8/29/11

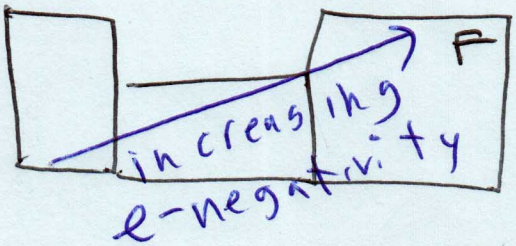
polarity
solubility
acid-base neutralization
extraction
chemical safety

H_3C-CH_3
ethane
MM ≈ 30 g/mol
gas @ RT

H_2O
MM ≈ 18 g/mol
liquid @ RT

IMF – Intermolecular forces – attractive electrostatic (involving + and – charges) forces between molecules

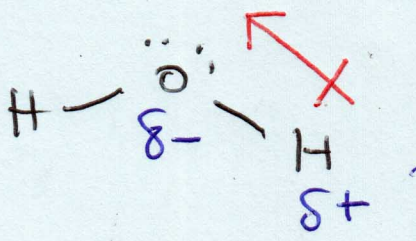
electronegativity – the tendency of an atom to pull electron density towards itself when part of a bond.



dipole – charge separation in space (has + and – end) → ~~caused~~.

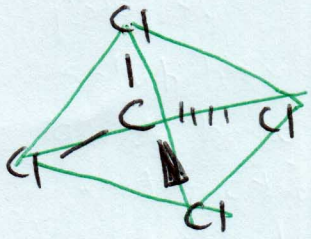
Bonds have dipoles when the atoms in a bond have different electronegativities.

polar – has a dipole → vector quantity



σ sigma
δ delta

→ "little bit"

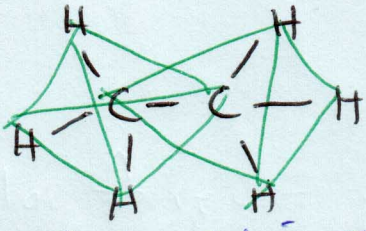
CCl_4 

Although the bonds in CCl_4 are polar, because the dipoles exactly balance each other, the molecule as a whole is non-polar.

Molecules will have dipoles if they have some form of asymmetry.

bent → polar

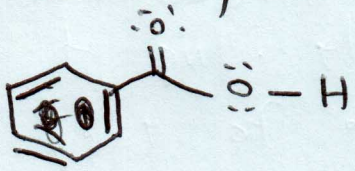
IMF > KE



symmetric → non-polar

IMF < KE

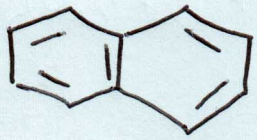
Solubility



benzoic acid

non-polar

(slightly polar)



naphthalene

non-polar

Benzoic acid is non-polar because the larger very non-polar benzene portion outweighs the polarity of the carboxylic acid.

solution – homogeneous mixture

solvent – major component of a soln

solute – minor component of a soln

soluble – able to form a solution with a particular solvent

miscible – two solvents that form a solution regardless of the proportions used.

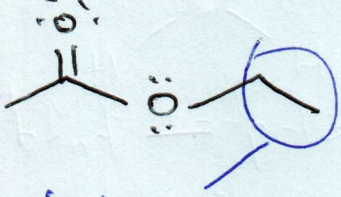
immiscible – unable to mix regarless of the quantities used.

Common organic solvents

hexane

hexanes (with an "s") – mixture of hexane isomers

↳ molecules with the same formula but different structures



ethyl acetate

ethyl – two-carbon substituent

acetone

$CHCl_3$ chloroform

~~CH_2Cl_2~~

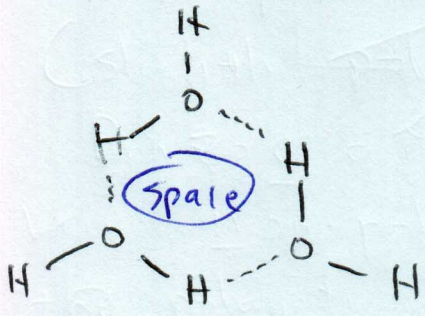
CH_2Cl_2 dichloromethane

methylene chloride

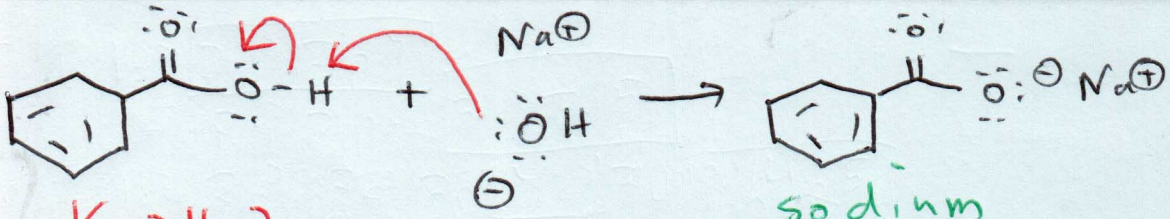
diethyl ether

ethyl ether

ether



ice



$pK_a = 4.2$

sodium benzoate

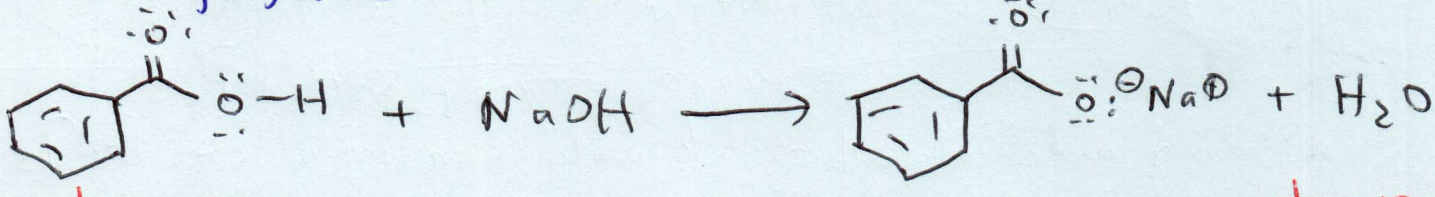
$+ H_2O$

$pK_a \equiv -\log_{10} K_a \qquad K_a = \dfrac{[H^+][A^-]}{[HA]}$

how much of the acid dissociates / how much does not dissociate

$K_a >> 1$	$pK_a < 0$	strong	extensive dissociation / acids
$K_a << 1$	$pK_a > 0$	weak	minimal dissociation / acids

The stronger an acid is, the weaker its conjugate base is.



$pK_a = 4.2$ — stronger acid — stronger base — weaker base — $pK_a = 15.7$ — weaker acid

By neutralizing benzoic acid and forming an ion, the molecule is now water soluble because it is now polar (the full ⊖ charge outweighs the non-polar benzene portion of the molecule).

hydrophilic - "water-loving" - water-soluble

hydrophobic - "water-fearing" - not water-soluble

#5

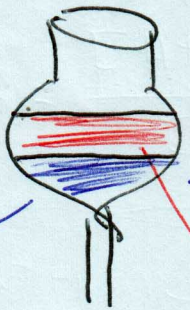
1) B.A. + Naph

2) ether

3)

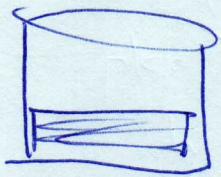
4) NaOH

5) shake + vent

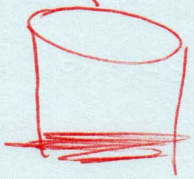


– ether + naph,

– water + benzoate



reacidify + filter



evaporate