Resonance Stabilization

The energy of the actual molecule is lower than the energy that might be estimated for any contributing structure. This stabilization is often called **resonance stabilization** or **resonance energy** or **delocalization energy**. The greater the number of relatively stable resonance contributors, the greater is the resonance energy. The more nearly equivalent the resonance contributors are, the greater is the resonance energy.

**Rules for Drawing Resonance Structures**

**Resonance is about moving electrons and not atoms.** The only electrons that can be moved are lone pair electrons and double bond electrons. Single bond electrons do not participate.

Sp3 hybridized carbons electrons will never participate in resonance (they don’t have long pairs or double bonds associated with them).

**3 moves you can make:**

1. Move lone pair electrons on an atom to form a new double bond to that atom
2. Move double bond electrons to make a lone pair on one of the atoms of the original double bond
3. Move double bond electrons to form a new double bond to an adjacent atom

**Generally speaking:**

Electrons always move toward an sp² atom. They never move towards an sp³ hybridized atom, because it already has 8 valence electrons.

Electrons move towards an atom bearing a positive charge or towards atoms that have a double bond. Electrons often move away from a neutral atom or an atom with a negative charge.

Electrons can only be shifted to adjacent atoms or adjacent bond positions

**Did you do it correctly?** When you are done drawing your new resonance structure make sure the following items are accounted for;

- √ Calculate new formal charges
- √ Make sure the total charge is the same between all resonance structures.
- √ Total number of electrons must stay the same
- √ Atoms must not have more than eight electrons (can’t break the octet rule)
- √ Single bonds must not be broken
- √ Atoms should not be moved

**Stability of Resonance Forms** Not all resonance forms have the same energy and some forms may be more stable than others. **The major resonance contributor is the most stable and is determined by these factors (the most important first):**

1. Complete octet
2. Negative charge resides on more electronegative atom and a positive charge on a less electronegative element.
3. Small charge separation

The relative stabilities of carbocations can also be applied to determining the stability of resonance structures.
The order of stability of the structures below is VII (most stable), IX and VIII (least stable). Does this make sense using the rules above?