

# Cambridge University Examinations

General Certificate of Education Ordinary Level  
O – LEVEL 5070. Notes, P1, P2 and P4

Teacher: - Mubashir Sulehri

Chapter

## *The Mole Concepts*

### Work Sheet Paper 4

**Mubashir Sulehri**

03224307040

Lahore Grammar School  
Roots International School  
Lahore Learning Campus  
Bloomfield Hall School



Star.media.publisher@gmail.com



To Order call 0317 4403030

Website

Olevel.shutterfly.com

**Moles**

- 1 A student was asked to make a sample of barium sulphate,  $\text{BaSO}_4$ . She added  $100 \text{ cm}^3$  of  $0.20 \text{ mol/dm}^3$  sulphuric acid to  $60 \text{ cm}^3$  of  $0.25 \text{ mol/dm}^3$  barium nitrate. The equation for the reaction is



- (a) Describe the appearance of barium sulphate in the resulting mixture.

..... [1]

- (b) Calculate

- (i) the number of moles of sulphuric acid used in the experiment,

..... moles [1]

- (ii) the number of moles of barium nitrate used in the experiment.

..... moles [1]

- (c) Using your answers to (b)(i) and (ii) calculate the maximum mass of barium sulphate that could be produced in the reaction.

[ $A_r$ : Ba, 137; S, 32; O, 16]

..... g [1]

The barium sulphate was removed from the solution by filtration. It was dried and weighed.

- (d) The mass of barium sulphate obtained was 3.35g. Calculate the percentage yield of barium sulphate.

..... % [1]



Another student, doing the same experiment and using the same quantities of barium nitrate and sulphuric acid, obtained 3.60 g of product.

(e) Suggest a reason for this increased mass of product.

.....[1]

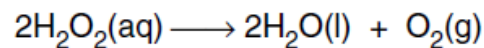
(f) Suggest a different barium salt that could have been used instead of barium nitrate to produce barium sulphate.

.....[1]

[Total: 7]

2 A student did an experiment to decompose hydrogen peroxide.

Some manganese(IV) oxide,  $\text{MnO}_2$ , was added to increase the rate of reaction.



100 cm<sup>3</sup> of 0.050 mol/dm<sup>3</sup> hydrogen peroxide was allowed to decompose until no more oxygen was produced.

One mole of a gas at 25 °C occupies a volume of 24 dm<sup>3</sup>.

The volume of oxygen produced was

(a) 12 cm<sup>3</sup>.

(b) 60 cm<sup>3</sup>.

(c) 120 cm<sup>3</sup>.

(d) 600 cm<sup>3</sup>.

[1]



- 3 A student added  $30 \text{ cm}^3$  of  $1.5 \text{ mol/dm}^3$  aqueous silver nitrate to a beaker containing  $50 \text{ cm}^3$  of  $1.0 \text{ mol/dm}^3$  aqueous sodium bromide.

A precipitate of silver bromide was produced.

- (a) (i) What colour was the precipitate?

.....

- (ii) Name the method by which this precipitate was separated from the mixture.

.....

[2]

- (b) (i) Calculate the number of moles of silver nitrate contained in  $30 \text{ cm}^3$  of  $1.5 \text{ mol/dm}^3$  aqueous silver nitrate.

..... moles

- (ii) Calculate the number of moles of sodium bromide contained in  $50 \text{ cm}^3$  of  $1.0 \text{ mol/dm}^3$  aqueous sodium bromide.

..... moles

[2]

Sodium bromide reacts with silver nitrate according to the equation below.



- (c) Using this equation and your answers to (b), calculate the mass of silver bromide produced in this experiment.

[ $A_r$ : Ag, 108; Br, 80]

..... g [2]

- (d) The student repeated the experiment using  $40 \text{ cm}^3$  of  $1.5 \text{ mol/dm}^3$  aqueous silver nitrate with  $50 \text{ cm}^3$  of  $1.0 \text{ mol/dm}^3$  sodium bromide.

Calculate the mass of silver bromide produced in this experiment.

..... g [2]



- 4 A student was given some hydrated sodium carbonate crystals,  $\text{Na}_2\text{CO}_3 \cdot x\text{H}_2\text{O}$ , where  $x$  is a whole number. They were placed in a previously weighed container, which was reweighed.

$$\begin{array}{rcl} \text{mass of container + sodium carbonate crystals} & = & 9.87 \text{ g} \\ \text{mass of container} & = & 5.83 \text{ g} \end{array}$$

- (a) Calculate the mass of sodium carbonate crystals used in the experiment.

.....g [1]

The container and crystals were heated to remove the water of crystallisation and then reweighed. This process was repeated until there was no further change in mass.

- (b) Describe the appearance of the sodium carbonate crystals after heating.

.....  
 ..... [2]

$$\text{mass of container + sodium carbonate after heating} = 7.35 \text{ g}$$

- (c) (i) Calculate the mass of sodium carbonate which remained after heating.

.....g [1]

- (ii) Calculate the mass of water which was lost from the crystals.

.....g [1]



- (d) (i) Calculate the relative formula mass of sodium carbonate,  $\text{Na}_2\text{CO}_3$ , and the relative formula mass of water.  
[ $A_r$ : Na, 23; C, 12; O, 16; H, 1]

relative formula mass of sodium carbonate .....

relative formula mass of water ..... [1]

- (e) Using your answers to (c) and (d), calculate

- (i) the number of moles of sodium carbonate which remained after heating,

..... [1]

- (ii) the number of moles of water which were lost on heating.

..... [1]

- (f) Using your answers to (e) calculate the value of x in the formula  $\text{Na}_2\text{CO}_3 \cdot x\text{H}_2\text{O}$ .

x = ..... [2]

[Total: 10]



