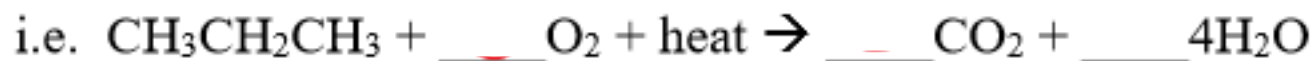
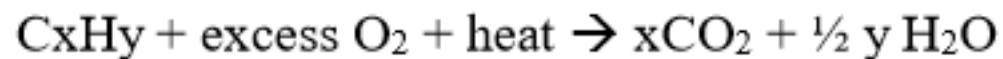


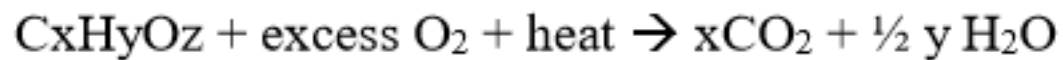
Tutorial 1

Elemental Analysis (Question 1)

This technique determines the mass percents of certain elements. The combustion of a sample with a known mass is carried out in excess oxygen.



The mass of CO_2 and H_2O can be measured, which can then be used to find the mass of C and H in the original sample.



How to find amount of oxygen in the original sample?

$$\text{Mass \% C} + \text{Mass \% H} + \text{Mass \% O} = 100.00\%$$

Question 1 continued

A monomer is a molecule that is reacted to make a polymer (it is the starting block)

A 0.02454 g sample of a monomer gave 0.07484 g CO_2 and 0.03675 g H_2O on combustion.

- (a) What is the %C in the organic compound?
- (b) What is the percent hydrogen?
- (c) Does the compound contain any elements besides carbon and hydrogen?

Question 2

How many protons, neutrons are there for the following isotopes

- $^{13}_6\text{C}$, $^{43}_{20}\text{C}$, $^{12}_6\text{C}$, $^{47}_{27}\text{Co}$, $^{59}_{27}\text{Co}$, $^{13}_6\text{C}$, $^{40}_{17}\text{Ca}$, $^{40}_{18}\text{Ar}$

Question 3 Draw the following

Condensed Formula / Molecular Formula (name)	Lewis structure	Line-Wedge Drawing
H ₂ CCH ₂ (ethene)		
HCCCH ₃ (propyne)		
CH ₃ CH ₂ OH (ethanol)		
CH ₃ CHO (ethanal)		
CH ₃ CH ₂ CO ₂ H (propanoic acid)		

CH ₃ NH ₂ (methyl amine)		
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Question 4

e.g. A chemical reaction is used to identify limestone. The reaction of hydrochloric acid with limestone (mostly calcium carbonate) is seen through an effervescence - a bubbling due to the liberation of carbon dioxide gas.

What is your plan? What are the relationships?

- a) How many moles of $\text{CaCO}_{3(s)}$ are consumed in a reaction with 225 mL of 3.25 M HCl?
- b) How many mL of 3.25 M HCl are consumed in a reaction with excess CaCO_3 to produce 1.00 mol CO_2 ?
- c) How many moles of $\text{CO}_{2(g)}$ are produced in the reaction of 175 mL of 3.25 M HCl with 45.0 g CaCO_3 ?

Question 5

Mini-*ME* (Mind Exploration) – discuss the answer with the instructor

In the Haber synthesis of ammonia, N_2 and H_2 react at high temperature, but they never react completely. In a typical reaction, 24.0 kg of H_2 and 84.0 kg of N_2 react to produce 68 kg of NH_3 . Find the theoretical yield, the percent yield and the remaining masses of N_2 and H_2 (assume that there are no side reactions).