PS Chemistry – Unit 3A – Part 1

Ionic Bonding

Stable Electron Configurations

* When the highest occupied energy level of an atom is filled with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the atom is stable and not likely to react
* Noble gases are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (have 8 valence electrons)
  + Argon: Greek work *argos*, means “idle” or “inert”
* Chemical properties depend on the number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + **Electron dot diagram**- a model of an atom in which each dot represents a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_The symbol in the center represents the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and all other electrons in the atom

Ionic Bonds

* Elements that do not have complete sets of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ tend to react, which allows them to achieve electron configurations similar to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Some elements achieve stable electron configurations through the \_\_\_\_\_\_\_\_\_\_of electrons between atoms

Transfer of Electrons

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_has one electron fewer than an argon atom
* If Cl gains a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, it will have the same stable electron arrangement as argon
* Sodium has one \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1 electron more than Neon)
* If sodium lost this \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, its highest occupied energy level would have 8 electrons
* Na would then have the same \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_electron arrangement as neon
* At the atomic level: an electron is transferred from each Na atom to a Cl atom; each atom ends up with a more stable electron arrangement than it had before the transfer

Formation of Ions

* When an atom gains or loses an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the number of protons is no longer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_to the number of electrons.
* Charge on atom is neither \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_nor \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_- an atom that has a net positive or negative electric charge
* Charge is represented by a plus or a minus sign
* \_\_\_\_\_\_\_\_\_- ion with a negative charge
* Named: element name plus suffix –*ide*
* Cl- : *chloride* ion
* \_\_\_\_\_\_\_\_\_\_- ion with a positive charge
* Named: just use the element name
* Na+ : *sodium* ion

Formation of Ionic Bonds

* Remember: \_\_\_\_\_\_\_\_\_\_\_\_\_charges attract
* When an anion and cation are close together, a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_forms between them
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- the force that holds atoms or ions together as a unit (one)
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- the force that holds cations and anions together
* An ionic bond forms when electrons are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_from one atom to another

Ionization Energy

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_form when electrons gain enough energy to escape from atoms
* This energy allows electrons to overcome the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of the protons in the nucleus
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- the amount of energy used to remove an electron
* Varies from element to element
* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_the ionization energy, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_it is to remove an electron from an atom
* Ionization energies tend to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_from left to right across a period
* Ionization energies tend to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_from the top of a group to the bottom
* Example: easier to remove an electron from K than from Na (K is more reactive than Na)

Ionic Compounds

* Compounds that contain \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, which can be represented by chemical formulas.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- a notation that shows what elements a compound contains and the ratio of the atoms or ions of these elements in the compound
* The chemical formula for sodium chloride is NaCl
* From the formula, you can tell that there is one sodium ion for each chloride ion in sodium chloride
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_are used to show the relative numbers of atoms of the elements present (if only one atom of element, no subscript is needed)

Crystal Lattices

* A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_for an ionic compound tells you the ratio of the ions in the compound, but it doesn’t tell you how the ions are arranged in the compound.
* Salt: pieces are shaped like \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* This \_\_\_\_\_\_\_\_\_\_\_\_is a clue to how the sodium and chloride ions are \_\_\_\_\_\_\_\_\_\_\_\_\_\_in the compound
* Each chloride ion is surrounded by \_\_\_\_\_\_\_\_sodium ions and each sodium ion is surrounded by \_\_\_\_\_\_\_\_\_chloride ions
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- solids whose particles are arranged in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_structure; classified into groups based on shape; shape depends on arrangement
* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of the ions depends on the ratio of ions and their relative size

Properties of Ionic Compounds

* High \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_point
* In solid state, poor conductor of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* When \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, good conductor of electric current
* Solid crystals \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_when struck with hammer
* The properties of an ionic compound can be explained by the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_among ions within a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Recall: the arrangement of particles in a substance is the result of two opposing factors
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_among particles in the substance
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of the particles
* The stronger the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_among particles, the more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_the particles must have before they can separate.