# SCHOOLMAROOCHYDORE STATE HIGH SCHOOL

YEAR 11 – CHEMISTRY SEMESTER ONE

## COMPLEX QUESTIONS

1. What volume of CO2 gas is produced at S.T.P. when 20 g of Calcium Carbonate is heated? Assume the reaction yield is 100%
2. An element X forms both a dichloride (XCl2) and a tetrachloride (XCl4). Treatment of 10.0 g of XCl2 with excess Chlorine forms 12.55 g of XCl4. Assuming the reaction had a 100% yield, calculate the atomic mass of X. Which element is it?
3. Nitric acid is produced commercially by the ostwald process, represented by the following equations;

 4 NH3(g) + 5 O2(g) → 4 NO(g) + 6 H2O(g)

Assume 100% yield in each step of the reaction

 2 NO(g) + O2(g) → 2 NO2(g)

 3 NO2(g) + H2O(l) → 2 HNO3(aq) + NO(g)

What mass of NH3 must be used to produce 1 x 106 g of HNO3 by the Ostwald process?

1. The fuel is a disposable cigarette lighter is an unknown hydrocarbon, C**x**H**y**. When 1.5 g of C**x**H**y** is burnt in excess oxygen gas, 4.55 g of Carbon dioxide and 2.33 g of Water are produced.

 a) Write an balanced equation (using x and y) to represent this combustion.

 b) Deduce the empirical formula of C**x**H**y**

1. A compound contains only Carbon, Hydrogen, and Oxygen. Combustion of 10.68 g of the compound yields 16.01 g of Carbon dioxide and 4.37 g of Water. The molar mass of the compound is 176.1 g. What are the Empirical and Molecular formulas of the compound?
2. Lead (II) Sulphide (PbS) is precipitated when Hydrogen Sulphide (H2S) gas is passed into a solution of Lead (II) Nitrate (PbNO3).

 Pb2+(aq) + H2S(g) → PbS(s) + 2 H+(aq)

What mass of Lead (II) Nitrate was dissolved in the water if 4.796 g of Lead (II) Sulphide is precipitated? Assume a 100% yield for the reaction.

**42.** An oxide of Copper is heated in a stream of Hydrogen until only the copper remains. The data for the experiment is given below. Calculate the Empirical formula for the copper oxide.

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|  Mass of crucible | = 27.002 g |
| Mass of crucible plus contents before heating | = 27.128 g |
| Mass of cucible and contents after heating | = 27.114 g |

1. The production capacity for Acrylonitrile (C3H3N) in the United States of America is over one billion kilos per year. Acrylonitrile, the building block for making ployacrylonitrile fibres and a variety of plastics, is produced from gaseous propylene (C3H6), ammonia (NH3), and oxygen.

 2 C3H6(g) + 2 NH3(g) + 3 O2(g) → 2 C3H3N(g) + 6 H2O(g)

a) Assuming a 100% yield, what mass of acrylonitrile can be produced from a mixture of 500 g propylene, 500 g ammonia, and 1000 g of oxygen?

 b)What mass of water is produced, and what masses of starting reagents are left over?

1. 0.22 g of an unknown gas is found to occupy 0.112 litres at S.T.P. What is the molar mass of the gas? What is the name of the gas?