

## Sophomores in AP Chemistry Summer Work

In order to be successful in (and be permitted to enroll in) AP chemistry for the 2017-2018 school year, there are certain topics you need to be proficient with. The topics are outlined below. Along with each topic I have written out a list of objectives. These are the tasks you need to be able to perform by the end of the summer.

Attached to this are sample problems for most of the topics to help you differentiate which types of problems you need to be able to solve. **You will need to complete the packet of practice problems and the summer work for 11<sup>th</sup> and 12<sup>th</sup> grade.**

There are two general resources given below where you can turn to for help understanding the topics. Some of the topics have additional resources listed with them.

I will periodically check my e-mail for questions you may have over the summer, though for the most part you are responsible for mastering this material on your own. Please e-mail me at [jenny\\_beck@gwinnett.k12.ga.us](mailto:jenny_beck@gwinnett.k12.ga.us) to ensure that I receive your messages.

### General resources:

Khan Academy – search for video tutorials on any topic

<http://drvanderveen.com/apchemistry.htm> - some webcasts and outlines

### Topics and corresponding objectives and book page numbers

#### **Scientific notation and significant figures**

1. Convert between scientific and standard notation.
2. Use scientific notation in a calculator.
3. Count significant figures in a value.
4. Perform addition/subtraction/multiplication/division or a combination of the four and report an answer with the correct number of significant figures.

#### **Structure of the atom**

1. State the relative size, charge and position of protons, neutrons and electrons.
2. Discuss the major advancements in atomic theory by Dalton, Thomson, Rutherford, Bohr and Chadwick.
3. Identify the number of protons for any element on the periodic table.
4. Identify the number of electrons in any neutral atom for any element on the periodic table.

5. Identify the atomic mass for any element on the periodic table.

### **Electron configurations**

1. Provide the full electron configuration for any element on the periodic table.
2. Provide the noble gas electron configuration for any element on the periodic table.
3. Identify the valence electrons for any element.
4. Identify the number of unpaired electrons for any element.

### **Periodic table, periodic trends**

1. Identify an element as a metal, non-metal or metalloid based on its position on the periodic table.
2. Provide the names of the families on the periodic table.
3. Identify the oxidation state of any non-transition element on the periodic table based on its group/family.
4. State the seven diatomic elements.
5. State the trends in atomic radius, ionic radius, electronegativity and ionization energy across a period and down a group.
6. Given a set of elements rank them in order of increasing or decreasing atomic radius, ionic radius, electronegativity or ionization energy.

### **Bonding and nomenclature**

1. State whether a compound is ionic or covalent.
2. Predict the formula for any ionic compound.
3. Provide the IUPAC (International Union of Pure and Applied Chemistry) name for any ionic, covalent, or acidic compound, including those with transition metals and polyatomic ions.
4. Given the IUPAC name, provide the formula for any compound.

### **Predicting products and balancing reactions**

1. Given a chemical reaction, balance the reaction with the lowest whole-number coefficients.
2. Provide the type of reaction if given the chemical reaction (combustion, synthesis, decomposition, single replacement, double replacement.)
3. Given the reactant(s) of a chemical reaction, predict the products and balance the resulting reaction for the types of reactions listed in (2).

#### Some reaction help sites

<http://www.youtube.com/watch?v=IPvqk5OwtDs>

<http://www.youtube.com/watch?v=cGUQFHvS6JQ&feature=related>

[http://www.files.chem.vt.edu/RVGS/ACT/notes/Types\\_of\\_Equations.html](http://www.files.chem.vt.edu/RVGS/ACT/notes/Types_of_Equations.html)

<http://www.chemistryexplained.com/Ce-Co/Chemical-Reactions.html>

<http://www.woodrow.org/teachers/chemistry/links/chem1/Chapter8.html>

### **Stoichiometry and Dimensional Analysis**

1. Convert between mass, moles and molecules/atoms/particles for any atom or compound/molecule.
2. Convert between mass, moles or molecules of a reactant or product to mass, moles or molecules of a different reactant or product in a chemical reaction.
3. Given the quantities of more than one reactant, determine which is limiting and how much product will be produced.

#### Some stoichiometry help sites

<http://chemistry.alanearhart.org/Old/Tutorials/Stoichiometry/index.html> (the third quiz is good, and if you click on "reveal it" the solution will show up with all the work)

<http://www.nauticus.org/chemistry/chemstoichiometry.html>

[http://www.chemcollective.org/stoich/reaction\\_stoi.php](http://www.chemcollective.org/stoich/reaction_stoi.php)(a movie goes through how to do the problems, then gives practice)

<http://www.scienceiscool.org/Stoichiometry> (gives the steps, then practice problems)

### **Solution calculations**

1. Calculate concentration in units of molarity or molality.
2. Perform calculations to go between molarity and moles or volume (or mass from moles.)
3. Describe how to create a certain volume of a solution with a certain molarity from a solid solute.
4. Describe how to dilute a solution to give a certain volume of a solution with a different concentration.

### **Simple pH and pOH calculations**

1. Convert between pH, pOH,  $[H^+]$  and  $[OH^-]$  for strong acids and bases given one of the four values.

### **Gas laws**

1. Perform calculations with the combined gas law and the ideal gas law.
2. State the conditions of STP (standard temperature and pressure.)
3. Perform gas stoichiometry problems using the volume of an ideal gas at STP.