S_N1 vs. S_N2 vs. E1 vs. E2

Factors to examine:

1. Steric environment of the substrate leaving group (1° vs. 2° vs. 3° vs. near 4°)
2. Nature of the leaving group (I^- vs. Br^- vs. H_2O vs. $TsO^- = {}^-OSO_2C_6H_4CH_3$)
3. Nature of the nucleophile/base (i.e. a strong=highly polarized/negatively charged)
4. Steric environment of the nucleophile/base
5. Temperature (higher temps generally favor elimination reactions)
6. Concentration of the nucleophile/base
7. Solvent which might promote carbocation formation (least important item)

Halide on	**S_N1**	**S_N2**	**E2****	**E1****
1°	**No**	Yes	Yes*	**No**
2°	Yes	Yes	Yes*	Yes*
3°	Yes	**No**	Yes*	Yes*
Allylic C	Yes	Yes	Possible*	Yes
Benzylic C	Yes	Yes	Possible*	Yes
Sp2	**No**	No	Depends	**No**

*All Elimination reactions require a beta hydrogen, which is typically on an sp3 carbon.
**Must have a beta hydrogen

S_N1 vs S_N2

	Substitution on SM	Good nuc.*	Polar solvent	Good leaving group
S_N1	Accelerates	No effect	Accelerates	Greatly accelerates
S_N2	Slows	Accelerates	Use aprotic/polar	Accelerates

* A good nucleophile is defined as a small highly polarized (i.e. negatively charged) species.

E2 vs. S_N2**

	Substitution on SM	Small Nuc./base	Bulky nucleophile/base	Higher temp
S_N2	Slows	Favored		
E2	Favored		Favored	Favored

**Both E2 and S_N2 generally require a high concentration of base/nucleophile

E1 vs. S_N1

	Higher temp.	Large base/nuc.	Good nuc.
S_N1			Favored
E1	Favored	Favored	