Penang Sangam High School

Year 12

Chemistry

Worksheet 3

Questions

1. The empirical formula expresses the

A. actual number of atoms of each type in a compound.
B. percentage composition of each element in a compound.
C. simplest whole number ratio of atoms or ions in a compound.
D. simplest method of calculating the molecular mass of a compound.

2. One mole of carbon dioxide gas (CO_2) will have the same number of molecules as

A. 10 g of neon. B. 16 g of oxygen. C. 28 g of nitrogen. D. 35.5 g of chlorine.

3. Which of the following is an oxidation reaction?

A. $ClO_3^- \rightarrow ClO_2$ B. $SO_4^{2-} \rightarrow S^{2-}$

C. $Mn^{2+} \rightarrow MnO_2$ D. $ZnCl_2 \rightarrow Zn$

4. A piece of iron ore is found to contain a compound containing 72.3 % iron and 27.7 % oxygen with a molecular mass of 231.4 g/mol. What is the empirical formula and molecular formula of the compound?

5. Use Avogadro's number to find the number of oxygen atoms in 4.5 moles of carbon dioxide molecule.

6. Use Avogadro's number to find the number of hydrogen atoms in 0.65 moles of hydrogen gas.

7. A student titrated 0.19 mol L^{-1} of potassium carbonate solution against a solution of hydrochloric acid until the end point was reached. The student carried out three trials and the respective volume of hydrochloric acid needed to reach end point for each trial is shown in the table below.

Volume of HCl used (mL)	Rough	**Trial**		
		1	**2**	**3**
Initial burette reading (mL)	1.90	1.80	1.75	1.63
Final burette reading (mL)	23.5	22.50	22.55	22.23

Volume of potassium carbonate used: 25 mL **Indicator used**: Phenolphthalein

a) To be used as a standard solution, a substance must have special characteristics. List **two** of these characteristics.

b) Calculate the average volume of hydrochloric acid used to the correct number of significant figures.

The equation for the reaction between hydrochloric acid and potassium carbonate is shown below.

$$K_2CO_3(aq) + 2HCl(aq) \longrightarrow 2KCl(aq) + H_2O(l) + CO_2(g)$$

c) Calculate the concentration of hydrochloric acid.

8. Use the equation given below to answer the following questions.

$$As_2O_{3(s)} + NO_3^-{}_{(aq)} \rightarrow H_3AsO_{4(aq)} + NO_{(g)}$$

i) Calculate the oxidation state of Nitrogen in NO_3^-.

ii) Define oxidant and reductant. Also, identify the reducing and oxidizing agent.

9. In an experiment to determine the formula of a hydrated salt, 11.44 g sample of hydrated sodium carbonate ($Na_2CO_3.xH_2O$) was strongly heated to drive off the water of crystallisation. The product was 4.24 g of anhydrous sodium carbonate (Na_2CO_3).

(i) Find the **mass of water** present in the sample of the hydrated salt.

(ii) Determine the value of **x** in the formula of the hydrated salt.

10. The reaction between lead and sulphur produces lead(II) sulphide as shown by the balanced equation below.

$$Pb_{(s)} + S_{(s)} \longrightarrow PbS_{(s)}$$

To demonstrate the stoichiometry of the above reaction, 3.02 g of lead was heated with excess sulphur in a crucible. (M_{Pb} = 207 g mol^{-1}; M_S = 32 g mol^{-1})

(i) Calculate the **amount** (in moles) of lead used.

(ii) Determine the amount (in moles) of sulphur that has reacted.

(iii) Calculate the **mass** of sulphur that has reacted.

(iv) State the **purpose** of using excess sulphur.

(v) State **one** conclusion that can be made on stoichiometry from this experiment.