Chapter 11 notes

Note: Chapter 11 is not taken entirely. Also, the last section of Chapter 10 is included with Chapter 11.

Periodic Trends

Atomic Size (radius) Trend

- Atomic size is the size of the atom. Specifically, it refers to the radius. The larger the radius the larger the atom. The smaller the radius the smaller the atom.
- The group trend for atomic size increases as you move down a group. This is because you are adding a principle energy level each block you move down.
- The period trend for atomic size decreases as you move across a period from left to right. This is because there is less shielding which allows the protons in the nucleus to pull the electrons in more closely, making a smaller atom

Ionization Energy Trend

- Ionization energy is the amount of energy required to remove an electron from the atom.
- The group trend for ionization energy decreases as you move down a group. This occurs because the valence electrons are farther from the nucleus making them easier to remove.
- The period trend for ionization energy increases as you move across a period from left to right. This happens because you are moving towards elements that want to gain rather than lose electrons. This makes it more difficult to remove the electron.

Electronegativity Trend

- Electronegativity is the ability of an atom to attract shared electrons to itself.
- The group trend for electronegativity decreases as you move down at group. This occurs because the nucleus is farther away and therefore has less pull on the electrons.
- The period trend for electronegativity increases as you move from left to right across a period. This is because you are moving towards elements that need to gain electrons to have a full energy level an this makes them attract electrons more strongly.

Chart of electronegativity values is on page 320. Do not memorize. It will be provided.

Types of Bonding

Ionic Bonding

- involves the transfer of electrons
- Forms when there is a difference in electronegativity greater than or equal to 2.0
- Forms from metals and non metals bonding
- Example: NaF (Na 0.9 electronegativity, F 4.0 electronegativity)
- Example : NaCl (Na 0.9 electronegativity, Cl 3.0 electronegativity)
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Chapter 11 notes

Covalent Bonding

- involves the equal sharing of electrons
- Pure covalent bonds exist between same type atoms only. Example: all diatomic atoms, H_2, N_2, O_2, F_2, Cl_2, Br_2, I_2.
- Electronegativity difference must be zero in order to be classified as a covalent bond.

Polar Covalent Bonding

- Involves the unequal sharing of electrons.
- Usually occurs when two different non metal atoms bond
- Electronegativity difference should be greater than zero but less than 2 to be classified as a polar bond.
- The greater the electronegativity difference the more polar the bond.
- Unequal sharing results in dipole moments.

Showing Dipole Moments

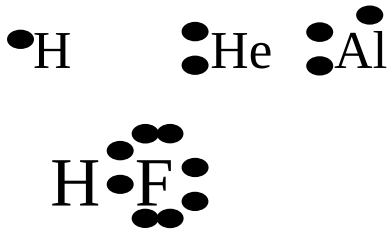
- A dipole moment is a partial negative and a partial positive charge created on a molecule due to the unequal sharing of electrons.
- use an arrow to indicate the direction in which the electrons are being pulled.
- A plus sign goes at the end of the molecule that is gaining a partial positive charge
- Arrow continues and points in the direction of the partial negative.
- Example:

The hydrogen becomes partially positive because the electrons are closer to fluorine due the electronegativity values. Because all of the electrons are closer to fluorine, fluorine becomes partially negative. This is a dipole moment and you draw it just like that.

Lewis Structures

- Lewis structures, also known as Lewis Dot Diagrams, are used to show valence electrons of single atoms and also to show valence electrons of bonded atoms.
- Lewis structures start with the element or elements symbols.
- Count total valence electrons.
- Place valence electrons as dots around the element symbol(s).
- Hydrogen and Helium follow the DUET RULE which means that each of them only wants a total of 2 electrons.
- All other elements follow the OCTET RULE which means that each of them want a total of 8 electrons.

- Some Examples: (see section 11.6 p. 328 in the text for better pictures as these are difficult to show in Word)



Notice in the bonded Lewis structure the octet rule is met for fluorine and the duet rule is met for hydrogen. Hydrogen is sharing its one valence electron and fluorine is sharing its 7 for a total of eight valence electrons. There are 8 dots in the diagram.