

CHEMISTRY F3 PAPER 3 MARKING SCHEME

You are provided with the following:

- 3.3g metal carbonate, MCO_3 , labeled solution Q
- 2M hydrochloric acid, labeled solution P
- Sodium hydroxide, labeled solution R containing 40g/L of solution

You are required to determine the relative atomic mass of metal M

Procedure

- i. Measure accurately 100cm^3 of solution P into clean 250cm^3 conical flask and add all the 3.3g of solid Q, MCO_3
- ii. Shake the mixture well and wait for effervescence to stop. Label the resulting solution as S
- iii. Pipette 25cm^3 of solution R into a conical flask and add 2-3 drops of phenolphthalein indicator.
- iv. Fill the burette with solution S and titrate against the solution R until the end point.
- v. Record your results in the table below. Repeat the procedure at least two times to complete the table.

(4 mks) *use the student's value. (Assuming A-V = 20 cm³)*

	i	ii	iii
Final burette reading (cm^3)	20.0	40.0	20.1
Initial burette reading (cm^3)	0.0	20.0	0.0
Volume of solution S used (cm^3)	20.0	20.0	20.1

- a) What is the average volume of solution S used? (1mk)

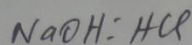
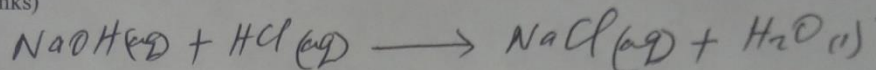
$$\frac{20.0 + 20.0 + 20.1}{3} = 20.0 \text{ cm}^3$$

- b) Calculate the moles of sodium hydroxide, solution R used. (2mks)

$$\begin{array}{l}
 \frac{40\text{g}}{40} = 1\text{M} \\
 1 \text{ mole} - 1000 \text{ cm}^3 \\
 x \text{ moles} - 25 \text{ cm}^3
 \end{array}
 \quad \left| \quad
 \begin{array}{l}
 x = \frac{1 \times 25}{1000} \\
 = 0.025 \text{ moles}
 \end{array}$$

CHEMISTRY F3 PAPER 3 MARKING SCHEME

- c) Calculate the moles of hydrochloric acid in the average volume of solution S used. (2mks)



$$0.025 : 0.025 = \underline{\underline{0.025 \text{ moles}}}$$

- d) Calculate the moles of hydrochloric acid in 100cm³ of solution S. (2mks)

$$\begin{array}{l} 0.025 \text{ moles} \times 20 \text{ cm}^3 \\ x \text{ moles} \times 100 \text{ cm}^3 \end{array} \quad \left| \quad \begin{array}{l} 0.025 \times 100 \\ 20 \end{array} = \underline{\underline{0.125 \text{ moles}}}$$

- e) Calculate the moles of hydrochloric acid in the 100cm³ of the original solution P. (2mks)

$$\begin{array}{l} 2 \text{ moles} - 1000 \text{ cm}^3 \\ x \text{ moles} \times 100 \text{ cm}^3 \end{array} \quad \left| \quad \underline{\underline{0.2 \text{ moles}}}$$

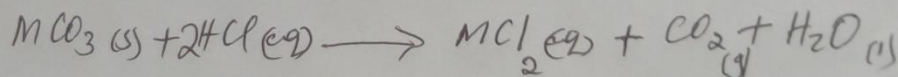
$$x = \frac{2 \times 100}{1000}$$

- f) Calculate the moles of hydrochloric acid, solution P that reacted with solid Q, MCO₃. (2mks)

$$0.2 \text{ moles} - 0.125 \text{ moles}$$

$$= \underline{\underline{0.075 \text{ moles}}}$$

- g) Calculate the moles of MCO₃ that reacted. (2mks)



$$= \frac{0.075}{2} = \underline{\underline{0.0375 \text{ moles}}}$$

- h) Calculate the relative formula mass (RFM) of MCO₃. (2mks)

$$\text{moles} = \frac{\text{mass}}{\text{RFM}}$$

$$0.0375 = \frac{3.3}{x}$$

$$x = \frac{3.3}{0.0375}$$

$$x = 88$$

2

CHEMISTRY F3 PAPER 3 MARKING SCHEME

i) Calculate the relative atomic mass (RAM) of metal M. (1mk)

$$88 = MCO_3$$

$$88 = M + 12 + 48$$

$$\begin{array}{r}
 88 = M + 60 - 60 \\
 - 60 \\
 \hline
 M = 28
 \end{array}$$

$$M = \underline{\underline{28}}$$