Chapter 8

Understanding Strategies for Stabilizing a Carbocation or Carbon Radical (Part 3): Share Delocalized Electrons Over a Distance

Key Concepts

When THREE OR MORE ADJACENT p ORBITALS OVERLAP, the electrons within those orbitals roam throughout the extended orbital system. This phenomenon is called resonance. An atom could be part of a RESONANCE system if it has a PI BOND, or if it is a CARBOCATION or CARBON RADICAL. In addition a NON-BONDED ORBITAL can be made to overlap with a resonance system. RESONANCE IS ONE OF THE MOST STABILIZING FACTORS for a carbocation or carbon radical because the electrons within the orbital system can be shared with an electron-deficient carbocation or carbon radical.

What You Need to Learn, Understand, and Apply

1. **The ability to recognize when resonance can occur and to determine which atoms are included in a resonance system.**
2. **The ability to explain why resonance is such a stabilizing factor.**
3. **The ability to draw resonance contributors.**
4. **The ability to determine relative stabilities of resonance contributors and therefore to determine the relative contribution of each to the structure of the actual molecule.**
5. **The ability to take resonance into account when considering initial placement of a carbocation or carbon radical.**
6. **The ability to predict the products of any reaction that has a resonance-stabilized carbocation or carbon radical intermediate.**
7. **The ability to label 1,2 and 1,4 products as kinetic and/or thermodynamic, when applicable, and the ability to determine which product predominates under a given set of conditions.**
8. **The ability to predict the stereochemistry of products resulting from resonance-stabilized reactions.**
9. **The skills needed to apply the material and to avoid common errors.**