Name:_____

AP Chemistry Summer Assignment
Ms. Crist - Room 239
2026-27

Course Description from Raleigh Charter High School Course Guide:
Advanced Placement Chemistry (AP)
Prerequisites: Honors Biology, Honors Chemistry, and Honors Math 3, or permission of instructor
This course covers advanced topics in chemistry including kinetics, oxidation-reduction, equilibrium, thermochemistry, quantitative and qualitative analysis, and introductory organic chemistry. Students continue to develop chemistry laboratory skills and learn to predict results of reactions and properties of reaction products. Students complete an intensive schedule of advanced lab exercises. The course prepares students to take the Advanced Placement exam in May. This class is designed for highly motivated students with good reading comprehension and study skills.

Course Topics from the College Board's AP Classroom
The AP Chemistry course provides students with a college-level foundation to support future advanced coursework in chemistry. Students cultivate their understanding of chemistry through inquiry-based investigations, as they explore content such as:

- Atomic Structure and Properties
- Compound Structure and Properties
- Properties of Substances and Mixtures
- Chemical Reactions
- Kinetics
- Thermochemistry
- Equilibrium
- Acids and Bases
- Thermodynamics and Electrochemistry

Summer Assignment Purpose and Overview
My goal in assigning summer work for AP Chemistry is to brush-up on chemistry topics that should have been mastered in high school level chemistry. You should start this school year ready to add to your chemistry knowledge at a fast pace. Completing your summer assignment will help you relearn and practice old skills so that you are ready to move forward at the beginning of the year. Topics you should feel confident in include…

1. Dimensional Analysis
2. Ideal Gas Law
3. Mole conversions and Stoichiometry
4. Solutions
5. Acids and Bases
6. Equilibrium

Each section of your summer assignment has practice problems with a video for help if needed.

Expectations
Your summer assignment is due on the first day of school. There will be a quiz on these topics in the first week of school. **Show all work and circle final answers to the correct number of significant figures and units.**

Instructions: Please print this packet and complete it by hand. Show all work and circle final answers to the correct number of significant figures and units.

Section 1: Dimensional Analysis

Review Video: Converting Units with Conversion Factors

1. Carry out the following conversions (you must use dimensional analysis):
    a. 22.6 m to dm

    b. 25.4 mg to kg

    c. 556 mL to L

    d. 0.6 kg/m^3 to g/cm^3

Section 2: Ideal Gas Law

Review video: Ideal Gas Law Practice Problems

1. A sample of nitrogen gas kept in a container of volume 2.3 L and a temperature of 32°C exerts a pressure of 4.7 atm. Calculate the number of moles of gas present.

2. Given that 6.9 moles of carbon monoxide gas are present in a container with volume 30.4 L, what is the pressure of the gas (in atm) if the temperature is 62°C?

Section 3: Mole Conversions and Stoichiometry

Molar Mass review video: Molar Mass

1. Calculate the molar mass of each of the following substances:
    a. NO_2

    b. SO_3

    c. C_6H_6

    d. NaI

    e. K_2SO_4

    f. $Ca_3(PO_4)_2$

Moles to atoms review video: Practice Exercise p 87 Convert mol to atoms

2. How many moles of cobalt (Co) atoms are there in 6.00×10^9 cobalt atoms?

3. How many moles of calcium (Ca) atoms are in 77.4 g of calcium?

4. How many atoms are present in 3.14 g of copper (Cu)?

5. How many molecules of ethane (C_2H_6) are present in 0.334 g?

Stoichiometry review video: ***Mass-Mass Stoichiometry***

Mole Ratio review video: ***How to Use a Mole to Mole Ratio | How to Pass Chemistry***

6. When baking soda (sodium bicarbonate or sodium hydrogen carbonate, $NaHCO_3$) is heated, it releases water, sodium carbonate, and carbon dioxide gas, which is responsible for the rising of dough in baked goods.
    a. Write the balanced equation for the decomposition of the compound.

    b. Calculate the mass of $NaHCO_3$ required to produce 20.5 g of CO_2.

7. The synthesis reaction of ammonia is called the Haber process.
    a. Write the balanced equation for the synthesis of ammonia (NH_3).

    b. In a particular reaction, 6.0 moles of NH_3 were produced. How many moles of H_2 and how many moles of N_2 were reacted to produce this amount of NH_3?

Section 4: Solutions

Review video: Representations of Reactions - Particulate Diagrams and Net Ionic Equations

1. What is the molarity of 0.0500 moles of NaCl in a 250.0 mL solution?

2. What is the molarity when 25.0 g of MgF_2 is dissolved into a 100.0 mL solution?

3. How many moles of $CuSO_4$ are in 25.0mL of a 3M solution?

Section 5: Acids and Bases

Review Video: pH and pOH calculations in chemistry

Review video: How to calculate concentration from pH and pOH

1. Calculate the $[OH^-]$ and pOH for the following strong base solutions:

    a. 3.5×10^{-3} M $Ca(OH)_2$

$[OH^-]$ = _____

pOH = _____

    b. 0.900 g of RbOH in 300.0 mL of solution

$[OH^-]$ = _____

pOH = _____

c. 2.50 mL of 1.20 M NaOH diluted to 500.0 mL

$[OH^-]$ = _____

pOH = _____

2. Calculate the [H+] and pH of the following strong acid solutions:

a. 0.150 M HBr

$[H^+]$ = _____

pH = _____

b. 0.980 g of HCl in 250.0 mL of solution

$[H^+]$ = _____

pH = _____

c. 25.0 mL of 2.00 M HNO_3 diluted to 1.50 L

$[H^+]$ = _____

pH = _____

Section 6: Equilibrium

Review video: How to write the equilibrium expression (Kc): 3 Trick Questions

1. Gaseous dinitrogen tetroxide is placed in a closed container at a certain temperature where it partially decomposes to nitrogen dioxide:

$$N_2O_4(g) \leftrightarrows 2NO_2(g)$$

At equilibrium, it is found that $[N_2O_4] = 1.20 \times 10^{-2}$ M and $[NO_2] = 3.60 \times 10^{-2}$ M.

a. Write the equilibrium constant (Keq) expression for the reaction.

b. Plug in the equilibrium concentrations given into your Keq expression from part a, and calculate the value of the equilibrium constant K.