TIGANIA SOUTH PRE-MOCKS 2015

CHEMISTRY 1

MAY 2015

MARKING SCHEME

1(a) Is the process s for the separation of a mixture of solutes by their different rates of movement over a porous medium caused by moving solvent √1

b) Separation of dyes any 2 correct)

analyse and identify mixtures of substances which are difficult to separate by other means

__ Used to analyse dyes in food colour

2a) Hydrogen sulphide reduces concentrated sulphuric(vi) acid to water

Accept $H_2SO_4 + 3\ H_2S_g \rightarrow 4\ S_{(s)} + 4H_2O$ √1

b) Anhydrous calcium (ii) chloride // fused $CaCl2_4$

3a)i $PbO_{(s)} + 2\ HNO_{3\ (aq)} \rightarrow Pb\ (NO_{3(2aq)} + H_2O_{(l)}$

ii) $PbO + 2\ NaOH_{(aq)} \rightarrow Na_2PbO_{2(aq)} + H_2O_{(1)}$

b) Amphoteric

4a) Zinc is re reactive than iron an4it will lose electrons instead of iron during rusting. Tin is less reactive than iron and hence it will not protect iron once exposed to the factor causing rusting

b) E1ectroplating, Galvanizing, Oil/greasing, painting

5a) Q and P√1

c) Covalent √1

6a) Isotopes; Atoms of the same element with the same atomic number (number of protons) but different mass number due to different number of neutrons

(b) Allotropes; Different forms of an element but in the same physical state

c) Isomers; these are compounds same molecular formula but different structural formula

7(a) Fractional distillation

(b) Petrol, Kerosene, Diesel, Lubricating oil

(c) Burning the above constituents produces carbon(iv) oxide which is acidic when dissolves in water, it forms acidic solution which lowers the PH of water√1

8) No effervescence√1 In methylbenzene, hydrogen chloride remains as a covalent√1 molecules/ /No H+ formed ,

9a) The volume of a given mass of a gas is directly proportional to its absolute temperature at constant pressure

(b) V1/T1=V2/T2

V1=510cc

T1= 17+273=290k

V2=420cc

T2=?

510/290=420/T2 1 for correct substitution

$T_2 \times 510 = \frac{290 \times 420}{510}$

=238.8k or -34.2°C

10(a) A yellow solid is formed √1

b) $Cl_{2(aq)} + H_2S_{(g)} \rightarrow S_s + 2\,HC1_{(aq)}$

c) Carried out in a fume chamber/in the open because the two gases are poisonous

11 .Use a magnet to remove iron filings

Heat the remaining mixture NH_4C1 sublimes and is collected as a sublimate.

Common salt remains as a residue√1

12 Add distilled water to $ZnC1_2$ solid and shake until all solid dissolves

Add K2CO3// Na2CO3 solution for form white ppt of ZnCO3(g)

Filter and wash the residue with a lot of water

13 White ppt forms and dissolves forming a clear solution the white ppt is due to formation of $CaCO_3$ which is insoluble and dissolves into a clear/ colourless solution due to the soluble $Ca(HCO_3)$ formed√1

$CO_{2(g)} + Ca(OH)_{2(aq)}\ CaO_3 + H_2O_{(l)}$

$CaCO_{(3)(s)} + H_2O_{(l)} + CO_{2(g)}\ Ca(HCO_3)_{2(aq)}$

White ppt Colourless soln)

14i) At 100°C l00g water $\longrightarrow$ 48Y

190g water $\longrightarrow$ $\frac{48 \times 190}{100}$

ii) In 150g of saturated solution at 100°C mass of Y = 50g

At 60°C mass of Y in solution = 4Og

Mass that crystallizes = 50—40 = l0g

Attemp to subtract

15i) –Equation shifts to the right for more $CaCO_3$ to decompose to replace the CO_2 absorbed by the NaOH √1

ii) Equation-shift to the right as the forward reaction is endothermic hence favoured by high temp

16 Hard water deposits the insoluble Mg_2 and Ca_2 carbonate on the pipes preventing lead from dissolving into the water. Lead dissolves in the soft water leading to lead poisoning

17i) (32 x 8)= 256√1

ii) Plastic sulphur

iii) the rings are broken to form long chains which entangle with one another making liquid viscous

18 Mass of carbon $\frac{11 \times 12}{44}$

Mass of hydrogen $\frac{4.5}{}$ x 2= 0.5 √1

C	H
3/12=	=0.5/1
0.25	0.5
0.25/0.25=1	0.5/0.5=2

(CH2)n=84

12n+2n=84 √ ½

14n=84

14

N=6

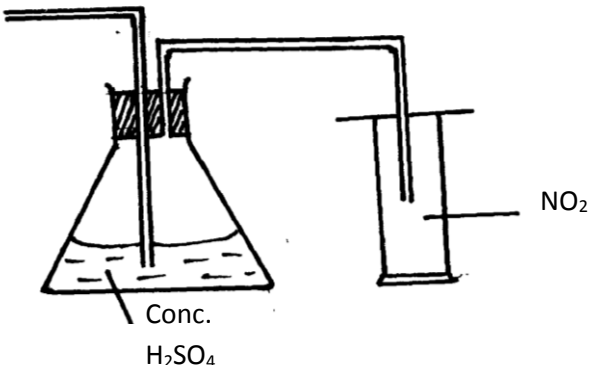
M.F=(CH2)6=C_6H_{12}√ ½

19.

Drying agent √1

Mode of collection√1

Workability √1



20 Melting point of strontium is lower than that of calcium√1
In metals are held by forces of attraction between positive nuclei and delocalized electrons. As the atomic radius increases, this attraction decreases because of the delocalized electrons increasing distance from the positive nucleus to the delocolized electrons

21a) 1

b) Increases the rate of the reaction by increasing the number of molecules with activation energy

c) Carbon(iv) oxide produced escapes into the atmosphere

22. $\frac{\text{Time } CO_2}{TNO_2} = \sqrt{\frac{\text{M.M } CO_2}{MMNO_2}}$

Where 100cm3 of CO2 takes 30 seconds

150cm3 of CO2 takes 30/100x150

=45 seconds

$\frac{TCO2}{TNO2} = \sqrt{\frac{M.MCO_2}{M.M\ NO_2}}$

$\frac{45}{TNO_2} = \sqrt{\frac{44}{46}}$

$TNO_2 = \frac{45 \times 46}{44}$

TNO2=46 seconds

OR

$\frac{RCO2}{RNO2} = \sqrt{\frac{M.M\ NO2}{M.M\ CO2}}$

But $RCO_2 = \frac{100cm^3}{30S} = 3.333/sec$

$3.33 = \sqrt{\frac{46}{44}}$

$RNO2 = \frac{3.33}{1.0225} = 3.263/sec$

Time for $NO_2 = 150cm^3/sec$

3.26cm3 ⟶ 1sec

150cm3 ⟶ $\frac{1x150}{3.2} = 46.01sec$

Time for $NO2 = 150cm^3$

3.26cm3 1 sec /‘

150cm3 , 1 x 150 46.0 secs

23(i)

Mobile/ free delocalized eiectrons√1

Mobile/free ions√1

Mobile/free ions√1

24. The oxide ion has 2 extra electrons that cause greater electron repulsion than in oxygen atom

25 SiOC2 has a giant atomic structure with strong covalent bond holding the atoms together. These require a lot of energy to break, hence it has a higher melting point. CO_2 has simple molecular structure with weak van der waals forces require little energy to break hence sublimes at low temperature and is a gas at room temperature and pressure.

26.(i) Propene // prop-1-ene

(ii) 1,2-dichloroethane

(iii) Presence of U.V light (Ultra violet light) sunlight

27. P1atinum-rhodium/ platinum

b) $4NH_{3(g)} + 5O_{2(g)}\ 4NO_{(g)} + 6\ H2O_{(g)}$

c) As a fertilizer

Preparation of N_2O√1

Making explosives

28a) Proton donor/ electron acceptor /substance which when dissolved in water dissociates/ break to hydrogen ions as the only positive ion

b)Water/H_2O

c) It is a proton donor/electron acceptor

233/2
CHEMISTRY
Paper 2
MAY 2015
Time: 2 hours

TIGANIA SOUTH PRE-MOCKS 2015

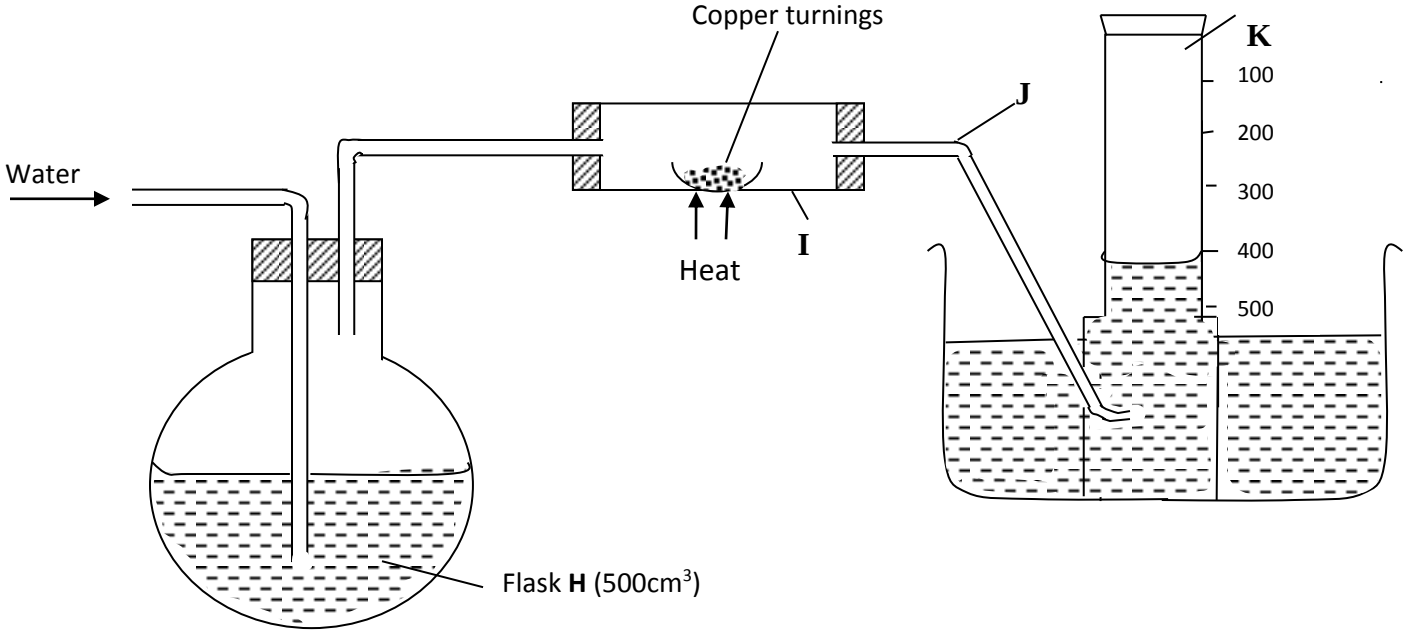
Kenya Certificate to Secondary Education

CHEMISTRY PAPER 2

TIME: 2 HOURS

M A R K I N G S C H E M E

1. A. In an experiment to determine the percentage of oxygen in air, the apparatus below were set up. Study the set up and the information provided to answer the questions that follow.



A 500cm³ measuring cylinder **K** was filled with water and assembled for gas collection. Copper turnings were heated red hot and water was slowly passed into 500cm³ flask **H** until it reached the 500cm³ mark. A colourless gas was collected in **K**.

(i) What was the purpose of passing water into flask **H**? **(1 mark)**

To displace air in flask H over the hot copper turnings.

(ii) What observations were made in the tube **I**? **(1 mark)**

The brown solid changes to black

(iii) Name one of the gases that is likely to be found in **J**. **(1 mark)**

Nitrogen, carbon (IV) oxide, argon, (Xeron, neon) ***(Any one)***

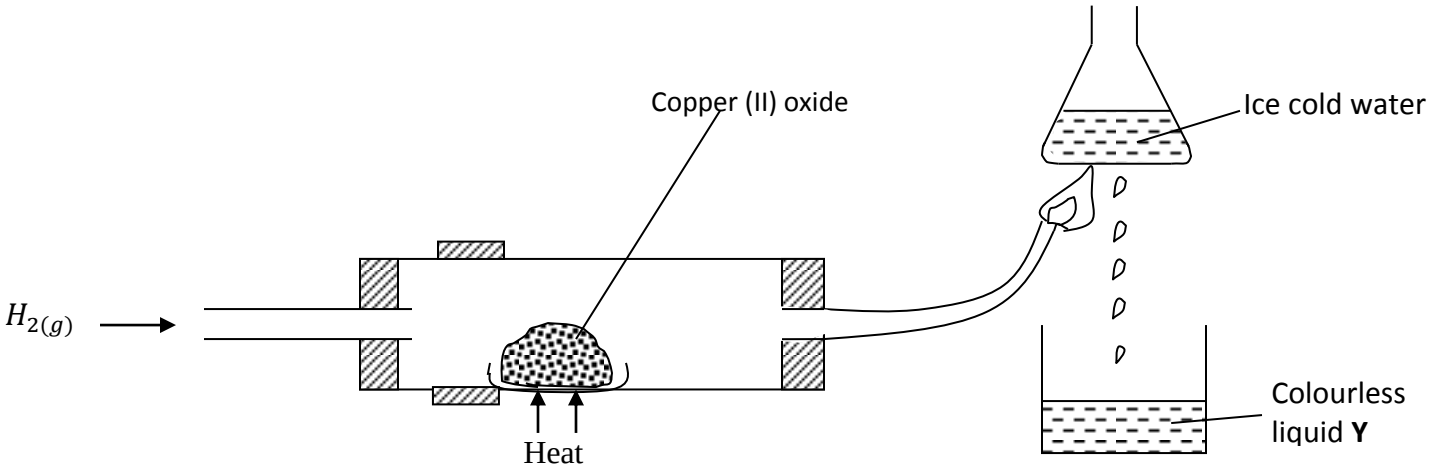
(iv) What was the volume of the gas collected in the measuring cylinder at the end of the experiment? **(1 mark)**

410cm³

(v) Calculate the percentage of oxygen in air using the above results. **(2 marks)**

$$\frac{(500 \times 410)}{500} \times 100 = \frac{90 \times 100}{500} = 18\% \quad \checkmark 1$$

B. Study the diagram below and answer the questions that follow.



(a) Give ***one*** observation made in the combustion tube after some time. **(1 mark)**

Black CuO turns to red-brown Cu.

(b) Write an equation for the formation of the colourless liquid **Y**. **(1 mark)**

$$2H_{2(g)} + O_{2(g)} \longrightarrow 2H_2O_{(l)}$$

(c) What was the aim of the above experiment as demonstrated in the combustion tube? Explain. **(2 marks)**

To determine the reducing property of hydrogen. ✓1 ***Hydrogen is above Cu*** ✓1 ***in the reactivity series, thus it reduces the oxygen from CuO.***

2. Use the information below to answer the questions that follow. The letters are not the actual symbols of the elements.

Element	Atomic No.	M.P^{0}C	B.P^{0}C	Ionic radius (nm)
P	11	98	890	0.095
Q	12	650	1110	0.065
R	13	660	2470	0.050
S	14	1410	2360	0.041
T	15	44.2 & 590	280	0.034
U	16	113 & 119	445	0.184
V	17	-101	-35	0.181
W	18	-189	-186	-

(a) (i) Write the electronic configuration of the atoms represented by letters **T** and **W**. **(1 mark)**

T - 2.8.5 ✓½
W - 2.8.8 ✓½

(ii) State the nature of the oxides of the elements represented by **Q** and **U**. **(2 marks)**

Q - Basic Oxide ✓**1**
U - Acidic oxide ✓**1**

(b) Why does the elements represented by the letters **T** and **U** have two values of melting points? **(1 mark)**

The two elements exhibit allotropy.

(c) Explain the following observations in terms of structure and bonding.

(i) There is an increase in boiling point from **P** to **R**. **(2 marks)**

There is gradual increase in the strength of the metallic bonds ✓**1** ***due to the increase in the number of delocalized (valence) electrons in the element*** ✓**1**

(ii) Element **S** has a high boiling point. **(2 marks)**

The atomic radius of V is smaller than that of U. ✓**1** ***V has more protons therefore has a stronger nuclear attraction hence the smaller atomic radius.*** ✓**1**

(iii) There is a decrease in boiling points from **U** to **W**. **(2 marks)**

Elements U, V and W have simple molecular structures ✓1 in which the molecules are held by weak Van der waals forces. The Van der waals ✓1 forces weaken from U to W.

(d) (i) Compare the atomic radius of **U** and **V**. **(1 mark)**

The atomic radius of V is smaller than that of U. ✓1

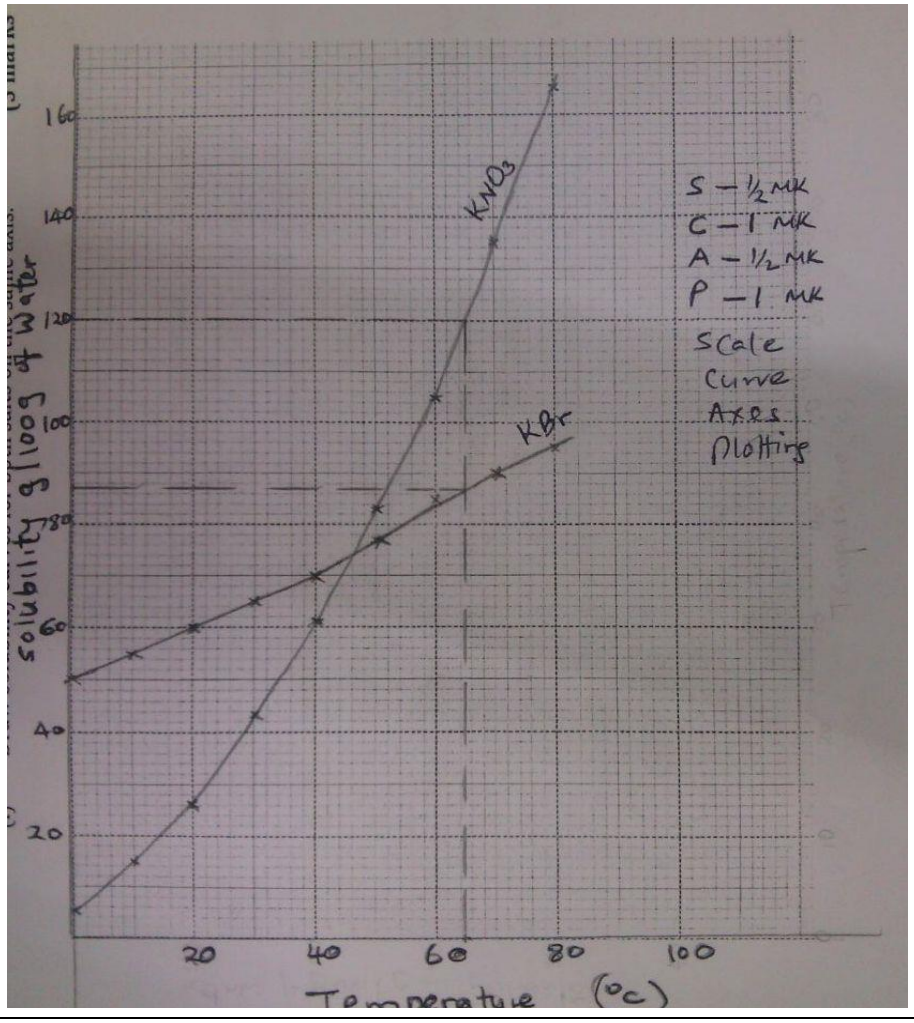
(ii) Why is there no ionic for **W** reported in the table? **(1 mark)**

It has a stable electron configuration hence does not ionize.

3. (a) The solubilities of potassium nitrate and potassium bromide at different temperatures was determined. The following data was obtained.

Temperature ^0C		0	10	20	30	40	50	60	70	80
Solubility g/100g H_2O	KNO_3	5	15	26	43	61	83	105	135	165
	KB_r	50	55	60	65	70	77	85	90	95

(i) Draw solubility curves for both salts on the same axis. **(3 marks)**



4

(ii) What was the solubility of each salt at 65^0C? **(1 mark)**

$\mathbf{KNO_3 - 120g/100g\ of\ water \pm 1}$ ✓½

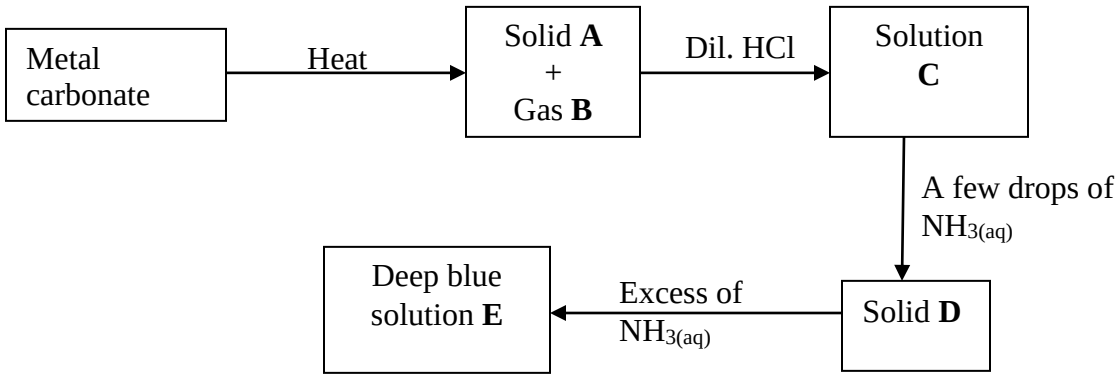
$\boldsymbol{KBr - 87g/100g\ of\ water \pm 1}$ ✓½

(iii) 100g of a saturated solution of potassium nitrate at 70^0C was cooled to 20^0C. What mass of the crystals will be crystallized? **(2 marks)**

At 70^0C solubility = 135g/100g of water
If 235g contain 135g of salt
100g contain 135g
$\frac{100 \times 135}{235} = 57.4468g$ ✓½

At 20^0C solubility = 26g/100g of water
If 126g contain 26g of salt
100g contain ?
$\frac{100 \times 26}{126} = 20.6349g$ ✓½
Mass which will crystallized
57.4468 – 20.6349
= 36.8119g

(b) Study the flow chart below and answer the questions that follow.



(i) Write an equation for the formation of solid **A** and gas **B**. **(1 mark)**

$\boldsymbol{CuCO_{3(s)} \xrightarrow{heat} CuO_{(s)} + CO_{2(g)}}$

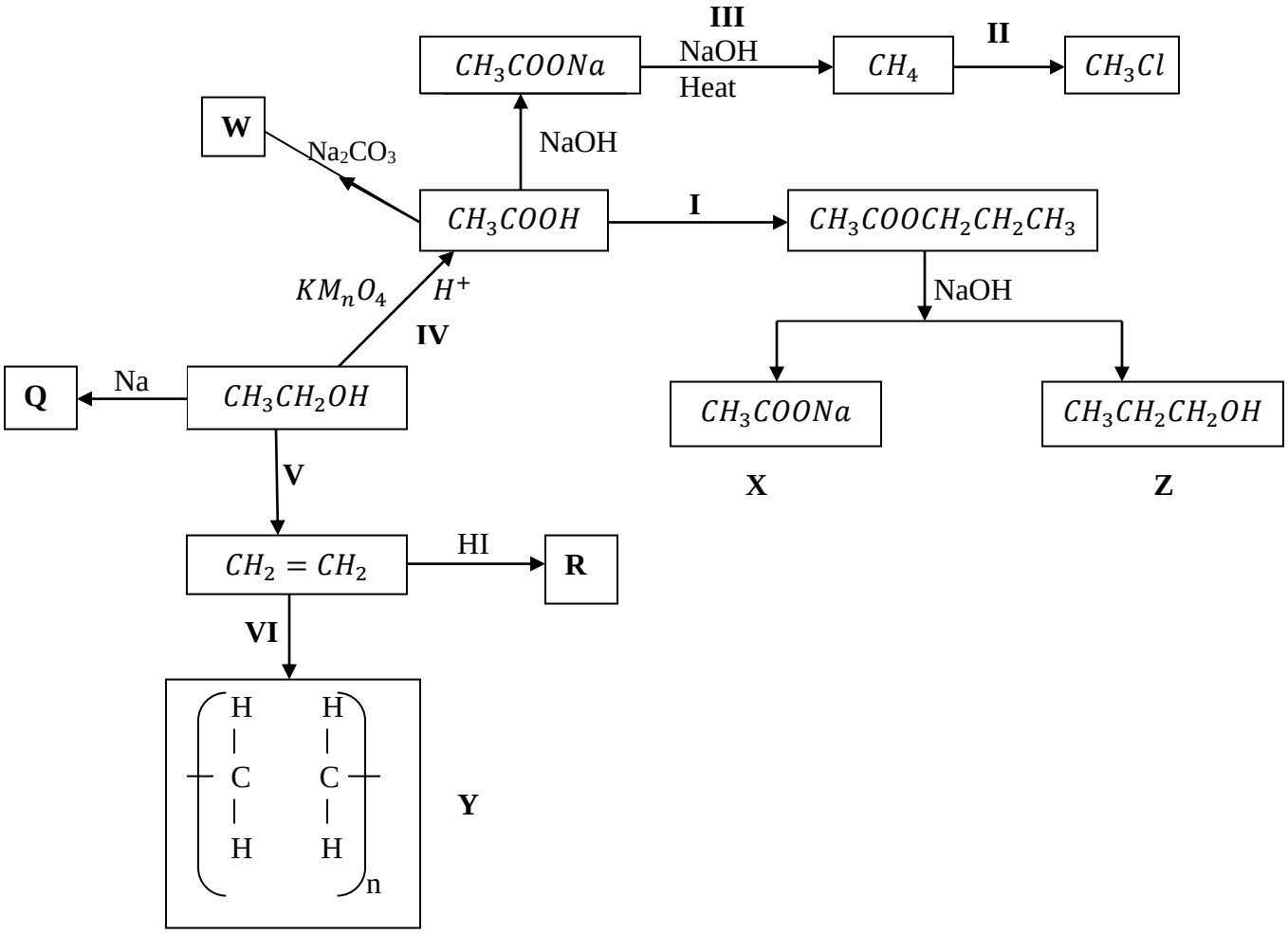
(ii) Name;

Solution **C** - ***Copper (II) chloride*** **(1 mark)**
Solid **D** - ***Copper (II) hydroxide*** **(1 mark)**

(c) Write the formula of the complex ion in solution **E**. **(1 mark)**

$\left[Cu\,(NH_3)_4 \right]^{2+}$

4. Study the flow chart below and answer the questions that follow.



(a) Name substance. **(3 marks)**

X - ***Sodium ethonoate*** ✓***1***

Q - ***Sodium ethoxide*** ✓***1***

R - ***Iodoethane*** ✓***1***

(b) Write down an equation for the reaction represented by step III. **(1 mark)**

$$CH_3COONa_{(s)} + NaOH_{(aq)} \longrightarrow CH_{4(g)} + Na_2CO_{3(s)}$$

(c) What are the conditions and reagent required for steps?

(i) **I** **(2 marks)**

Reagent - ***Propan-l-ol*** ✓*1*

Condition - ***Conc. H_2SO_4*** ✓*1*

(ii) **IV** **(2 marks)**

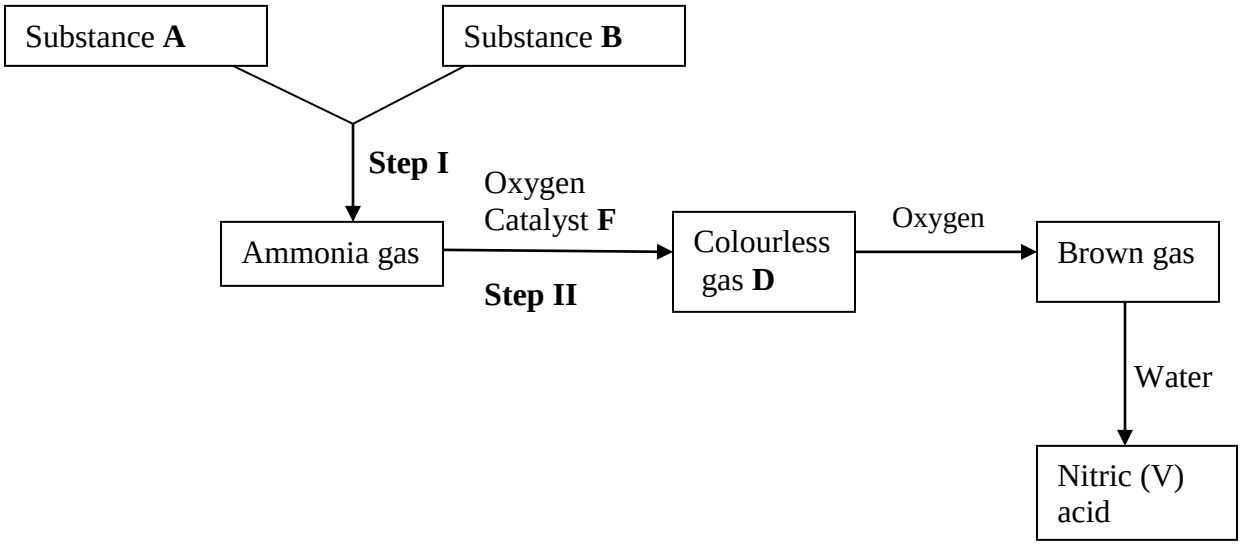
Reagent - ***Conc. H_2SO_4*** ✓*1*

Condition - **Temp 160 – 180^{0}C** ✓*1*

(b) Name the process represented by: **(4 marks)**

I - ***Esterification***
II - ***Substitution***
IV - ***Oxidation***
V - ***Dehydration***

5. **I.** Study the scheme below and answer the questions that follow.



(a) Identify substances. **(3 marks)**

A - ***Hydrogen***
B - ***Nitrogen***
D - ***NO***

(b) State the catalyst necessary for; **(2 marks)**

Step **I** - ***Iron finely divided / iron***
Step **II** - ***Platinum – rhodium catalyst***

(c) Write a balanced chemical equation for taking place in step **II**. **(1 mark)**

$4NH_{(3)} + SO_2 \longrightarrow 2NO_{(g)} + 6H_2O$

(d) Write two balanced chemical equations for the reaction between chlorine Gas and;

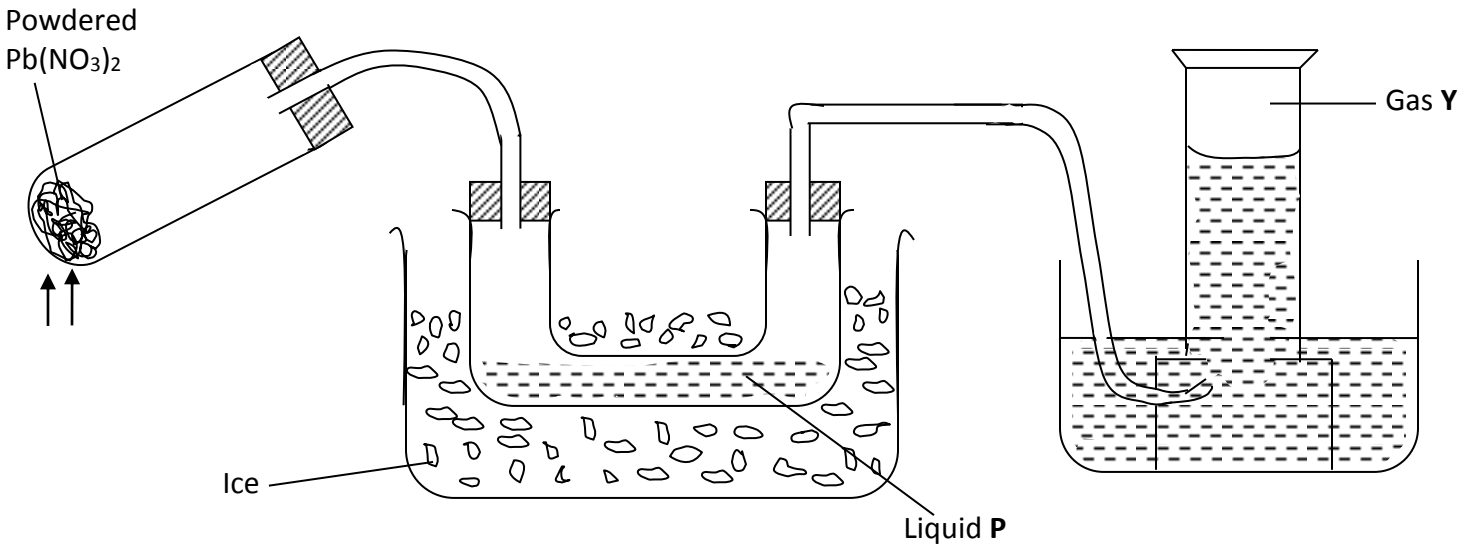
(i) Hot and concentrated sodium hydroxide. **(1 mark)**

$6NaOH_{(aq)} + 3Cl_{2(g)} \longrightarrow NaClO_{3(aq)} + 5NaCl_{(aq)} + H_2O_{(l)}$

(ii) Dilute and cold sodium hydroxide. **(1 mark)**

$2NaOH_{(aq)} + Cl_2 \longrightarrow NaOCl + NaCl + H_2O$

II. The diagram below shows an experiment in which the Lead (II) nitrate crystals are heated.



(a) Name; **(2 marks)**

(i) Liquid **P** - ***dinitrogen tetra oxide***
(ii) Gas **Y** - ***oxygen***

(b) Write a balanced chemical equation for the decomposition of Lead (II) nitrate. **(1 mark)**

$2Pb(NO_3)_2 \longrightarrow 2PbO_{(s)} + 4NO_{2(s)} + O_{2(g)}$

(c) Explain how you can distinguish between nitrogen (II) oxide and nitrogen (I) oxide. **(2 marks)**

- ***Nitrogen (V) oxide relights a glowing splint while nitrogen (II) oxide does not.***
- ***N_2O has xtic sweet smell, while. NO_2 is odourless.***

6. **I.** Study the standard electrode potentials given below and answer the questions that follow.

$D^{2+}_{(aq)} + 2e^- \rightleftharpoons D_{(s)} \quad E^\theta = -2.92V$

$G^{2+}_{(aq)} + 2e^- \rightleftharpoons G_{(s)} \quad E^\theta = -2.36V$

$\frac{1}{2}J^{2+}_{(g)} + e^- \rightleftharpoons J_{(s)} \quad E^\theta = 0.00V$

$M^{2+}_{(aq)} + 2e^- \rightleftharpoons M_{(s)} \quad E^\theta = +0.34V$

$\frac{1}{2}R^{2+}_{(aq)} + e^- \rightleftharpoons R_{(s)} \quad E^\theta = 2.87V$

(a) Identify the strongest:

(i) Reducing agent ***D*** **(1 mark)**

(ii) Oxidizing agent $\boldsymbol{R^{2+}}$ **(1 mark)**

(b) Calculate the e.m.f of a cell made of G and M. **(2 marks)**

$\boldsymbol{e.m.f = E^\theta R - E^\theta O}$

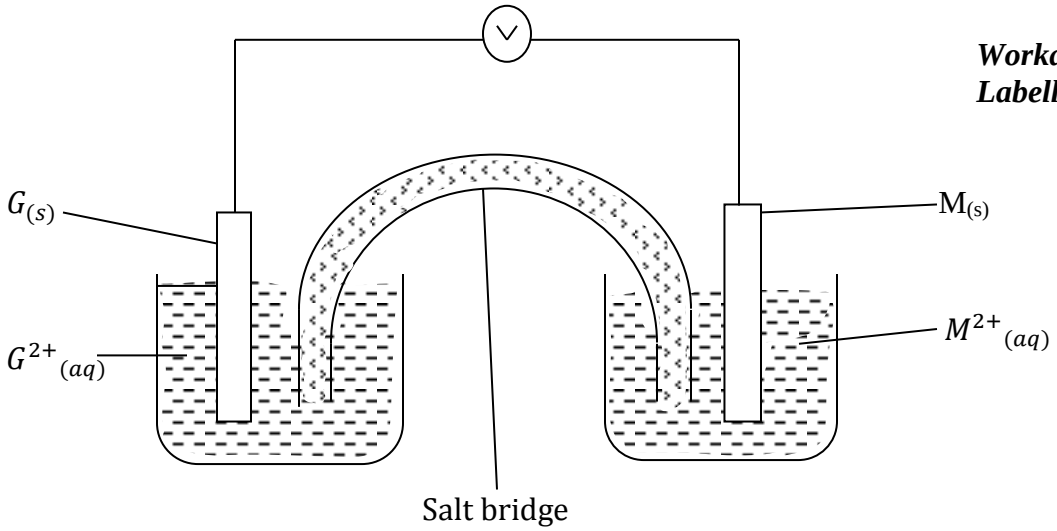
$\boldsymbol{= +0.34 - {}^{-}2.36}$

$\boldsymbol{= +2.70V}$

(c) Write the cell representation for the above cell in (b). **(1 mark)**

$\boldsymbol{G_{(s)} \left/ G^{2+}_{(aq)} \right\!\!\right/ M^{2+}_{(aq)} \left/ M_{(s)} \right. ; E = +2.70V}$ ***Penalize for lack of states and E value***

(d) Draw a cell diagram for the cell in (b) above. **(2 marks)**



Workability ✓1
Labelling ✓1

(e) Write the cell reaction for the drawn cell diagram in (d) above. **(1 mark)**

$$G_{(s)} + M^{2+}{}_{(aq)} \longrightarrow G^{2+}{}_{(aq)} + M_{(s)} \; ; E = +2.70V$$

II. Electrolysis of aqueous solution of metal M resulted in the deposition of 1.07g of metal upon passage of a current of 1.32 amperes for 75 minutes.
(M = 52, 1F = 96500C)

(i) Calculate the quantity of electricity passed through the cell. **(1 mark)**

$Q = 1t$
$= 1.32 \times 75 \times 60$ ✓½
$= 5940C$ ✓½

(ii) Calculate the charge on the metal ion. **(3 marks)**

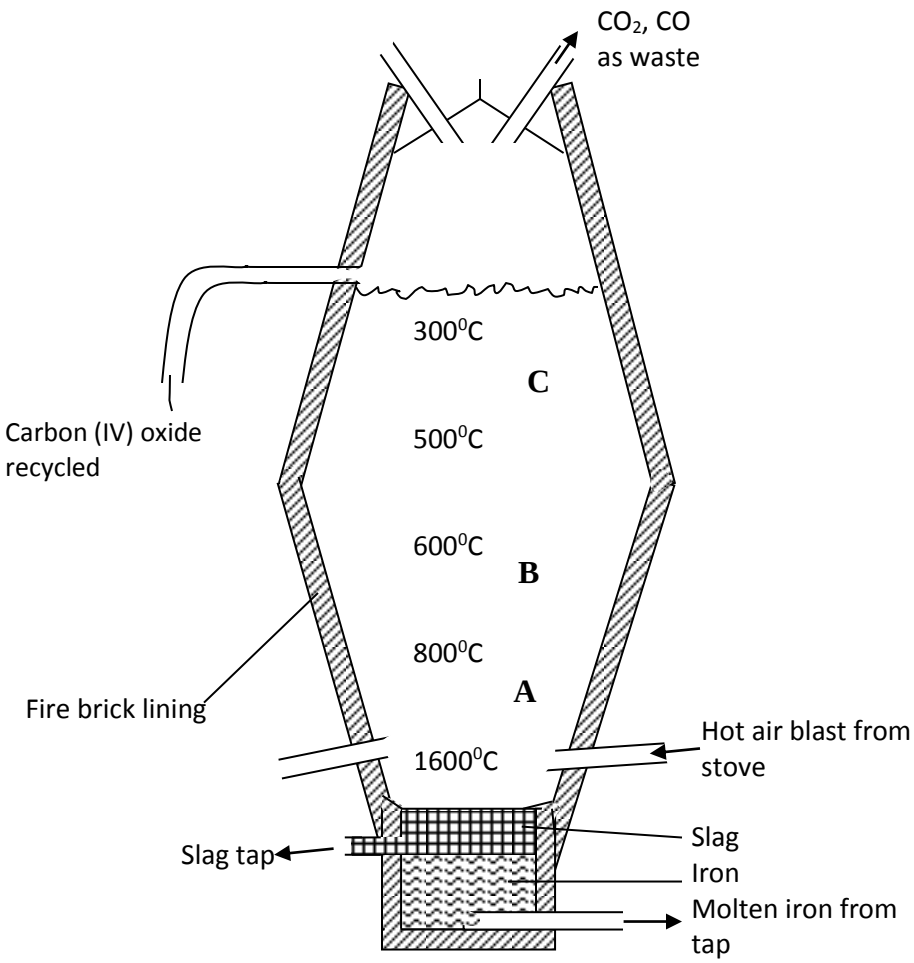
If 1.07g is departed by 5940C
52g " "
$\frac{52 \times 5940}{1.07} = 288,672.8972C$ ✓1

If 1F is 96500C
? " 288672.8972C

$\frac{1 \times 288,672.8972}{96500}$ ✓1

$= 2.994$
$\simeq 3$
$+3$ ✓1

7. Extraction of iron involves two main processes, smelting and refining. Below is the blast furnace which is used to smelt iron from its ore.



(a) (i) What does the word smelt mean? **(1 mark)**

Extraction of a metal from its ore using a reducing agent and heat.

(ii) Name the reducing agent in the process. **(1 mark)**

Carbon (in form of coke)

(iii) What is the role of the hot air blast in the process? **(2 marks)**

Hot air reacts with coke to form carbon (IV) oxide producing a lot of heat which melts the iron formed in the blast furnace.

(b) Write equations for the reactions that take place at the region marked A, B and C. **(3 marks)**

A $C_{(s)} + O_{(2)} \longrightarrow CO_{2(g)}$

B $CO_{2(g)} + C_{(s)} \longrightarrow 2\,CO_{(g)}$

C $2Fe_2O_{3(s)} + 3C_{(s)} \longrightarrow 4Fe_{(s)} + 3CO_{2(g)}$

(c) What is the purpose of limestone in the extraction process? **(1 mark)**

To remove silica impurities in the ore.

(f) Write equations to show how impurities are removed from the ore. ***(3 marks)***

$CaCO_{3(s)} \xrightarrow{\text{heat}} CaO_{(s)} + CO_{2(g)}$

$CaO_{(s)} + SiO_{2(s)} \longrightarrow CaSiO_{3(s)}$

$Al_2O_{3(s)} + CaO_{(s)} \longrightarrow CaAl_2O_{4(s)}$

slag

233/3

CHEMISTRY

PAPER 3

TIGANIA SOUTH PRE-MOCKS

(CONFIDENTIAL)

In addition to the apparatus found in the laboratory each candidate will require the following;

- About 0.5g of solid F
- About 1g of solid G
- 6 clean test-tubes
- Universal indicator solution and a pH chart
- Ethanol supplied with a dropper
- Clean dry metallic spatula
- 1 boiling tube
- Distilled water
- Solution J, about $130cm^3$
- Solution Q, about $160cm^3$
- Solution R, about $30cm^3$
- Screened methyl orange indicator
- Methyl orange indicator
- 100ml measuring cylinder
- Filter paper
- Means of labeling
- Solid P
- Thermometer
- 100ml beaker

Access to the following;

- Ethanol supplied with a dropper
- Concentrated sulphuric (VI) acid supplied with a dropper bottle
- Acidified Potassium dichromate (VI) solution
- Acidified Potassium Manganate (VII) solution.
- 2M $Ba(NO_3)_2$ solution.
- 2M NaOH solution.
- 2M HCl acid.
- Source of heat.

Preparation

- ✓ Solurion J is 0.12M HCL, prepared by adding about 800cm^3 of distilled water to 4.05$cm^3$of concentrated HCL of density 1.08gcm^{-3} and making it to one litre of solution.
- ✓ Solution Q is prepared by dissolving 5.3g of anhydrous sodium carbonate in enough distilled water and making up to one litre of solution.
- ✓ Solution R is prepared by dissolving 15.75g of hydrated barium hydroxide in enough distilled water and top up to one litre of solution.
- ✓ Solid P is 2.0g of oxalic acid weighed accurately and supplied in a stoppered container
- ✓ Solid F is maleic acid
- ✓ Solid G is sodium sulphite

MARKING SCHEME

233/3

CHEMISTRY

MAY 2015

TIGANIA SOUTH PRE-MOCKS 2015

Kenya Certificate of Secondary Education (K.C.S.E.)

1. **Table 1**

a)

Complete table …… 1mark

Conditions:

i) Complete table with 3 titrations done ……. 1 mark
ii) Incomplete table with two titrations done….½ mark
iii) Incomplete table with only one titration done ….0 mark

Penalties:

i) Wrong arithmetic
ii) Inverted table
iii) Unrealistic values i.e less than 1 cm^3,or in 100s
iv) Burette readings >50 cm^3,unless explained

Penalize ½ mark each to a maximum of ½ mark, i.e, penalize ½ mark ONCE.

Use of decimal places…… 1 mark (Tied to

1st and 2nd row only)

i) Accept 1 or 2 decimal places used consistently, otherwise penalize FULLY.
ii) If two decimal places are used, the 2nd must be a "0" or a "5", otherwise penalize FULLY.
iii) Accept the inconsistency in the use of zeros in the initial burette readings e.g 0.0,0.00, 00.0

Accuracy…….. 1 mark

Compare candidate's correct titre value with school value (s.v) and tick (✓) if it earns a mark and award accordingly.

Coditions:

i) If at least one titre value is within ± 0.1 cm^3 of s.v award…… 1 mark
ii) If no value is within ± 0.1 cm^3 of s.v but there is at least one within ± 0.2 cm^3 award …… ½ mark
iii) If no titre value is within ± 0.2 cm^3 award…… 0 mark

Principles of averaging…… 1 mark

i) If three consistent values are averaged ……. 1 mark

ii) If three titrations are done and only two are consistent and averaged…… (1 mark)

iii) If two titrations are done, are inconsistent and averaged … (0 mark)

Final Accuacy (tied to correct average titre)…….. (1 mark)

Compare the candidate's correct average titre with s.v;

i) If within ± 0.1 of s.v …….. 1 mark

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

iii) If beyond ± 0.2 of s.v ……. 0 mark

b) 250 cm^3 ⟶ 1.325g of Na_2CO_3

⟶ 1.325 x 4g of $N_{a2}CO_3$

= 5.3/ RFM

= $\frac{5.3}{106}$ grams per litre

= 0.05M ✓

c) i) Moles of Na_2CO_3 reacted = $\frac{0.05 \times 25}{1000}$

= 0.00125 ✓

Reacting mole ratio of HA: Na_2CO_3 = 2:1

ii) 0.0025 moles of HA ⟶ average titre

? ⟵ 1000cm^3

= $\frac{0.0025 \times 1000}{\text{Average titre}}$

= 0.12M ✓

Table II: mark as in table I

e) i) $1000cm^3$ ⟶ 0.12 mol.

Titre volume ⟶ $\frac{\text{average volume x 0.12}}{1000}$ moles

= correct answer

ii) Reacting mole ratio of HA to Na_2CO_3 is 2 : 1
∴ Moles of Na_2CO_3 = ½ * answer above

=Correct answer

2. **Table 1**

d)

Complete table …… 1mark

Conditions:

iv) Complete table with 3 titrations done ……. 1 mark
v) Incomplete table with two titrations done….½ mark
vi) Incomplete table with only one titration done ….0 mark

Penalties:

v) Wrong arithmetic
vi) Inverted table
vii) Unrealistic values i.e less than 1 cm^3,or in 100s
viii) Burette readings >50 cm^3,unless explained

Penalize ½ mark each to a maximum of ½ mark, i.e, penalize ½ mark ONCE.

Use of decimal places…… 1 mark (Tied to

1^{st} and 2^{nd} row only)

iv) Accept 1 or 2 decimal places used consistenly, otherwise penalize FULLY.

v) If two decimal places are, the 2nd must be a "0" or a "5", otherwise penalize FULLY.
vi) Accept the inconsistency in the use of zeros in the initial burette readings e.g 0.0,0.00, 00.0

Accuracy…….. 1 mark

Compare candidate's correct titre value with school value (s.v) and tick (✓) if it earns a mark and award accordingly.

Coditions:

iv) If at least one titre value is within ± 0.1 cm^3 of s.v award…… 1 mark
v) If no value is within ± 0.1 cm^3 of s.v but there is at least one within ± 0.3 cm^3 award …… ½ mark
vi) If no titre value is within ± 0.2 cm^3 award…… 0 mark

Principles of averaging…… 1 mark

iv) If three consistent values are averaged ……. 1 mark
v) If three titrations are done and only two are consistent and averaged…… (1 mark)
vi) If two titrations are done, are inconsistent and averaged … (0 mark)

Final Accuacy (tied to correct average titre)…….. (1 mark)
Compare the candidate's correct average titre with s.v;
iv) If within ± 0.1 of s.v …….. 1 mark
v) If not within ± 0.1 but within ± 0.2 of s.v ……½ mark
vi) If beyond ± 0.2 of s.v …….. 0 mark

e) 250 cm^3 ⟶ 1.325g of Na_2CO_3
⟶ 1.325 x 4g of $N_{a2}CO_3$

= 5.3/ RFM

= $\frac{5.3}{106}$ grams per litre

= 0.05M ✓

f) i) Moles of Na_2CO_3 reacted = $\frac{0.05 \times 25}{1000}$

= 0.00125 ✓

Reacting mole ratio of HA: Na_2CO_3 = 2:1

ii) 0.0025 moles of HA ⟶ average titre

? ⟵ $1000cm^3$

= $\frac{0.0025 \times 1000}{\text{Average titre}}$

= 0.12M ✓

Table II: mark as in table I

e) i) $1000cm^3$ ⟶ 0.12 mol.

Titre volume ⟶ $\frac{\text{average volume} \times 0.12}{1000}$ moles

= correct answer

iii) Reacting mole ratio of HA to Na_2CO_3 is 2 : 1
∴ Moles of Na_2CO_3 = ½ * answer above

=Correct answer

iv) $25cm^3$ ⟶ answer(ii)
$75\ cm^3$ answer (ii) x $\frac{75}{25}$ = correct answer

v) Original solution c: 75 x answer (iii) = correct answer

vi)

vii) 0.00375 – answer (iV) = correct answer

viii) Reacting mole ratio is 1 : 1 ∴ moles of $M(OH)_2.8H_2O$= = answer (v)

f) i) answer b(vi) are in 25 cm^3 of $M(OH)_2.8H_2O$

x $\frac{1000}{25}$ cm^3

$x = \frac{\text{answer} \times 1000}{25}$ ✓

= correct answer (moles per litre) ✓

ii) 15.75 g ⟶ answer (i)

?? ⟵ 1mol.

$x = \frac{18.3 \times 1}{\text{answer (i)}}$ ✓

= correct answer ✓ (accept rounded off to ma whole number)

iii) M + 178 = answer (ii)
M = Answer (ii) - 178 ✓

∴ R.A.M of M = correct answer ✓

ix) answer(ii)
75 cm^3 answer (ii) x $\frac{75}{25}$ = correct answer

x) Original solution c: 75 x answer (iii) = correct answer

xi) 0.00375 – answer (iV) = correct answer

xii) Reacting mole ratio is 1 : 1 ∴ moles of $M(OH)_2.8H_2O$= = answer (v)

f) i) answer b(vi) are in 25 cm^3 of $M(OH)_2.8H_2O$

x $\frac{1000}{25}$ cm^3

x = $\frac{\text{answer} \times 1000}{25}$ ✓

= correct answer (moles per litre) ✓

ii) 15.75 g ⟶ answer (i)

?? ⟵ 1mol.

x = $\frac{18.3 \times 1}{\text{answer (i)}}$ ✓

= correct answer ✓ (accept rounded off to a whole number)

iv) M + 178 = answer (ii)
M = Answer (ii) - 178 ✓

∴ R.A.M of M = correct answer ✓

Question 2

Table

(i) Complete table…..2 readings recorded…. 1 mk

Penalty:

penalize fully for any space not filled.

(ii) Use of decimal…… 1 mk

Accept temperature readings for 1 mk if consistently given either as whole numbers of 1 d.p. of .0 or .5

(iii) Accuracy…… 1 mk

Compare candidate's initial temperature reading to school value. Award 1 mk for value within $\pm$ 2^{o}C of SV otherwise penalize fully.

Questions

(a) ΔT = Final-Initial = Correct ans 1 mk

Penalties

- Penalise ½ mark for wrong units or omission of unit on the answer.

(b) (i)Accept correct transfer of ΔT, even if rejected in (a) above.

Heat change= m.c. ΔT

= 30 x 4.2 x ΔT 1 mk

= correct ans 1 mk

ii) Number of moles= $\frac{2.0}{126}$ = 0.01587 1 mk

- Penalise ½ mk for wrong units used otherwise ignore if omitted.

iii) Molar heat of solution.

ΔH= $\frac{\text{ans b(i)}}{ans\ b(ii)}$ ½ mk

= correct ans ½ mk

Penalties

- Penalise ½ mk for transfer of either b(i) or b(ii), otherwise penalize fully for strange values.

3 i)

Observation	Inference
No white precipitate formed ✓½	Na^+, K^+, NH_4^+ ✓½

(ii)

Observation	Inference
Burns with a golden-yellow flame ✓1	Na^+ present ✓½

(iii)

Observation	Inference
White precipitate ✓½ dissolves on addition of HCl acid ✓½	SO_3^{2-}, CO_3^{2-} *present* ✓

(iv)

Observation	Inference
Colour changes from <u>orange</u> to <u>green</u> ✓½	SO_3^{2-} *present* ✓½

b) You are provided with solid F. Carry out the tests below and record your observations and inferences in the spaces provide

(i) Using a metallic spatula, heat half of solid F in a non-luminous burnsen burner flame for some time then remove when it ignites

Observations	Inferences
Melts burns with a sooty/smoky/luminous yellow flame√½ (accept melts on its own for ½ mk)	C= C or –C = C- present √1 Organic compound with high C:H ratio long chain organic compound (½ mk)

ii) Put a half spatula endful of solid F into a boiling tube. Add about 10cm3 of distilled water and shake vigorously

Observations	Inferences
Dissolves into a colourless solution ½ mk	Soluble compound /salt/polar substance ½ mk

iii)Divide the resulting solution into two portions

a) To the first portion,add 2-3 drops of universal indicator and dertermine its PH

Observations	Inferences
pH 2.0√ ½	Strongly acidic H^+/-COOH √ ½ (½ mk

b) To the second portion, add two drops of acidified potassium manganate (VII) solution and shake vigorously

Observations	Inferences
$H^+/KMnO_4$ decoclourises √1 (½ mk)	C=C or –C= C- present √ ½ Or R-OH present √ ½