

Year Ten PCS – Practice test on Chemistry

ANSWERS

1. What is the mass percent of each element in dichloromethane, CH<sub>2</sub>Cl<sub>2</sub>?

- a. 10.06% C, 60.24% H, 29.70% Cl  
 b. 20.00% C, 20.00% H, 60.00% Cl  
 c. 24.10% C, 3.11% H, 72.79% Cl  
 d. 33.87% C, 0.22% H, 65.91% Cl  
 e. 14.14% C, 2.37% H, 83.48% Cl

$$\%C = \frac{\text{no. of C} \times \text{mass of C}}{\text{MM}} = \frac{1 \times 12}{85} = 0.1414 \quad (1 \text{ mark})$$

2. If 1.00 <sup>m</sup>g of an unknown molecular compound is equivalent to 0.0139 <sup>n</sup> moles of that compound. Calculate the molar mass of the compound.

- a. 44.0 g/mol  
 b. 66.4 g/mol  
 c. 72.1 g/mol  
 d. 98.1 g/mol  
 e. 132 g/mol

$$n = \frac{m}{MM} \Rightarrow 0.0139 = \frac{1}{MM} \quad (1 \text{ mark})$$

$$MM = \frac{1}{0.0139} = \underline{71.9}$$

3. Identify the compound which would have a molar mass of 52 g.

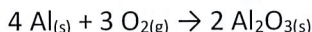
- a. Ca(OH)<sub>2</sub> – MM = 74.1  
 b. BaO – too high (60)

c. (NH<sub>4</sub>)<sub>2</sub>O  
 d. Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> (too high)

$$2 \times N + 8 \times H + 1 \times O$$

$$28 + 8 + 16 = \underline{52} \quad (1 \text{ mark})$$

4. Aluminium reacts with oxygen to produce aluminium oxide.



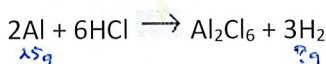
If 5.0 moles of Al react with excess O<sub>2</sub>, how many moles of Al<sub>2</sub>O<sub>3</sub> can be formed?

- a. 2 mol  
 b. 2.5 mol  
 c. 5.0 mol  
 d. 10.0 mol

$$5 \times \frac{2}{4} = \underline{2.5} \quad \text{this step}$$

(1 mark)

5. Calculate the mass of hydrogen formed when 25 grams of aluminium reacts with excess hydrochloric acid.



- a. 0.41 g  
 b. 1.2 g  
 c. 1.8 g  
 d. 2.8 g  
 e. 0.92 g

3 step

①  $n_{\text{Al}} = \frac{m}{MM} = \frac{25}{27} = 0.93$       ②  $n_{\text{H}_2} = \frac{3}{2} \times n_{\text{Al}} = 1.39$       ③  $m = n \times MM = 1.39 \times 2 = \underline{2.78}$  (1 mark)

6. What volume of sulfuric acid (0.77 M) contains 25.0 grams of H<sub>2</sub>SO<sub>4</sub>?

$$n = \frac{m}{MM} = \frac{25}{98} = 0.255 \quad (1/2)$$

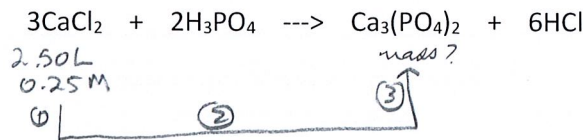
$$n = C \times V$$

$$\frac{n}{C} = V$$

$$\frac{0.255}{0.77} = V = \underline{0.33 \text{ L}} \quad (\text{or } 330 \text{ mL}) \quad (1/2)$$

(2 marks)

7. How many grams of calcium phosphate can be produced from the reaction of 2.50 L of 0.250 M Calcium chloride with an excess of phosphoric acid?



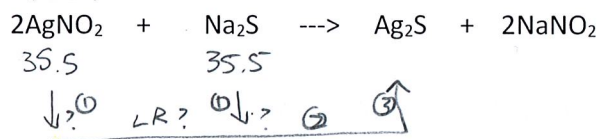
①  $n_{\text{CaCl}_2} = C \times V$   
 $= 0.25\text{M} \times 2.5\text{L}$   
 $= 0.625\text{ moles}$  (1/2)

②  $n_{\text{Ca}_3(\text{PO}_4)_2} = \frac{1}{3} \times n_{\text{CaCl}_2}$   
 $= \frac{1}{3} \times 0.625$   
 $= 0.2083$  (1/2)

③  $m = n \times \text{MM}$   
 $= 0.2083 \times 310.3$   
 $= 64.6\text{g}$  (1/2)

(3 marks)

8. Calculate the number of grams of silver sulphide ( $\text{Ag}_2\text{S}$ ) produced when 35.5 g of silver nitrite ( $\text{AgNO}_2$ ) is reacted with 35.5 grams of sodium sulphide ( $\text{Na}_2\text{S}$ ).



①  $n_{\text{AgNO}_2} = \frac{m}{\text{MM}}$   
 $= \frac{35.5}{153.86}$   
 $= 0.231$  (1/2)  
 LR

$n_{\text{Na}_2\text{S}} = \frac{m}{\text{MM}}$   
 $= \frac{35.5}{78}$   
 $= 0.455$  (1/2)

②  $n_{\text{Ag}_2\text{S}} = \frac{1}{2} \times n_{\text{AgNO}_2}$   
 $= \frac{1}{2} \times 0.231$   
 $= 0.116$  (1/2)

③  $m = n \times \text{MM}$   
 $= 0.116 \times 247.8$   
 $= 28.7\text{g}$  (1/2)

L.R calculation

$\text{AgNO}_2: \frac{0.231}{2}$        $\text{Na}_2\text{S}: \frac{0.455}{1}$

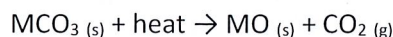
$= 0.116$        $= 0.455$

LR =  $\text{AgNO}_2$ . (1)

(4 marks)

### CHALLENGE Q

In an experiment 1.056 g of a metal carbonate ( $\text{MCO}_3$ ), containing an unknown metal M, is heated to give the metal oxide (MO) and 0.376 g of  $\text{CO}_2$ .



Identify which of the following is the correct identity of the metal (M) in the carbonate ( $\text{MCO}_3$ )

a. M = Ni

b. M = Cu

c. M = Zn

d. M = Ba

Two ways to do this Q.

- First way is to do three steps for each of four options, see which one gives you a mass of  $\text{CO}_2$  close to 0.376g.
- Second way is to calculate moles of  $\text{CO}_2$  ( $8.55 \times 10^{-3}$ ), then moles of  $\text{MCO}_3$  ( $8.55 \times 10^{-3}$ ), then calculate the MM of  $\text{MCO}_3$  (123.5), subtract  $\text{CO}_3$ , mass of metal = 63.5 (B).