

Comparison of S_N1 and S_N2 mechanism

	S _N 1	S _N 2
Stereochemistry:	Product is a mixture of inversion and retention of orientation because the carbocation can be attacked from either side. Interestingly, the amount of the inverted product is often up to <u>20% greater than the amount of product with the original orientation</u> . Saul Winstein has proposed that this discrepancy occurs through the leaving group forming an ion pair with the substrate, which temporarily shields the carbocation from attack on the side with the leaving group.	Configuration is inverted.
Rate of reaction:	- Rate depends only on the concentration of the haloalkane. The carbocation forms much slower than it reacts with other molecules. This makes S _N 1 reactions slow.	Rate depends on concentrations of both the haloalkane and the nucleophile. S _N 2 reactions are fast
Role of solvent:	- Polar protic solvents favored. Examples: H ₂ O, Formic acid, methanol. Aprotic solvents will work also, but protic solvents are better because they will stabilize the leaving group, which is usually negatively charged, by solvating it. Nonpolar solvents are the worst solvent for S _N 1 reactions because they do nothing to stabilize the carbocation intermediate.	Polar aprotic solvents favored. Examples: Acetone, THF (an ether), dimethyl sulfoxide, n,n-dimethylformamide, hexamethylphosphoramide (HMPA). Nonpolar solvents will also work, such as carbon tetrachloride (CCl ₄) Protic solvents are the worst type for S _N 2 reactions because they "cage," or solvate, the nucleophile, making it much less reactive.
Role of nucleophile	Any nucleophile will work (since it has no effect on reaction rate)	Good nucleophiles favored
Carbocation stability:	3° carbon - most stable = S _N 1 favored 2° carbon - less stable = either could be favored	1° carbon - seldom forms = S _N 2 favored CH ₃ ⁺ - never forms = S _N 2 favored 2° carbon - less stable = either could be favored