



Summer Assignment AP Chemistry

Directions: Welcome to AP Chemistry. The material below is based on concepts that you should be familiar with based on your participation in High School Chemistry and other science courses. If you are familiar with the AP Chemistry “Big Ideas”, you will see some present below but also throughout the school year. If you are struggling with any of the questions below, I would suggest searching back through your previous Chemistry materials and/or contacting Mr. Frageau, at the email address above to ask for clarification. The assignments below are meant to be done in a paced manner during the summer, not all together. Try to take one assignment at a time, and then the following week, work on Assignment two, etc.

Academic Integrity: All work should be completed independently and without the assistance of unapproved resources. Any work violating academic integrity will be subject to a “0” and any additional consequences as outlined in the Knox Academic Integrity Policy attached to this assignment.

Due Date: Your work is due the first day of your AP Chemistry class. All late work will be subjected to a grade reduction or penalty as outlined in the course syllabus and copied below:

All major assignments not submitted on the due date will face a 10% deduction of max points per day for up to five (5) days and up to a 50% deduction.

Summer Assignments for AP Classes that are not submitted on time will result in the student being dropped from the course.

If you have any questions or concerns regarding this assignment, please contact the Dean of Academics, Mrs. Pergola, at dpergola@knoxschool.org .

Concepts include:

The Atom

Atomic Theory

Concepts include:

Density

Dimensional Analysis

Ion formation

Measurements

Nomenclature

Significant Figures

Scientific Notation

Temperature

Measurements:

Measurement Units		
Length (m) meter	Mass (kg) kilogram	Time (s) second
Electric Current (A) ampere	Temperature (K) kelvin	Temperature (C) celsius
Luminous Intensity (cd) candela	Amount (mol) mole	

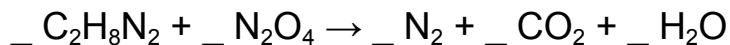
Assignment 1:**1. Define the following terms:**

- a. Absolute Zero
- b. Accuracy
- c. Anhydride
- d. Aldehyde
- e. Binary Compound
- f. Infer
- g. Absorption
- h. Manipulate
- i. Sequence
- j. Trend
- k. Emit
- l. Inversely proportional
- m. Enthalpy
- n. Equilibrium
- o. Frequency
- p. Vaporization
- q. Titration
- r. Isomer

2. Pick any 6 of the words from the previous question and write sentences with each. Underline or highlight the word used in each sentence.

- a. .
- b. .
- c. .
- d. .
- e. .
- f. .

3. Using the following equation, what would be the sum of all coefficients in a properly balanced equation?



Sum = _____

4. When 32 grams of oxygen are used to react with zinc sulfide, forming zinc II oxide and sulfur dioxide, how many grams of zinc II oxide are produced?

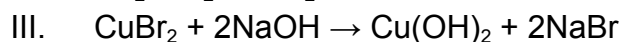
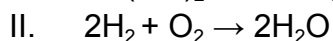
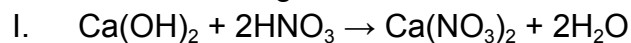
Assignment 2:

1. An approximately 0.1-molar solution of NaOH is to be standardized by titration. Assume that the following materials are available.
- Clean, dry 50 mL buret
 - 250 mL Erlenmeyer flask
 - Wash bottle filled with distilled water
 - Analytical balance
 - Phenolphthalein indicator solution
 - Potassium hydrogen phthalate, KHP, a pure solid monoprotic acid (to be used as the primary standard)
- (a) Briefly describe the steps you would take, using the materials listed above, to standardize the NaOH solution.
- (b) Describe (*i.e.*, set up) the calculations necessary to determine the concentration of the NaOH solution at the start.
2. Pick **2** of the following statements (a,b,c,d) then give a scientific explanation for the following observations. Use equations or diagrams if they are relevant to your response.
- (a) It takes longer to cook an egg until it is hard-boiled in Denver (altitude 1 mile above sea level) than it does in New York City (near sea level).
- (b) Burning coal, containing a significant amount of sulfur, leads to acid rain.
- (c) Perspiring (sweating) is a mechanism for cooling the body.
- (d) The addition of antifreeze to water in a vehicle radiator decreases the likelihood that the liquid in the radiator will either freeze or boil.

3. Ammonium is diluted for household use. What is the concentration in mol/liter of an ammonia solution prepared by taking 100mL of a 6.50 M solution of ammonia and adding enough water to make a 2.00 L solution.

(show set up and circle / bold the answer)

4. Which of the following is / are an Acid-Base neutralization reaction?



- a. I only
- b. II only
- c. III only
- d. I and III
- e. II and III

Assignment 3:

1. For the following parts of question 1 (a through f), identify the proper ending for each name in parts a through e.:

-ide	-ite	-ium	-ate	-ane	-ene
a. CO_3^{-2}					
b. PO_3^{-3}					
c. NH_4^{+1}					
d. ClO_2^{-1}					
e. OH^{-1}					
f. C_2H_4					

Questions 2 - 4 refer to the graph below and uses the following key to answer the questions, then select the proper answer for each question.

(A) sublimation

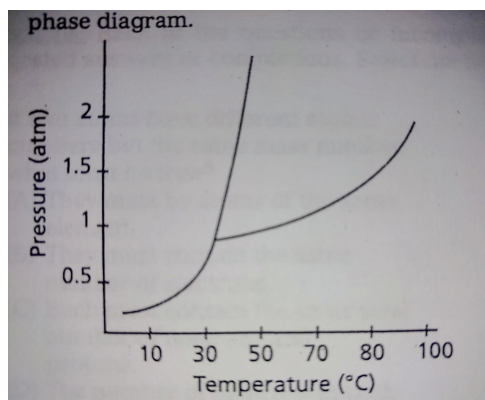
(B) condensation

(C) Boiling

(D) Melting

(E) Freezing

(F) Ionization



2. If the temperature increases from 10 C to 60 C at a constant pressure of 0.4 atm, which process will occur? A , B , C , D , E , F.
3. If the temperature decreases from 110C to 40C at a constant pressure of 1.1 atm, which process will occur? A , B , C , D , E , F.
4. If the pressure increases from 0.5 to 1.5 atm at 30 C, which process will occur? A , B , C , D , E , F.

Questions 5 through 9 involve the following 6 elements. Write the symbol of each element that corresponds to the proper statement (you may use an answer more than once)

He Na Si Mg Ar Al

5. This element has atoms with the largest atomic radius _____
6. This element has a full outer electron shell with its 8 maximum electrons _____
7. This element has the highest first ionization energy. _____
8. This element has the highest second ionization energy _____
9. This element is the most metallic in character _____

10. If two atoms have the same mass number but different atomic numbers, what must be true?
 - a. Atoms of the same element
 - b. Must contains same number of electrons
 - c. Each must contain same number of protons and neutrons
 - d. The number of neutrons must be the same
 - e. The number of protons in each must be the same.

11. A substance with strong intermolecular forces of attraction would be expected to have

- | | |
|------------------------|--------------------------------|
| I. Low boiling point | III. High heat of vaporization |
| II. Low vapor pressure | IV. Low melting point |

- a. I only
- b. II only
- c. I and II only
- d. II and III only
- e. I, II, III, IV

12. Write the ground state electron configuration for an arsenic atom, showing the number of electrons in each subshell in the space right below this question, then answer a and b.

- a. Quantum numbers normally go along with an electron configuration. What are quantum numbers?

- b. Explain how the electron configuration of the arsenic atom in the ground state is consistent with the existence of the following known compounds: Na_3As , AsCl_3 , and AsF_5 .

Assignment 4:

1. The postulates (statements) of the Bohr model of the hydrogen atom can be stated as follows:

- (I) The electron can exist only in discrete states each with a definite energy.
- (II) The electron can exist only in certain very specific circular orbits around the nucleus.
- (III) Radiation is emitted by the atom only when an electron makes a transition from a state of higher energy to one of lower energy.

(a) State whether each of these postulates is currently considered to be correct according to the wave mechanical model of the hydrogen atom.

(b) Give the wave mechanical model description that has replaced one of the postulates now considered to be incorrect (this uses the above postulates).

2. Popular Science is a news site that has many interesting articles relating to scientific concepts. One such article has to do with radiation. Visit the site (<https://www.popsci.com/watch-chernobyl-disaster-site-finally-get-proper-cover/>) and write a 1 paragraph summary of the article itself, then watch the video at the top and write a 1 paragraph response to your thoughts after watching the video.
(so 2 paragraphs total)

3. The link below is to a popsci article about chernobyl that you read about before. It also introduces a discussion about the relationship to Fukushima. Write a paragraph discussing how the 2 locations are similar and how they are different.

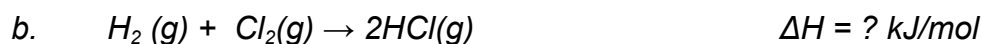
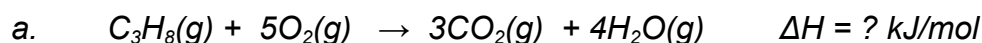
<https://www.popsci.com/science/article/2012-06/chernobyl-now/>

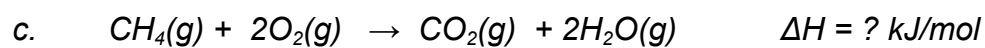
Assignment 5

1. The reaction of magnesium with sulfuric acid was carried out in a calorimeter. This reaction caused the temperature of 27.0 grams of liquid water, within the calorimeter, to raise from 25.0°C to 76.0°C. Calculate the energy associated with this reaction. *Answer: 5760J Prove that the answer is correct.*

2. The reaction of zinc with nitric acid was carried out in a calorimeter. This reaction caused the temperature of 72.0 grams of liquid water, within the calorimeter, to raise from 25.0°C to 100.°C. Calculate the energy associated with this reaction. *Answer: 22,600J Prove that the answer is correct.*

3. Determine the ΔH for each of the following reactions. Then Classify each reaction as either exothermic or endothermic.





Assignment 6:

Calculate the pH for each of the following problems. (#1-5)

1. A 0.023 M solution of hydrochloric acid

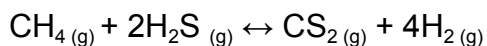
2. A 6.6×10^{-6} M solution of nitric acid

3. A 0.0334 M solution of potassium hydroxide

4. A 1.0×10^{-5} M solution of hydroarsenic acid

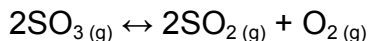
5. A 2.23×10^{-2} M solution of aluminum hydroxide

6. For the reaction below, which way would the equilibrium shift, for each situation below, to the right or to the left?



- (a) Decrease the concentration of dihydrogen sulfide. _____
- (b) Increase the pressure on the system. _____
- (c) Increase the temperature of the system. _____
- (d) Increase the concentration of carbon disulfide. _____
- (e) Decrease the concentration of methane (CH_4). _____

7. What would happen to the position of the equilibrium when the following changes are made to the equilibrium system below?



- (a) Sulfur dioxide is added to the system. _____
- (b) Sulfur trioxide is removed from the system. _____
- (c) Oxygen is added to the system. _____