FORM IV PRE NECTA SYNDICATE

CHEMISTRY 2A

MARKING SCHEME

1. Table of results

	PILOT	EXPI	EXP II	EXP III
Final volume acid (cm^3)	25.50	25.00	25.10	26.00
Initial volume acid (cm^3)	0.00	0.00	0.00	1.00
Volume of acid used (cm^3)	25.00	25.00	25.10	25.00

From the table Accuracy =**01,** decimals point=**01**,

Correct fill of table&lebell=**03**

Note: pipette used = $25cm^3$ **001/2**

Average volume of acid = $\frac{(Exp\ I+EXP\ II+EXP\ III)Cm^3}{3}$ ..... **00 ½**

$= \frac{(25.00+25.10+25.00)Cm^3}{3}$ ..... **00 ½**

$= \frac{(75.10)Cm^3}{3}$

$= 25.03cm^3 = 25.00$

∴ Volume of acid used = 25.00 cm^3 ..... **01**

(b) (i) $25.00cm^3$ of B required $25.00cm^3$ of 9 for complete reaction **01**

(ii) Balanced chemical equation

$2HCl_{(aq)} + M_2CO_{3(aq)} \rightarrow 2Mcl_{(aq)} + CO_{2(g)} + H_2O_{(l)}$ **02**

Ionic equation.

$2HCl_{(aq)} + M_2CO_{3(aq)} \rightarrow 2Mcl_{(aq)} + CO_2 + H_2O_{(l)}$ 00½

$2H(aq)^{2+} + 2Cl^-(aq) + 2M^+(aq) + CO_3^-(aq) \rightarrow 2Cl^-(aq) + 2M^+(aq) + CO_{2(g)} + H_2O_{(l)}$ 02

$2H^+_{(aq)} + CO_3{}^{2-}{}_{(aq)} \rightarrow Co_{2(g)} + H_{2(l)}$ **01**

(iii) R.A.M of X.

Soln

(i) To calculate molarity of base (B).

Data given

Molarity of acidic $(C_1) = \frac{0.1\ mole}{dm^3}$ or 0.1M.

Volume of acid (va)=$25cm^3$

Volume of base $(vb) = 25cm^3$ ……..**00 ½**

Na = 2

Nb = 1

From mole ratio equation

$\frac{M_a v_a}{M_b V_b} = \frac{na}{nb}$ …… **00 ½**

$M_a V_b nb = M_b V_b na$ …… **00 ½**

$Mb = \frac{M_a V_a nb}{V_b na}$ ……**00 ½**

$Mb = \frac{0.1M \times 25cm^3 \times 1}{25cm^3 \times 2}$ ……**01**

$= \frac{2.5\ M}{so} = 0.05M$

∴ Molarity of base (B) = 0.05M …… **01**

(ii) To calculate concentration of base (B).

From

Molarity = $\frac{conc}{M.m}$

But

$Conc = \frac{mass\ (g)}{volume\ (dm)^3}$ …… **00 ½**

$Conc = \frac{2.65g}{0.5dm^3} = 5.3\frac{g}{dm^3}$ …… **01**

∴ Concentration of base (B) = $5.3\frac{g}{dm^3}$ ……**01**

(iii) To calculate molar mass of base (B).

From

Molarity = $\frac{conc\left(\frac{g}{dm^3}\right)}{Mola\ mass}$ …….. **00 ½.**

Molar mass = $\frac{conc}{molarity}$ …….. **00 ½**

$= \frac{5.3\frac{g}{dm^3}}{0.05\frac{mol}{dm^3}} = 106\frac{g}{mol}$ …….. **00 ½**

∴ The molar mass of base (B) = $106\frac{g}{mol}$…… **01.**

(iv) To calculate R.A.M of element M in M_2CO_3

Molarmass = sum of R.A.M

$106 = 2M + C + 30$

$106 = 2M + 12 + (3\times16)$ ..... **00 ½**

$106 = 2M +$

$2M = 106 - 60$

$\frac{2M}{2} = \frac{46}{2}$

M = 23

∴ R.A.M of element M = 23 ..... **01**

Element M is sodium Na **01**

Total marks = 25

2.

s/n	Experiment	Observation	Inference
1.	Sample M was observed on watch glass. **00 ½.**	Green powdered sample. **00 ½.**	Cu^{2+} may be present Co_3^{2-} and HCO_3 may be present. **00 ½.**
2.	A flame test was conducted by using a well cleaned nicrome wire on a non-luminous flame. **00 ½**	Bhlish-green flame was observed. **00 ½**	Cu^{2+} may be present.**00 ½.**
3.	About 0.5g of the solid sample M was put into a dry pyrex test tube, then heated strongly until no further change and the gas evolved was tested by using lime water and litmus paper. **00 ½**	Colourless gas evolved which turned lime water milky and moist litmus paper from blue to red. **00 ½**	CO^{2-}_3 and HCO^{-}_3 May be present. **00 ½**
4.	About 0.5g of the solid sample M was put into a test tube followed by 3 drops of dilute Hcl. **00 ½.**	Effervescence of a colourless gas evolved which turned lime water milky and moist litmus paper from blue to red. **00 ½**	CO_3^{2-}, HCo_3^{-} may be present. **00 ½**
5.	About 0.5g of solid sample M was transferred in a clean and dry test	Effervescence of a colourless gas evolved which	CO_3^{2-}, HCo_3^{-} may be present…..(**00 ½**)

	tube followed by 3 drops of conc. H_2SO_4. **00 ½**	turner lime water milky and most litmus paper from blue to red. **00 ½**	
6.	About 0.5g of sample M was put into the test tube and enough water was added to dissolve the sample. **00 ½**	Soluble forming green solution. **00 ½**	Cu^{2+}may be present. **00 ½.**
7.	About 1cm^3 of the original sample solution was put into the test tube than $NaoH$ solution was added drop-wise until in excess. **00 ½**	Blue precipitate was formed insoluble in excess. **00 ½.**	Cu^{2+}may be present. **00 ½.**
8.	About 1cm^3 of the original sample solution was put into the test tube ammonia solution was added drop wise until in excess. **00 ½**	Pale blue precipitate was formed soluble in excess forming a deep blue solution. **00 ½**	Cu^{2+}may be present. **00 ½.**
9.	Is about 1cm^{3}of the original sample solution 3 drops of potassium hexacynoferrate (II) was added. **00 ½**	Reddish brown precipitate was formed. **00 ½**	Cu^{2+}present and confirmed. **00 ½**
10.	About 1cm^3 of original sample solution was put into the test tube $Bacl_2$ solution was added followed by dilute Hcl.**00 ½.**	White precipitate formed but solution in dilute Hcl.**00 ½.**	Co_3^{2-}present and confirmed. **00 ½**

Total table = 15

Conclusion.

a) (i) The cation in sample M is Cu^{2+} (Copper (II) ion) …….. **01**

(ii) The anion in sample M is Co_3^{2-} (Carbonate ion) …..**01**

(iii) The chemical formula of sample M is $CuCo_3$**01**

And its chemical name is <u>copper (II) Carbonate</u> …… **01**

b) Applications of qualitatics analysis in real life.

i) Help as to identify the poisonous substances in water or food.

ii) Help as to find oil good commodities such as food, ripper fruits.

iii) To identify the poisonous gases evolved in our surrounding eg. $H_2S$from rotten egg.

iv) Used in performing medical examination such as blood and urine tests.
v) Used in exploring the earth for minerals and fuels.
Any 3 points …… **3 marks 2 @ 2X3=6marks**