The summer assignment for AP Chemistry reviews basic information from previous chemistry courses; including Physical Science, Chemistry, and Honors Chemistry. Students should also be ready for the lab safety and math skills test during the first week of school.

You Tube Video Notes Links
The following list of links are to help you with the summer assignment questions, should you need it.

- Calculations [https://youtu.be/qT4_i7ZZyn4](https://youtu.be/qT4_i7ZZyn4)
- More Dimensional Analysis [https://youtu.be/6M8idnsrr_Q](https://youtu.be/6M8idnsrr_Q)
- Scientific Notation Review [https://youtu.be/VjFUS8hBjxU](https://youtu.be/VjFUS8hBjxU)
- Intro to Sig Figs [https://youtu.be/66DJUij2Fio](https://youtu.be/66DJUij2Fio)
- SF Example [https://youtu.be/kqI_kkEdqEk](https://youtu.be/kqI_kkEdqEk)
- SF Example with calculations [https://youtu.be/_Bca4ceuR7o](https://youtu.be/_Bca4ceuR7o)
- Matter/Physical and Chemical [https://youtu.be/9QH94rx9d5M](https://youtu.be/9QH94rx9d5M)
- Binary Nomenclature [https://youtu.be/nVbYLT8d-78](https://youtu.be/nVbYLT8d-78)
- Nonbinary Nomenclature [https://youtu.be/2OCd8cpNXHA](https://youtu.be/2OCd8cpNXHA)
- Formula Writing: binary acid [https://youtu.be/-HCtAKNPLcw](https://youtu.be/-HCtAKNPLcw)
- Formula Writing: binary ionic [https://youtu.be/hPdhrfDbx8c](https://youtu.be/hPdhrfDbx8c)
- Sample equation translations [https://youtu.be/sxjvdGkVph4](https://youtu.be/sxjvdGkVph4)

Answer the following questions in a notebook or on loose leaf paper. For math problems, show all work and report answers to significant figures. This assignment is due on the first day back to school.

**Basic Science Skills**
1) What is the difference between quantitative and qualitative data? Give examples of each.
2) What is the difference between an observation and an inference? Give examples of each.
3) What are the differences between a chemical and a physical change?
4) Identify the following as a chemical or a physical change.
   a) melting ice
   b) pennies turning green when an acid is added to them
   c) hydrogen gas ignites in air when a spark is added to it
   d) making water vapor (gas) from liquid water
   e) making water vapor (gas) from hydrogen and oxygen mixing together
   f) hydrochloric acid evaporating to hydrochloride gas
5) List the rules for significant figures. Include the difference between a leading, captive, and trailing zero. Give examples of each.
6) What are the fundamental/base SI units and what do they measure?
7) What are the prefixes used with SI units? What does each stand for?
8) Use dimensional analysis to solve for the following conversions.
   a) According to the Fall Out Boy song, Centuries, “you will remember me for centuries.” If you remember me for 92 centuries, how many months will you remember me?
   b) Your book snuck into the lab to play with lab equipment. It massed itself and found it has a mass of 0.6321 kilogram (kg). What is its mass in grams (g)?
   c) My laptop’s processor performs at 1.7 gigahertz (GHz). What is this in MHz?
   d) How many kilobytes (kb) of data are in an older 512 megabyte (Mb) flash drive?
   e) You decided to buy a 2.0 L bottle of Mountain Dew Code Red for a potluck in science. How many milliliters (mL) is contained in the bottle?
   f) There’s a person trying to beat the world record of taking 1449 selfies per hour. How many selfies per second is that current world record?
   g) You need to take care of Mr. Lyon’s biology students’ plants, so you bought a 2.20 x 10^5 g bag of fertilizer. How many kilograms of fertilizer is that?
   h) Trekker, the track star, ran 18.8 m/s in a recent competition. How many cm/s was this?
   i) Ms. Baker’s birth month is December. If she celebrates her birthday the entire month, for how many seconds is she celebrating?
   j) Linoleum flooring is sold in one foot squares. Approximately how many squares must be ordered to cover the rooms in a school if each room is 1300 square feet and there are 10 rooms per floor and 3 floors in the building?
   k) How many donuts could Ms. Roushar buy for the science department with twenty-three dollars if they cost $4.00/dozen? Tax and other fees are included in the price.
   l) A light year is the distance light travels in one year. Sirius (the dog star), the brightest star in the sky, is approximately 8.6 light years from earth. How far (in km) from the earth is it knowing that light travels 3.0 x 10^8 m/s? Density Practice

9) Answer the following questions about density \((d=m/v)\)
   a) Kevin Garnett and other NBA players typically play with a basketball has a diameter of 24.12 cm and a mass of 624 g. What is the density of the basketball?
   b) The density of aluminum is 2.70 g/mL. If the mass of a sheet of aluminum found in the lab is 244 grams, what is the volume of the aluminum?

10) The following equations show how to convert between temperature units:
    \( ^\circ F = (1.80 \times ^\circ C) + 32 \) \n    \( K = ^\circ C + 273 \)
   a) How many \(^\circ\)C is 372 Kelvin? Show your work.
   b) How many degrees Fahrenheit is 42 degrees Celsius? Show your work.

11) What is the difference between a scientific theory and a scientific law? Give examples of each.

Basic Chemistry
12) Locate the following groups of elements on the periodic table
   a) alkali metals 
   b) alkaline earth metals 
   c) inner/outer transition metals
   d) halogens 
   e) metalloids 
   f) noble gases

13) Define atomic mass, isotope, mass number, protons, electrons, neutrons, and ions.

14) Describe how to find the number of protons, electrons, and neutrons in an atom or ion.
15) Find the number of protons, electrons, and neutrons in the following atoms and ions. Round the atomic mass on your periodic table for the mass number.
   a) He  b) Mg$^{2+}$  c) Cl$^{-}$  d) Ar  e) Li$^{+}$

16) Define and give an example of an ionic compound.

17) Define what a diatomic element is and list the 7 diatomic elements.

18) Name the following substances.
   a) W  b) Mn  c) HCl  d) MgCl$_2$  e) H$_2$SO$_4$  f) H$_2$SO$_3$  g) FeCO$_3$
   h) SO$_3$  i) Fe$_2$S$_3$

19) Write the chemical symbols/formula for the following substances.
   a) Silver  b) Hydrobromic acid  c) Iron (III) chloride  d) Magnesium carbonate
   e) Phosphoric acid  f) Lithium sulfide  g) Nitrous acid  h) Carbon monoxide
   i) Ammonium sulfite  j) Sulfur trioxide

20) What are the similarities and difference between SO$_3$ and SO$_3^{2-}$?

Chemical Reactions

21) What are the common symbols used in chemical equations?

22) Translate the following equations into chemical equations.
   a) When aqueous beryllium chloride reacts with aqueous silver nitrate, aqueous beryllium nitrate and silver chloride powder are made.
   b) When aqueous bismuth (III) oxide and zinc metal are mixed, they produce aqueous zinc (II) oxide and bismuth metal.
   c) When dissolved sodium hydroxide reacts with sulfuric acid, aqueous sodium sulfate and water are formed.
   d) When fluorine gas is put into contact with calcium metal at high temperatures, calcium fluoride powder is created.
   e) When sodium metal reacts with iron (II) chloride, iron metal, and aqueous sodium chloride are formed.
   f) A solution of hydrochloric acid reacts with solid calcium bicarbonate to produce water, carbon dioxide gas, and aqueous calcium chloride.