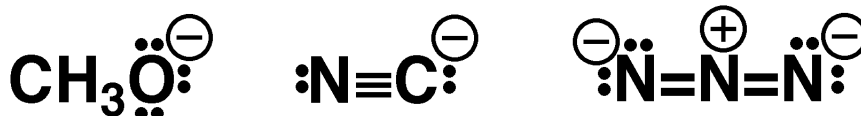


Nucleophile Reactivity

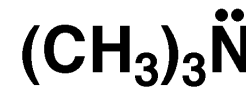
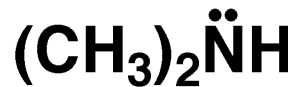
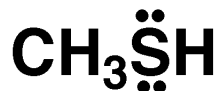
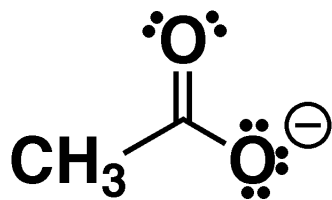
increasing nucleophilicity

stronger bases
negative charges

good

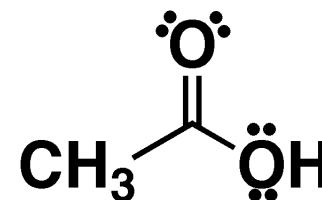
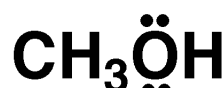
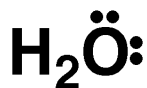


moderate

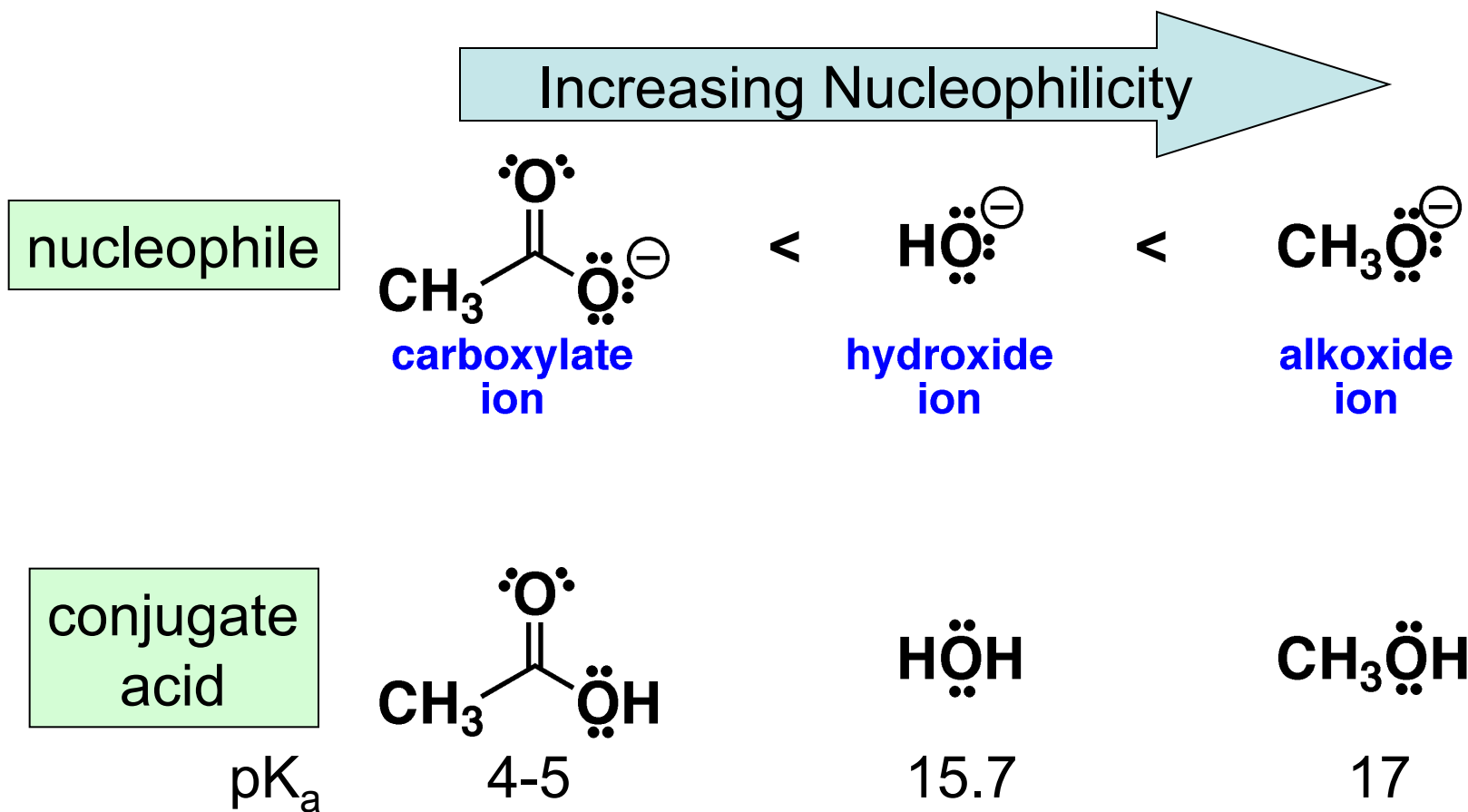


weak bases
neutral charges

poor

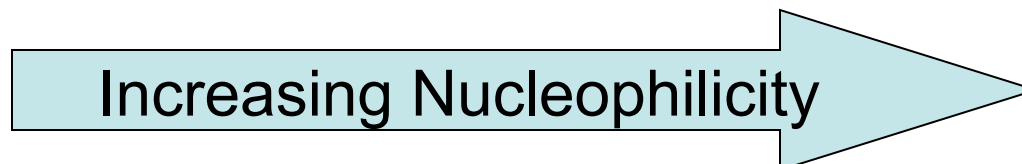


Nucleophilicity and Basicity



In a series of nucleophiles with the same nucleophilic atom, the stronger the base, the greater the nucleophilicity.

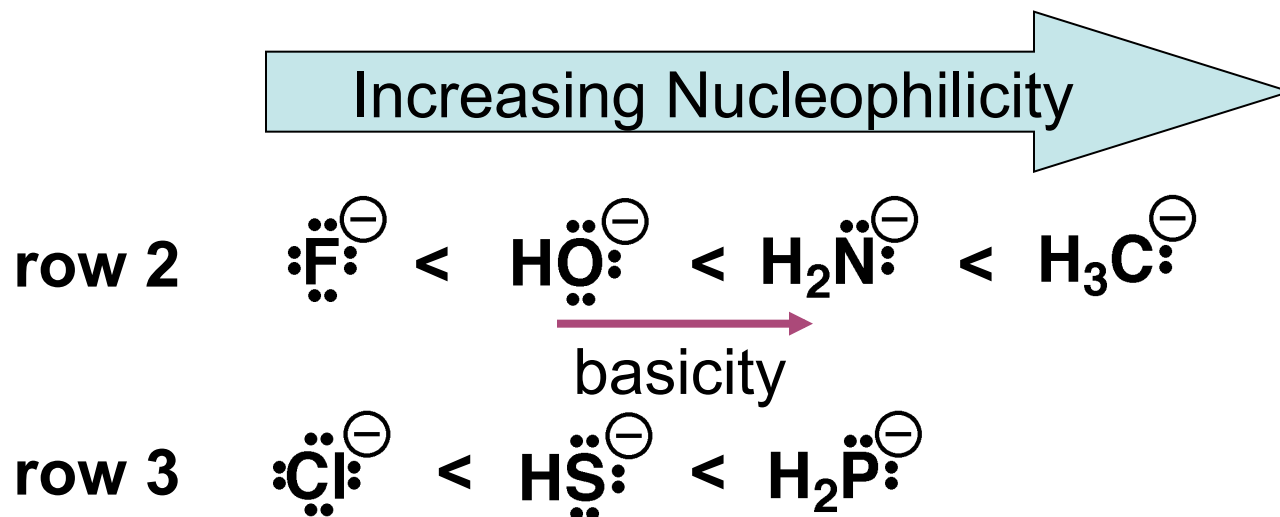
Nucleophilicity of Neutrals vs. Anions

Increasing Nucleophilicity 



In a series of nucleophiles with the same nucleophilic atom, anionic nucleophiles are stronger than neutrals

Nucleophilicity of Nucleophiles in the Same Row



Within a row, nucleophilicity increases from right to left and tracks with basicity (regardless of solvent type)

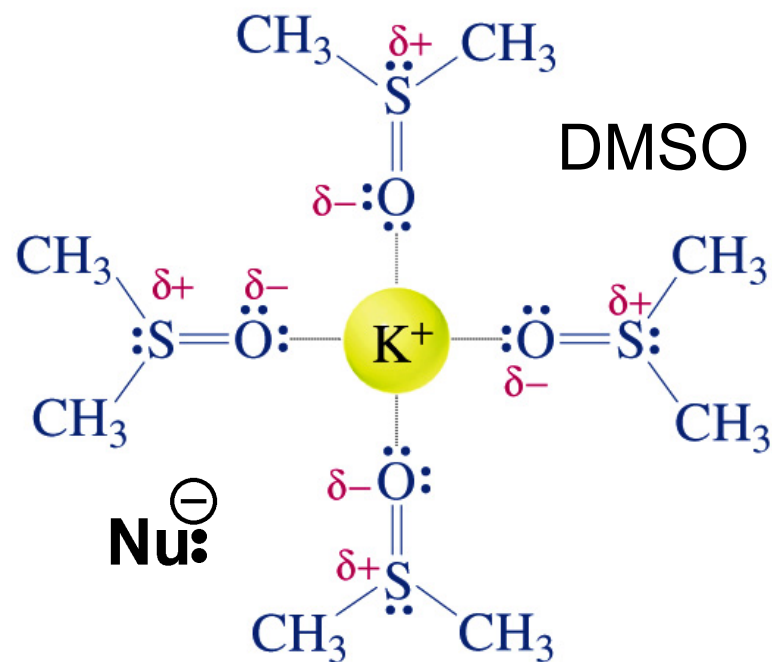
Solvents Influence Nucleophilicity

Nucleophilicity also depends on the solvent

The interaction between solvent and nucleophile: solvation

In polar aprotic solvents (DMSO, acetone, acetonitrile, DMF) relative nucleophilicities parallel relative basicities.

Reason: Cations are effectively solvated but anions are poorly solvated and thus the nucleophile is not shielded by solvent.

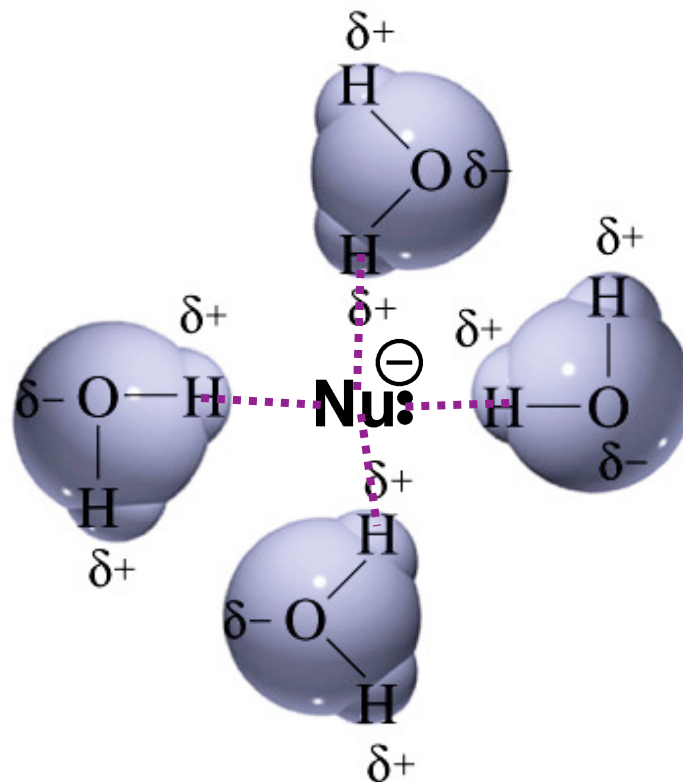


From Paula Y. Bruice *Organic Chemistry* 4th Ed.
Pearson

Nucleophilicity and Solvent

In polar protic solvents, the solvent shell is tightly held around the nucleophile due to hydrogen bonding

The smaller the ion, the tighter the solvent shell. Thus, for nucleophiles of different size (moving up or down in the periodic table) the larger the size, the better the nucleophile (opposite to base strength).



Nucleophilicity of Nucleophiles in Different Rows

