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Hyperconjugation

The relative stability of various classes of carbonium ions may be explained by the number of no-bond resonance structures that can be written for them. These structures are arrived by shifting the bonding electrons from an adjacent C-H bond to the electron-deficient carbon. In this way the positive charge originally on carbon is dispersed to the hydrogen. This manner of electrons can release by assuming no-bond character in the adjacent C-H bond is known as Hyperconjugation or No-bond resonance.

The more hyperconjugation structures that can be written for a species, the more stable is the species. e.g.

a. Isopropyl carbonium ion is stabilized by six hyperconjugation structures.

b. Ethyl carbonium ion is stabilized by three hyperconjugation structures.

Stability of carbocations holds in following order :-

$$(CH_3)_3\overset{+}{C} > (CH_3)_2\overset{+}{C}H > CH_3\overset{+}{C}H_2 > \overset{+}{C}H_3$$

In general, resonance effects are more important than hyperconjugation effects. The alkyl and benzyl carbonium ions are more stable than most alkyl carbonium ions because the former are stabilized by resonance while the latter are stabilized by hyperconjugation.