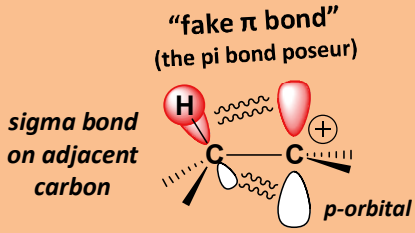
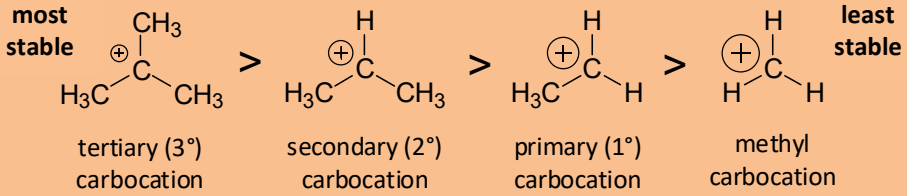
Carbocation Stability

✪ **ALL carbocations have an empty (also called vacant), unhybridized *p*-orbital and an incomplete octet.**

"Level one carbocation stability" (good): since alkyl groups are electron donating through the phenomenon of hyperconjugation, a more substituted carbocation will be more stable.



hyperconjugation:
electrons of an **eclipsing** σ bond feed into a *p*-orbital



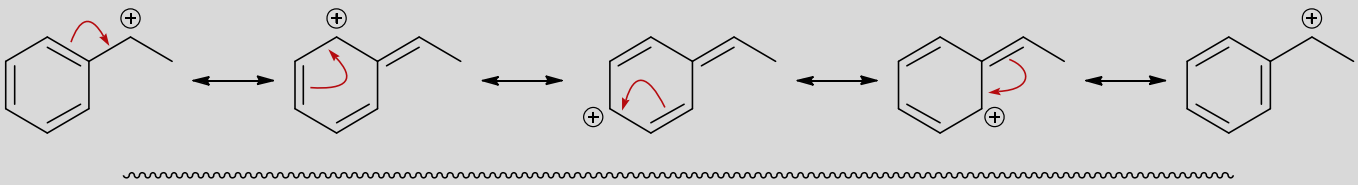
tertiary (3°) carbocation > secondary (2°) carbocation > primary (1°) carbocation > methyl carbocation

"Level two carbocation stability" (better): allylic and benzylic resonance stabilized carbocations will *typically* be more stable than non-resonance stabilized carbocations.

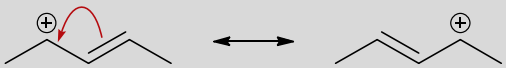
Perhaps it is helpful to know that a 3° carbocation without resonance stabilization is more stable than a 1° benzylic or 1° allylic carbocation, but that is only important **IF** your teacher enforces that. **MOST** classes just use the rough guideline that all resonance stabilized carbocations are more stable than all non-resonance stabilized carbocations.

The MCAT and DAT expect you to say resonance stabilized is more stable than non-resonance stabilized.

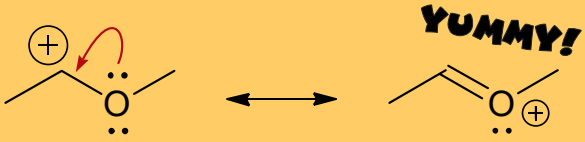
benzylic = position next door to a benzene carbon



allylic = position next door to an alkene carbon



"Level three carbocation stability" (BEST!!): the most stable carbocations are typically the ones that involve resonance stabilization from a lone pair of electrons. This creates a resonance structure with the highly desirable full octet on every atom.



more stable: oxygen has a full octet

WORST: VINYLIC carbocations
Carbocations directly on a double bonded carbon are **the least stable**.