

Haloalkanes, Substitution vs. Elimination

Introduction to Organic Chemistry, 3rd ed., Brown & Poon, section 7.10

HALIDE	NUCLEOPHILE (Nu: or Nu:⁻)	PREDOMINANT REACTION MECHANISM
methyl	+ (any) →	S _N 2
primary (1°)	+ "bulky", strong base →	Elimination
	+ all other nucleophiles →	S _N 2
secondary (2°)	+ (any) →	Elimination
	+ good nucleophile, weak base →	S _N 2
	+ poor nucleophile, polar protic solvent →	S _N 1
tertiary (3°)	+ (any) →	Elimination
	+ poor nucleophile →	S _N 1

Note that there may be exceptions to these guidelines and/or that these types of reactions may have been oversimplified, but these are the rules we will use for CHM201.

	NUCLEOPHILE (Nu: or Nu:⁻)		
	POOR	Pretty Good	GOOD
WEAK BASE	H ₂ O, CH ₃ OH, CH ₃ COOH... (water, alcohols, carboxylic acids; any neutral molecule w/ oxygen)	NH ₃ , (CH ₃) ₂ S, CH ₃ COO ⁻ ... (thiols, amines, or resonance stabilized anion w/ O)	Cl ⁻ , Br ⁻ , I ⁻ , RS ⁻ (halides, thiolates)
STRONG BASE			⁻ OH, RO ⁻ , H ₂ N ⁻ (hydroxide, alkoxides, nitrogen anion)

HALIDE	E1	S _N 1	E2	S _N 2
methyl				X
primary (1°)			X	X
secondary (2°)	X	X	X	X
tertiary (3°)	X	X	X	