

**WORKSHEET**  
**CHEMISTRY FOR ENGINEERING STUDENTS, LECTURE 1**  
 Molecular formula of hydrocarbon or a mixture based upon combustion analysis

**ANALYSIS KEY**

**PROBLEM 1. Calculate empirical formula of hydrocarbon and molecular formula.**

1. Combustion analysis of hydrocarbon yields the following mass percentages of the carbon compound:  $C_{10}H_{16}$  or  $C_{15}H_{24}$ . From these, determine the molecular formula of the hydrocarbon.
  - (a) write the molecular structural equation for the reaction:
 
$$C_{10}H_{16} + 15O_2 \rightarrow 10CO_2 + 8H_2O$$
  - (b) calculate the mass percentage of carbon in  $C_{10}H_{16}$  and  $C_{15}H_{24}$  as follows:
 
$$C_{10}H_{16} = \frac{120}{136} \times 100 = 88.2\%$$
  - (c) determine the mass of the hydrocarbon from the mass percentage of C as follows:
 
$$1.147 \text{ g}$$
  
2. A hydrocarbon hydrocarbon contains 87.5% carbon and the rest is hydrogen. The hydrocarbon has a relative molecular mass of 96. Determine the molecular formula of the hydrocarbon.
  - (a) write the molecular structural equation for the reaction:
 
$$C_8H_{16} + 12O_2 \rightarrow 8CO_2 + 8H_2O$$
  - (b) calculate the mass percentage of carbon in hydrocarbon as follows:
 
$$88.2\%$$
  - (c) determine the mass of the hydrocarbon from the mass percentage of C as follows:
 
$$0.83 \text{ g}$$
  
3. Hydrocarbon is found to have carbon content 85.63%. Relative molar mass is 98. Determine the molecular formula:  $C_{10}H_{18}$  or  $C_{15}H_{24}$ .
  - (a) write the molecular structural equation for the reaction:
 
$$C_{10}H_{18} + 15.5O_2 \rightarrow 10CO_2 + 9H_2O$$
  - (b) determine the mass of the hydrocarbon from the mass percentage of C as follows:
 
$$0.83 \text{ g}$$
  - (c) determine the mass of the hydrocarbon from the mass percentage of C as follows:
 
$$0.83 \text{ g}$$

**PROBLEM 2. Calculate empirical formula of hydrocarbon.**

1. From the following combustion analysis data, determine the empirical formula of the hydrocarbon.
 

Mass of  $CO_2 = 1.10 \text{ g}$ , Mass of  $H_2O = 0.45 \text{ g}$ . From these, determine the empirical formula of the hydrocarbon.

  - (a) write the molecular structural equation for the reaction:
 
$$C_2H_6 + 3.5O_2 \rightarrow 2CO_2 + 3H_2O$$
  - (b) determine the mass of the hydrocarbon from the combustion analysis data:
 
$$0.3 \text{ g}$$

# Chem 21 Lab Answers

**Yijin Wang**



**Chem 21 Lab Answers:**

## **Chem 21 Lab Answers** Book Review: Unveiling the Magic of Language

In an electronic digital era where connections and knowledge reign supreme, the enchanting power of language has become more apparent than ever. Its capability to stir emotions, provoke thought, and instigate transformation is really remarkable. This extraordinary book, aptly titled "**Chem 21 Lab Answers**," compiled by a very acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound effect on our existence. Throughout this critique, we shall delve into the book's central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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