb^{2+} ions present 1mk for 3 cations, ½ for 3cations 0mk for cat ion Al^{3+} or Pb^{2+} $^1/_2$mk present Al^{3+} present ✓^{1}/2mk or Pb^{2+} absent ✓$^1/_2$mk

II

a)Burns with a blue smokeless flame (1mk)	Saturated organic compound or hydrocarbon with low C:H ratio or  √ (1mk)
b) Purple $KMnO_4$ turns colorless ½ mk	R- OH or  √ ½ mk
c) Orange $K_2Cr_2O_7$ turn green ½ mk	R-OH present✓$^1/_2$mk

Q3.

a) Observation	Inference
– Colourless liquid form✓$^1/_2$ mk – Vapour condenses on cooler part of test tube $^1/_2$mk – Red litmus remains red$^1/_2$mk – Blue litmus turns red – Yellow solid when hot white when cold✓ $^1/_2$ mk Reject water forms	Contains water of crystallization Hydrated salt ✓$^1/_2$ mk Acidic gas ✓$^1/_2$mk ZnO

b) Observation	Inference
White ppt✓$^1/_2$mk Dissolve in excess✓$^1/_2$mk	Pb^{2+}, Zn^{2+}, Al^{3+} present

3 ions 1mk
2 ions ½ mk
1ions 0mk

c)Observation	Inference
– White precipitate✓$^1/_2$mk – Dissolves in excess✓$^1/_2$mk	Zn^{2+} present

Award zero for any contradictory ion.

d) Observation	Inference
– White ppt✓$^1/_2$mk – Dissolves on warming$^1/_2$mk	Cl^- present

Any contradictory ion award zero.