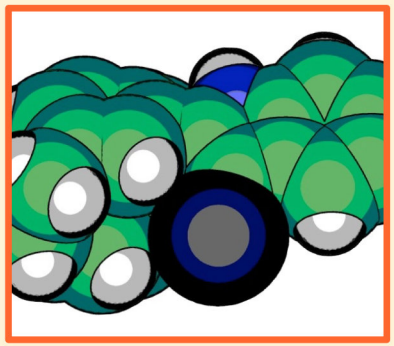
HIGHLIGHTS

- General acid-base reaction indicates that the stability of the conjugate base is key.
- The four factors influencing the stability of the conjugate base are:

1. The atom the charge is on.
2. Delocalization of the charge.
3. The inductive effect.
4. The hybridization of the atom.



An important skill for an organic chemist is being able to compare the relative acidity of two, or more, compounds, and based on structure alone determine which will be more acidic. This skill will be invaluable when you start looking at reactions. The key to predicting the relative acidity is assessing the factors that influence the stability of the conjugate base. The four most important factors are outlined in this summary. The same ideas can be used to assess the reactivity of lone pairs of electrons and thus the basicity of compounds.

It is important to note that these are just guidelines that direct your thinking. They are not infallible rules.

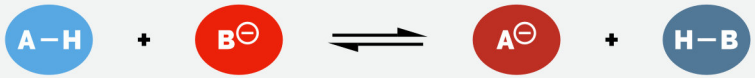
CHEMISTRY CLASSICS

ACIDS AND BASES

PREDICTING THE RELATIVE STRENGTH OF ACIDS

Predicting relative acidity

Comparing two acids

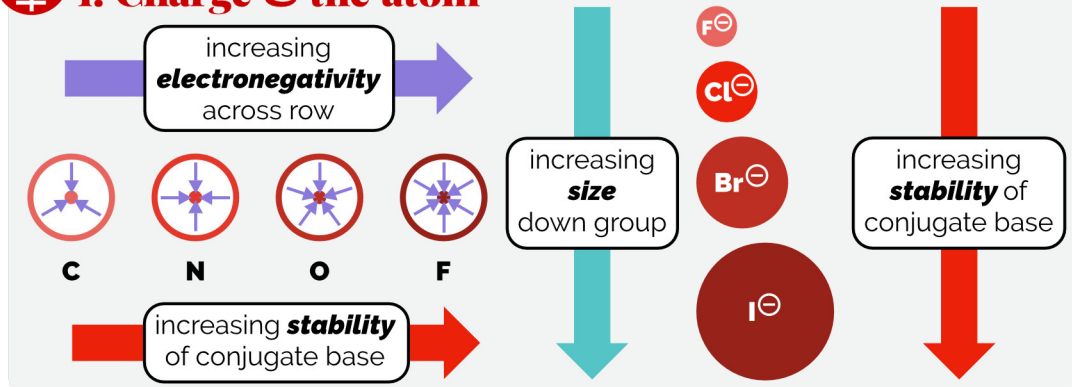


A–H is a ***stronger acid*** than **H–B** if **A⊖** is ***more stable*** than **B⊖**

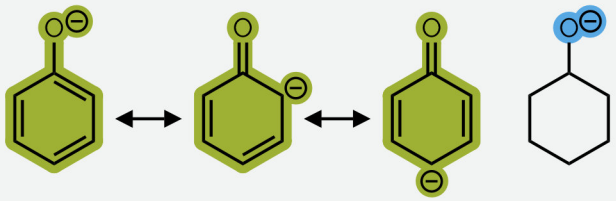
acid — *(conjugate)* **acid** — *(conjugate)* **base** — **base**

The ***more acidic*** compound has the ***more stable conjugate base*** or more stable anion. (For basicity, the same factors influence reactivity of a lone pair of electrons.)

1. Charge & the atom

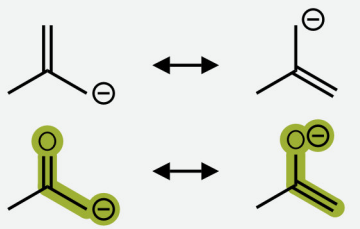


2. Charge & delocalization



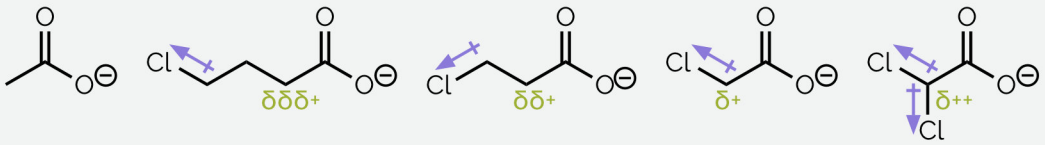
delocalized
charge spread out
more stable

localized
charge fixed
less stable



delocalization on electronegative atom ***favored***
inductive effect also important

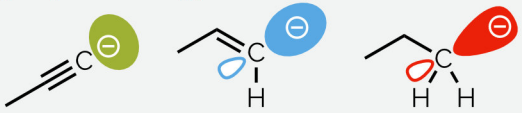
3. Charge & the inductive effect



pK_a	pK_a	pK_a	pK_a	pK_a
4.8	4.5	4.0	2.9	1.3

Stability of charge (& hence acidity) increases as the ***electron withdrawing group*** gets closer to the charge. The ***more*** electron withdrawing groups the more stable.

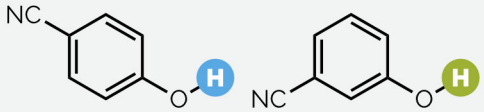
4. Charge & hybridization



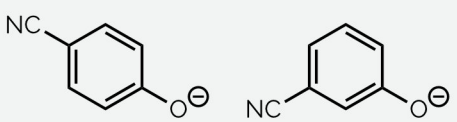
pK_a = 24	50	53
sp	sp^2	sp^3
50% s	33% s	25% s

Greater s character more stable charge.

Example

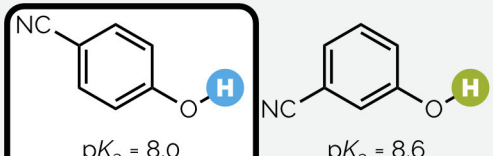


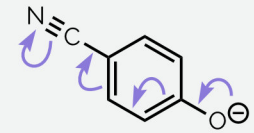
Which compound is more acidic?



conjugate base stability — conjugate base stability

1. **Atom** - no difference
2. **Delocalisation** - more on *p*-CN
3. **Inductive effect** - slightly more *m*-CN
4. **Hybridization** - no difference





delocalization deciding factor