

Submit a *Single-sided Copy* to the Undergraduate Office
NO NOT STAPLE - ONLY WRITE NOTES INSIDE THE SQUARE BELOW

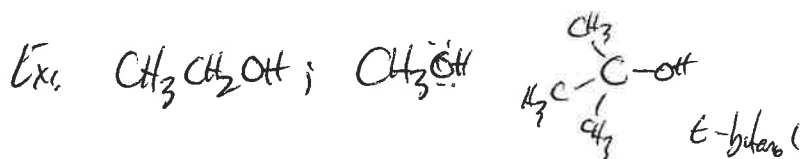
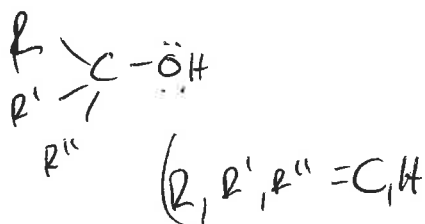
Exam #2 on Wednesday - Same locations as last exam
 Chaps. 5-7

Chap. 8: Noncovalent interactions including solvation

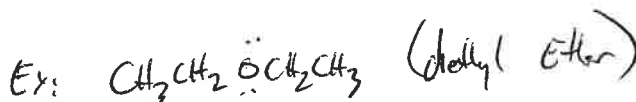
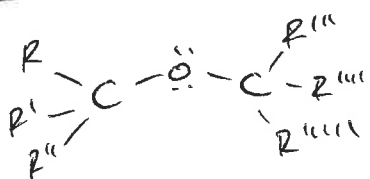
Common organic solvents often share a "motif"



Alcohols

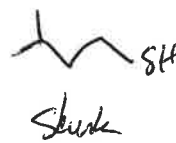
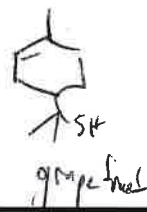
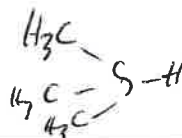


Ethers



Sulfur Analogues

Thiol



Submit a *Single-sided Copy* to the Undergraduate Office
NO NOT STAPLE - ONLY WRITE NOTES INSIDE THE SQUARE BELOW

Together



Key issue amongst solvents

"Polarity" Polar vs nonpolar solvents
 (apolar)

Solvent parameters

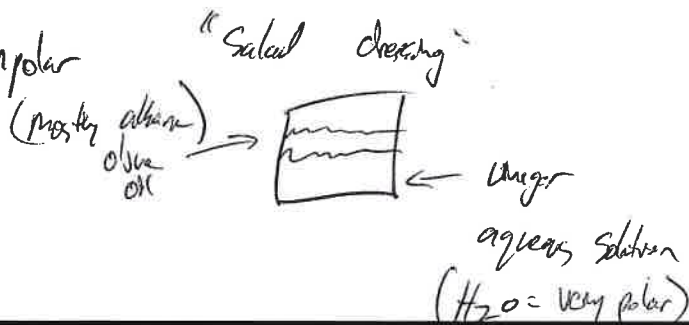
- Dipole moment (μ) - property of individual molecules
- Dielectric constant (ϵ) - property of a bulk liquid

Larger dielectric constant \Rightarrow more polar solvent
 (ϵ)

large μ usually correlates w/ large ϵ but not always...
 (See text)

key empirical issue - can all reactants/S.M. be dissolved in the same solvent?

"Like dissolves like" polar vs nonpolar



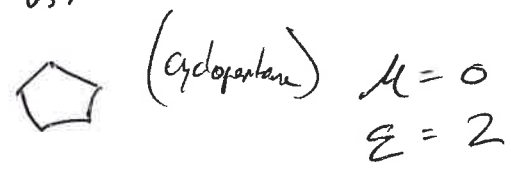
Submit a *Single-sided Copy* to the Undergraduate Office
NO NOT STAPLE - ONLY WRITE NOTES INSIDE THE SQUARE BELOW

An example - Relationship between molecular structure and solvent properties



Miscible with H₂O

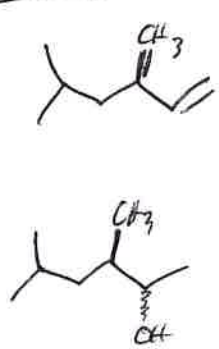
vs.



Least polar

Recall

Ensures that everything dissolves



1) Hg(OAc)₂, H₂O, THF
 2) NaBH₄, NaOH, H₂O

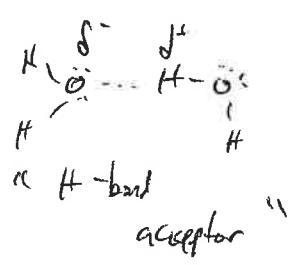
(Diastereomers)

Note: Small chlorocarbons CCl₄, CHCl₃, CH₂Cl₂ - nonpolar solvents

Hydrogen bonding

Important + strong interaction w/ H₂O + alcohols + between these molecules and polar solutes

Ex:



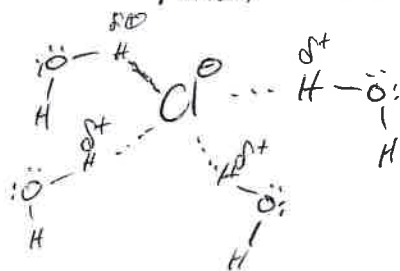
"H-bond donor"

Rule of thumb regarding H-bond donor $pK_a < 20$ (HO-H $pK_a \sim 16$, RO-H 15-19)
 Alkane $pK_a > 50$ No H bond donation!

Submit a *Single-sided Copy* to the Undergraduate Office
NO NOT STAPLE - ONLY WRITE NOTES INSIDE THE SQUARE BELOW

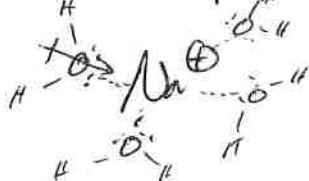
Ionic Solutes in H_2O

- Anions are solvated via H-bonding interactions



Chloride is H-bond acceptor

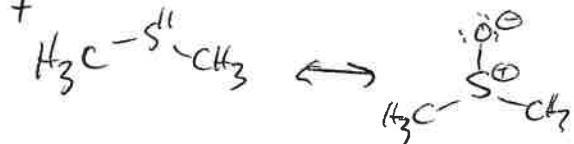
- Cations - ion-dipole interactions



Two classes of polar solvents

1) Protic - Containing H-bond donor (strong solvation of anions)
 Simple alcohols (not ethers, alkanes, chloroalkanes)

2) "Polar aprotic" (Dimethyl Sulfoxide)



- good at solvating cations but not anions

"Molecular engineering"

No H-bond donor



- Controlling non-covalent interactions

Ex: Cation binding by crown ethers "Pedersen"
 "Cram's"