

Chapter 13

Understanding Solvent Effects

(Illustrated by Substitution and Elimination Reactions)

Key Concepts

When a solvent has relatively strong intermolecular attractive forces, it can affect several properties of an organic reaction. First, it can make a nucleophile less effective. This is a particularly important factor when the nucleophilic atom is small (has only one or two shells) and has a charge. Second, a solvent with relatively strong intermolecular attractive forces can rip the leaving group off of a molecule, creating a carbocation. Third, the more polar the solvent, the more it helps stabilize a carbocation intermediate, which also helps drive creation of a carbocation. A solvent tends to interact strongly when it has hydrogen bonding. That type of solvent is said to be protic polar.

What You Need to Learn, Understand, and Apply

1. Definitions and examples of protic polar and aprotic polar solvents.
2. When and why a solvent decreases the relative effectiveness of a nucleophile.
3. When and how a solvent can assist a leaving group.
4. When and how a solvent can stabilize an intermediate.
5. What SN and E as well as associated numbers stand for when used to describe specific types of organic chemistry mechanisms.
6. SN1, E1, SN2, and E2 mechanisms, Zaitsev's rule, the reasons why any given set of conditions may drive specific mechanism type(s), and how each mechanism can be used to predict product stereochemistry.
7. The types of functional groups that signal the potential for a substitution and/or elimination reaction.
8. How each method of making oxygen or nitrogen a better leaving group atom determines the type of substitution/elimination mechanism the reaction must follow.
9. The types of reactants that signal a SNAr reaction and the major mechanism for that reaction.
10. How to recognize epoxides, how to assign two types of IUPAC names, and, when applicable, how to assign a common name to an epoxide. Also, how to draw the structure of an epoxide based on its name.
11. Relative stabilities of cyclohexane conformers.
12. The skills needed to apply the material and to avoid common errors.

More for Your Tuition Dollar

1. Know how to modify aniline to make it an arenediazonium salt. Also, know the major reactions associated with arenediazonium salts.