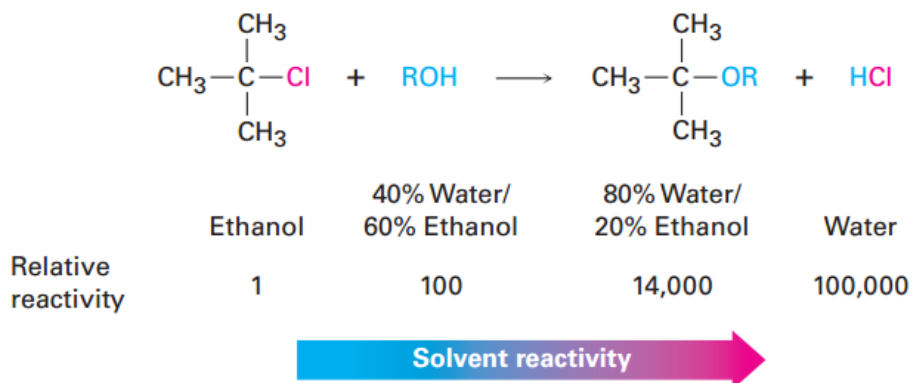


## Effect of Solvent on S<sub>N</sub><sup>1</sup> Reaction

The properties of a solvent that contribute to its ability to stabilize ions by solvation are related to the solvent's polarity. S<sub>N</sub><sup>1</sup> reactions take place much more rapidly in strongly polar solvents, such as water and methanol, than in less polar solvents, such as ether and chloroform. In the reaction of 2-chloro-2-methylpropane, for example, a rate increase of 100,000 is observed upon going from ethanol (less polar) to water (more polar). The rate increases when going from a hydrocarbon solvent to water are so large they can't be measured accurately.



It should be emphasized again that both the S<sub>N</sub><sup>1</sup> and the S<sub>N</sub><sup>2</sup> reaction show solvent effects, but that they do so for different reasons. S<sub>N</sub><sup>2</sup> reactions are *disfavored* in protic solvents because the *ground-state energy* of the nucleophile is lowered by solvation. S<sub>N</sub><sup>1</sup> reactions are *favored* in protic solvents because the *transition-state energy* leading to carbocation intermediate is lowered by solvation.