



AP[®] Chemistry

Summer Assignment

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Pictures taken from Zumdahl, 5th ed.; Houghton Mifflin Co.

What to Review and Know by September...

- Measurement and the Metric System; units and conversions
 - length
 - volume
 - mass
 - density
 - temperature
 - significant digits in ALL calculations
- States of Matter
- Mixtures (homo- & hetero-)
- Pure substances
 - Elements
 - Compounds
- Ways to separate mixtures
- Dalton's Atomic Theory
- Atomic Structure
 - J.J. Thomson's contribution
 - Robert Millikan's contribution
 - Ernst Rutherford's contribution
- Isotopes for atoms and ions (nuclear symbol)
- Periodic Table Make Up
- Diatomic Elements
- Molecular & Empirical Formulas
- Elements that form ions and their charge
- Polyatomic ions – memorize these!!!
- Naming ionic compounds and molecular compounds
- Writing formulas for ionic and molecular compounds
- Naming & Formulas for basic Organic compounds
 - methane, ethane, propane, butane, as well as, methanol, ethanol, propanol, etc...
- Balancing equations & writing basic equations
- The Mole
- Molar Mass of elements & compounds
- Avogadro's number & calculating the number of atoms, molecules, ions, etc...
- % composition
- Determination of Empirical/Molecular Formulas
- Stoichiometry

Use the internet, check out a book from your school, go to the library, but be sure you review and study the above concepts. We will not spend a lot of time “re-learning” this material – come prepared to ask questions over the concepts/topics for which you need help so those areas can be reviewed quickly.

Work the following problems, be sure to show all work necessary to arrive at the final answer (even on the multiple choice)...

Be sure to record your answer with the correct number of significant figures.

Question 1

Water is added to 4.267 grams of UF_6 . The only products are 3.730 grams of a solid containing only uranium, oxygen and fluorine and 0.970 gram of a gas. The gas is 95.0% fluorine, and the remainder is hydrogen.

- From these data, determine the empirical formula of the gas.
- What fraction of the fluorine of the original compound is in the solid and what fraction in the gas after the reaction?
- What is the formula of the solid product?
- Write a balanced equation for the reaction between UF_6 and H_2O . Assume that the empirical formula of the gas is the true formula.

Question 2

A sample of dolomitic limestone containing only calcium carbonate and magnesium carbonate was analyzed.

- When a 0.2800 gram sample of this limestone was decomposed by heating, 75.0 milliliters of CO_2 at 750 mm Hg and 20°C were evolved. How many grams of CO_2 were produced?
- Write equations for the decomposition of both carbonates described above.
- It was also determined that the initial sample contained 0.0448 gram of calcium. What percent of the limestone by mass was calcium carbonate?
- How many grams of the magnesium-containing product were present in the sample in (a) after it had been heated?

Question 3

A sample of dolomitic limestone containing only calcium carbonate and magnesium carbonate was analyzed.

- When a 0.2800 gram sample of this limestone was decomposed by heating, 75.0 milliliters of CO_2 at 750 mm Hg and 20°C were evolved. How many grams of CO_2 were produced?

Questions 4-6 refer to the following compounds.

	Chemical Formula	Molar Mass
A	$\text{C}_{12}\text{H}_{22}\text{O}_{11}$	342
B	CaSO_4	136
C	CO_2	44.0
D	H_2O	18.0
E	NaOH	40.0

- 22.0 g of this compound will contain 6.02×10^{23} atoms of oxygen
- 0.250 moles of this compound has a molar mass of 10.00 g/mol
- The substance that contains the highest percentage of oxygen

Questions 7-9 refer to the following equation.



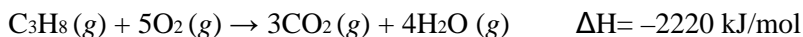
7. How many liters of C can be formed when 3 L of A react with 4 L of B at STP?
- A) 3 L
 - B) 4 L
 - C) 6 L
 - D) 7 L
 - E) 20 L
8. Two moles of A are reacted with three moles of B. The molar mass of compound C is 40.0 g/mol. How many grams of C can be produced during this reaction?
- A) 8.00 g
 - B) 10.0 g
 - C) 80.0 g
 - D) 200. g
 - E) 400. g
9. What is the theoretical yield of compound C (molar mass = 40.0 g/mol) when 80. g of compound A reacts with 20. g of B?
- A) 20. g
 - B) 40. g
 - C) 100. g
 - D) 120. g
 - E) 200. g

Question 10 – 15

10. A compound contains 40.0% calcium, 12.0% carbon, and 48.0% oxygen. What is the empirical formula for the compound?
- A) CaC_2O_4
 - B) CaCO_3
 - C) CaCO_4
 - D) CaC_3O_5
 - E) CaCO_6
11. Which of the following is incorrectly paired?
- | | |
|------------------------|-------------|
| A) methane | 16.05 g/mol |
| B) lithium nitride | 34.83 g/mol |
| C) carbon dioxide | 44.01 g/mol |
| D) manganese(IV) oxide | 86.94 g/mol |
| E) silver nitrate | 231.9 g/mol |
12. A certain hydrocarbon was found to have an empirical formula of CH_3 . Its molar mass was determined to be 30. g/mol. What is its molecular formula?
- A) CH_3

- B) C₂H₆
- C) C₃H₉
- D) C₄H₁₂
- E) C₅H₁₅

13. The reaction for the complete combustion of propane, C₃H₈, is given below. Which statements describe this reaction?



- I. Heat is released to the surroundings.
- II. The combustion of 2.00 mole of propane will have an enthalpy change of 2220 kJ.
- III. The sign of ΔH is negative for an endothermic reaction.

- A) I only
- B) I and II only
- C) I and III only
- D) II and III only
- E) I, II, and III

14. Hydrogen and oxygen gases react to form water. How many grams of each reactant are necessary to produce 36 g of water?

	Hydrogen gas	Oxygen gas
A)	2.0 g	1.0 g
B)	4.0 g	16 g
C)	4.0 g	32 g
D)	18 g	18 g
E)	36 g	36 g

15. All of the following are empirical formulas EXCEPT

- A) CH₂O
- B) C₆H₆
- C) C₂H₃O₂
- D) CHO₂
- E) C₃H₈