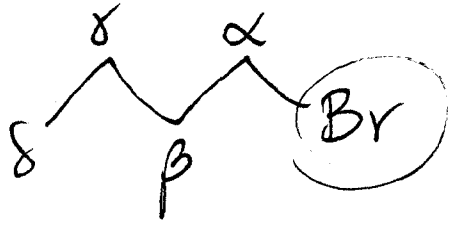
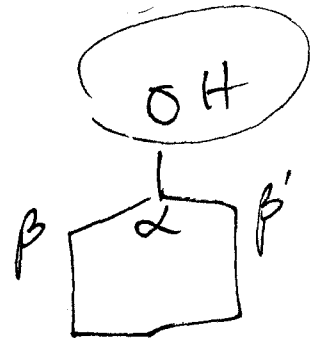
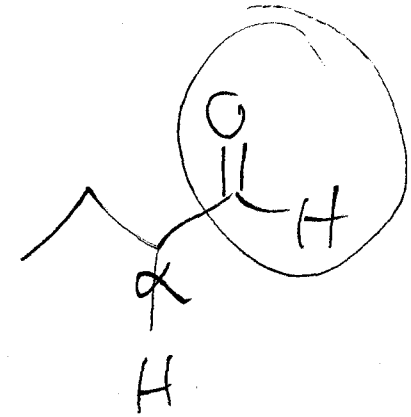
The α-carbon is the carbon to which the functional gp is attached. (The α-H is attached to the α-C).







Structure-Acidity Relationships

1. Acidity increases going down a column.
   $HF < HCl < HBr < HI$ (bond strengths decrease as go ↓)

2. Acidity increases from left to right across a row. (bond strengths ~same)

* the more stable the anion, the more acidic the parent.

$CH_4 < NH_3 < H_2O < HF$

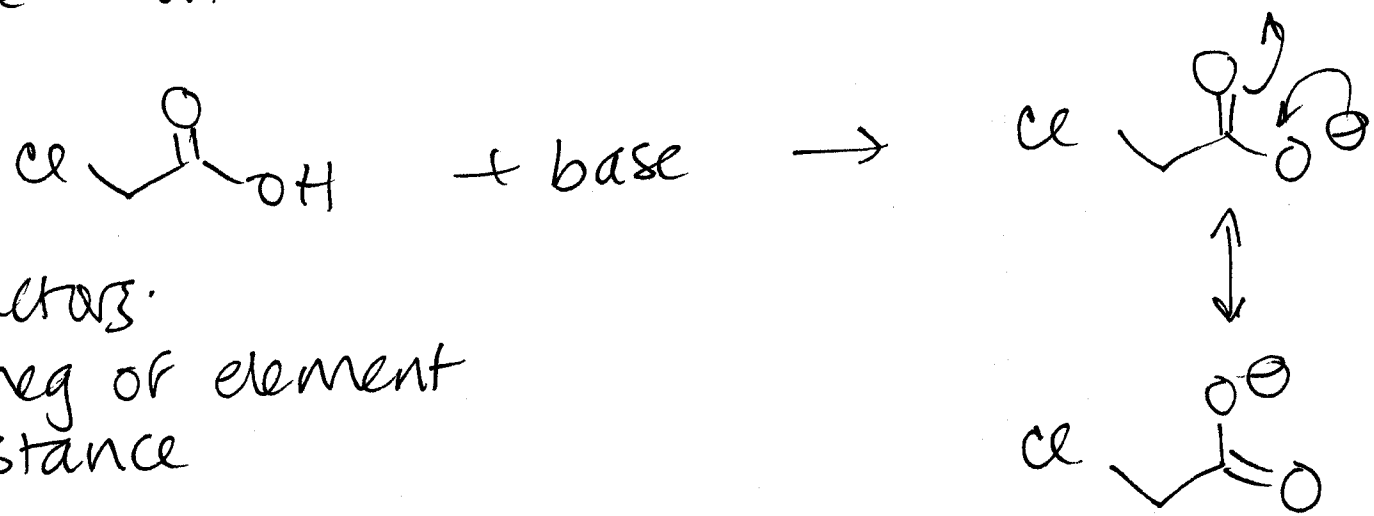
3. Hybridization factors

CH_4	$H_2C=CH_2$	$HC\equiv CH$
least acidic		most acidic
pka 50	44	25
sp^3	sp^2	sp
25% s	33% s	50% s

The larger the contribution of the 2s orbital to the overall hybridization, the lower the energy of the hybrid orbitals
⇒ more stable the anion ⇒ more acidic parent

4. Inductive effect. (via the σ framework)

e'neg elements polarize bonds through the σ bonds. This effectively delocalizes e' in the molecule.

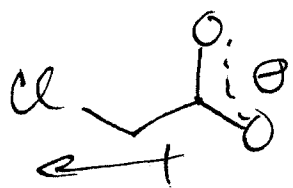


Two factors:

1. e'neg of element
2. distance

anion is

* also stabilized by induction- e'neg Cl pulls e' density away from anion through σ framework



Energy = the potential for work.

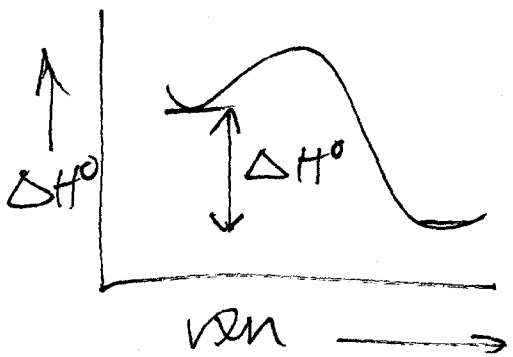
1. Kinetic (energy of motion) = $\frac{1}{2} mv^2$
2. Potential (stored) e.g. chemical energy

Generally discuss relative energies + relative stabilities. High energy = low stability

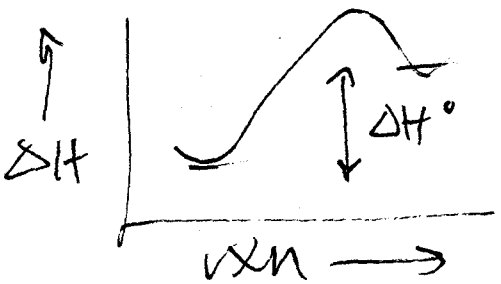
Compare stabilities in terms of enthalpies.

ΔH° is the difference in enthalpy between reactant + product.

$-\Delta H^\circ$ = exothermic



$+\Delta H^\circ$ = endothermic



Know this equation:

$$\Delta G^\circ = -2.303\ RT \log K_{eq}$$

↑ Gibbs free energy

negative: equilibrium favors products $K_{eq} > 1$

positive: equilibrium favors reactants $K_{eq} < 1$

Corrolary: $\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$

enthalpy entropy

* in many organic rxns, ΔS° is extremely small, so $\Delta G^\circ \approx \Delta H^\circ$.

Back to Acid - Base Stuff...

Solvent Effects

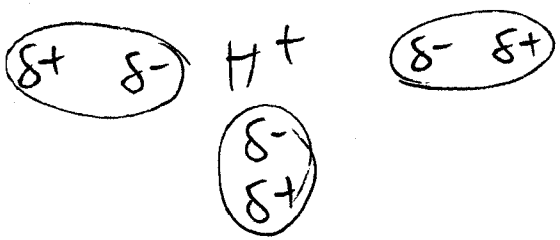
To act as an acid, a cmpd must Ionize.

$$HA \rightleftharpoons H^+ + A^-$$

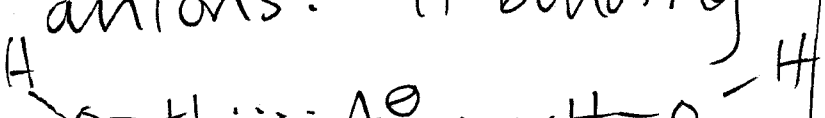
Ionization is much easier when the resulting ions are stabilized - can be stabilized by solvation.

polar protic solvents such as H_2O can stabilize both anions and cations.

cations: dipole-dipole



anions: H-bonding



polar aprotic	YES
	NO

Solvent Types

polar vs apolar (nonpolar)

protic vs aprotic

↑

has a proton on an e'neg atom (can form H-bonds)