

# Chem!stry

Name: ..... ( )

Class: .....

Date: ..... / ..... / .....

## Mole Concept Assignment Four

### Question 1.

Under certain conditions, steam reacts with methane to produce carbon monoxide and hydrogen only. Construct the equation for the reaction and calculate the total volume of gas that can be obtained when 500 cm<sup>3</sup> of methane react completely with steam.

### Question 2.

- Hydrogen and carbon monoxide can be converted into methanol (CH<sub>3</sub>OH). Construct the equation for this reaction.
- When 100 g of coal was completely burned in oxygen it produced 330 g of carbon dioxide. Calculate the percentage by mass of carbon in this sample of coal.

### Question 3.

- Write the equation, including state symbols, for the reaction between magnesium oxide and hydrochloric acid.
- Tablets containing magnesium oxide can be used to relieve stomach pains caused by excess hydrochloric acid. If the stomach contains the equivalent of 100 cm<sup>3</sup> of excess hydrochloric acid of concentration 3 mol/dm<sup>3</sup>, how many tablets each containing 3 g of magnesium oxide should be taken?

### Question 4.

The sugar glucose has an empirical formula of CH<sub>2</sub>O and a relative molecular mass,  $M_r$ , of 180.

- Calculate the molecular formula of glucose.
- If an aqueous solution of glucose is heated with alkaline copper(II) sulphate, a brick red precipitate is formed. The precipitate is an oxide of copper. A 1.44 g sample of this oxide was found to contain 1.28 g of copper.
  - Calculate the empirical formula of this oxide of copper.
  - What is the oxidation state of the copper in this oxide?
  - Why does this reaction show that glucose is a reducing sugar?

### Question 5.

A 0.50 g sample of vegetable oil reacted with 60 cm<sup>3</sup> of hydrogen, measured at r.t.p. Assuming that one mole of the oil reacts with one mole of hydrogen gas, calculate the relative molecular mass,  $M_r$ , of the oil.

**Question 6.**

Ammonia and carbon dioxide react together to form water and a solid, urea,  $\text{CON}_2\text{H}_4$ . In the reaction,  $72 \text{ dm}^3$  of carbon dioxide at r.t.p. are converted to urea.

- Write the equation, including state symbols, for the formation of urea.
- Calculate the volume of ammonia at r.t.p. which reacted.
- Calculate the mass of urea formed.

**Question 7.**

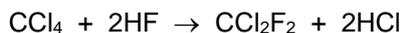
CFCs are compounds that contain only carbon, chlorine and fluorine. They are atmospheric pollutants and destroy ozone in the upper atmosphere.

- "CFC11" Has the following composition by mass:

$$\text{C} = 8.7\% \quad \text{F} = 13.8\% \quad \text{Cl} = 77.5\%$$

Calculate the empirical formula of CFC11.

- "CFC12" has the molecular formula  $\text{CF}_2\text{Cl}_2$ . It can be made by the reaction of hydrogen fluoride, HF, with tetrachloromethane,  $\text{CCl}_4$ .



What is the maximum mass of CFC12 that can be made from 10.0 g of hydrogen fluoride?

- Scan the QR code below for the answers to this assignment.



[http://www.chemist.sg/mole/assignments/mole\\_four\\_ans.pdf](http://www.chemist.sg/mole/assignments/mole_four_ans.pdf)