**Honors Chemistry October 04, 2018**

What I hope you can do:

* **General science items**
  + Units: grams, kilograms, meters, liters, moles (a count!), seconds
  + Prefixes: deci, centi, milli, micro, nano, kilo, mega, giga, tera
  + Scientific notation: 2, 045, 000 is 2.045 x 106
  + Significant figures: have a sense of proportion for measurements…you do not have the instruments to measure beyond a certain number of decimal places, for example, so be thoughtful about the numbers you generate
* **General reading of the periodic table** (references to the one on the south wall of the classroom)
  + Black: solids; blue: liquids (only 2); red: gases (all happen to be nonmetals)
  + Staircase of metalloids: along left side of Boron, then alternating down and right, these elements can act as both metals and nonmetals; give rise to all of our modern digital electronics. Otherwise, your phone would be as large as a lab table!
  + Metals: consider them to be metal ions in a sea of mobile electrons, this gives rise to the properties of conductivity (both heat and electricity), malleability, and ductility
    - Metals lose electrons, thus forming cations (ca**+**ions!); the name doesn’t change, we just call it “element” when naming a compound (see below in molar mass calculations)
  + Nonmetals: mostly gases or brittle solids (yes, bromine is a liquid), these typically form anions, called -ides for the element, such as fluoride, chloride, oxide, sulfide, etc.
* **Be able to determine protons, neutrons, and electrons for a given element**
  + Protons = atomic number, symbol will direct you to correct place in periodic table; if no gain or loss, electrons = protons; neutrons: mass # - atomic # = neutrons;
  + Any two pieces should give you all the rest of the possibilities
    - Symbol or protons or atomic number tells you which element
    - These, above, and any charge on the atom tells you the # electrons
    - # neutrons or mass number will allow you to calculate mass # or # neutrons, respectively
  + Protons: identifies which element
  + Electrons, particularly valence electrons (those on outermost energy level): determine chemical behavior or reactivity
  + Neutrons: determine the stability of the nucleus; unstable isotopes are called radioactive, as they can decay into other elements/isotopes, over varying periods of time (half-lives), eventually reaching some stable element/isotope, typically under mass 82 (lead)
* **Be able to read several different notations and get the above information**
  + 23592U is the same as U-235; both indicate the isotope of uranium of mass 235
* **Be able to consider the distribution of isotopes** (atoms of the same element with different masses, due to different numbers of neutrons)
  + Percentages multiplied by masses can be summed for the actual atomic mass of the element, as found on the periodic table
* **Recognize the number of valence electrons** (those on the outermost energy level, and which affect bonding) for the “A” groups (1/Ia, 2/IIa, 13/IIIa, 14/IVa, 15/Va, 16/VIa, 17/VIIa, 18/VIIIa), and that those with 1, 2, 3 valence electrons will lose these, those with 4 valence electrons can lose or gain (variable), and that those with 5, 6, or 7 usually gain enough to reach 8. Those with 8 are relatively nonreactive (the noble gases)
  + ***Realize that transition metals, groups 3-12, have some variations possible, and, with the exceptions of Zn (zinc) and Ag (silver), could have one of several oxidation states (# electrons lost), so other information will direct you to this: either a Roman numeral will tell you if given a name, or the formula will let you derive the oxidation state*** 
    - ***Since any stable compound will have a net charge of zero, if you know the charge of the anion, (#cation)(charge of cation) + (#anion)(charge of anion) = 0; plug and chug for answer***
    - ***Example: Fe2O3: (2)(x) + (3)(-2) = 0, rearranging, 2x = 6, so x = +3 for the iron atoms***
      * ***Thus Iron (III) is the cation of the compound, called Iron (III) oxide***
* **Be able to calculate molar mass**, to wit, the mass of one mole of either an element or a compound
  + Multiply the subscript present by the atomic mass of the element preceding it, and summing for the total molar mass (using whole numbers for simplicity of demonstration):
    - Ne: (1)(20) = 20 g/mol
    - NaCl: (1)(23) + (1)(35.5) = 58.5 g/mol
    - CaCO3: (1)(40) + (1)(12) + (3)(16) = 100 g/mol
    - Ca3(PO4)2: (3)(40) + (2)(31) + (8)(16) = 310 g/mol
* **Start being able to write formulas from names, names from formulas**
  + If you here “-ide,” recognize that that means an anion (a negative ion) of that element, so the second part of the formula
    - Sodium chloride: the metal (cation) is sodium, the nonmetal (cation) is a chlorine ion
      * Since sodium becomes Na+1, chlorine becomes Cl-1, the balance between the two is 1:1, hence NaCl
    - Calcium chloride: the metal (cation) is calcium, the metal (cation) is chlorine
      * Calcium becomes Ca+2, chlorine becomes Cl-1; it takes two chlorides to balance the charge of the calcium (1)(+2) + (2)(-1) =0, so the formula is CaCl2