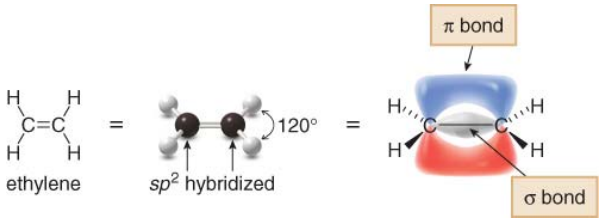
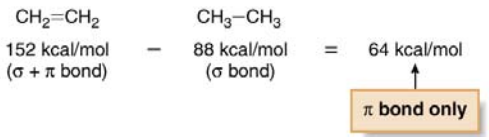
Alcheni

Introduzione — Struttura e Legami

- **Il doppio legame di un alchene è costituito da un legame σ e da un legame π.**
- **Ogni atomo di carbonio ha un'ibridazione *sp*^{2}. Gli angoli di legame misurano 120°.**



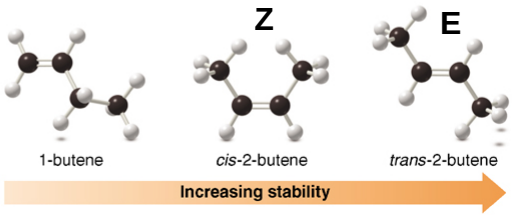
- **Il doppio legame e' piu' forte del legame singolo, ma la la forza della componente π del doppio legame e' inferiore a quella della componente σ**



- **La rotazione attorno al doppio legame e' impedita: possono esistere due stereoisomeri cis (Z) e trans (E)**

Table 10.1 Properties of the Carbon–Carbon Double Bond

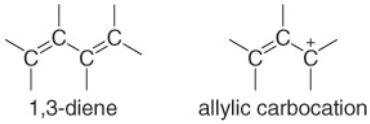
Restricted rotation	• **The rotation around the C–C double bond is restricted.** Rotation can only occur if the π bond breaks and then re-forms, a process that is unfavorable (Section 8.2B).
Stereoisomerism	• Whenever the two groups on each end of a C=C are different from each other, two diastereomers are possible. *Cis*- and *trans*-2-butene (drawn at the bottom of Table 10.1) are diastereomers (Section 8.2B).
Stability	• **Trans** alkenes are generally more stable than **cis** alkenes. • **The stability of an alkene increases as the number of R groups on the C=C increases** (Section 8.2C).



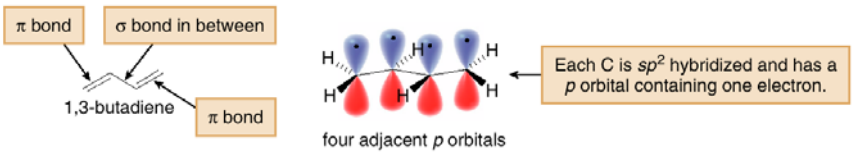
Coniugazione, Risonanza e Dieni

Coniugazione

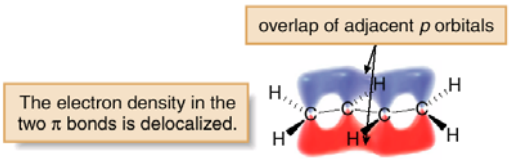
- **La coniugazione avviene quando orbitali *p* pieni o vuoti sono collocati su tre o più atomi adiacenti.**



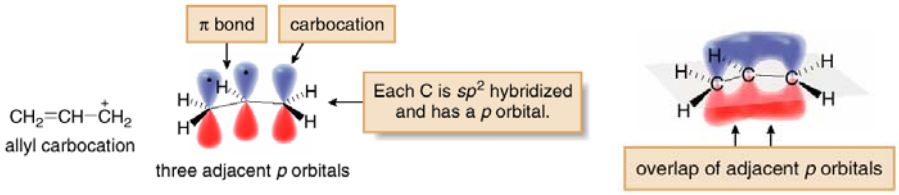
- **I quattro orbitali *p* pieni su atomi adiacenti fanno dell'1,3-diene un sistema coniugato.**



- **Gli elettroni si delocalizzano come descritto nella figura qui sotto**

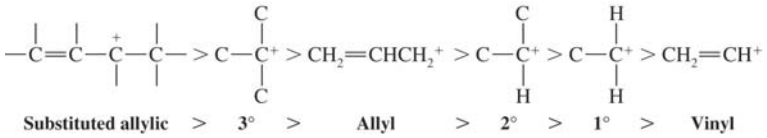


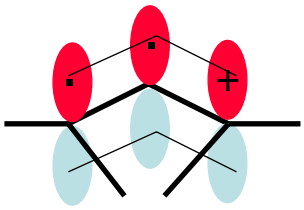
- **Il carbocatione allilico è un altro esempio di sistema coniugato.**



- **In formule di Lewis la delocalizzazione si rappresenta con due forme di risonanza**

- The Allyl Cation
  - The allyl cation is intermediate in stability between a tertiary and secondary carbocation





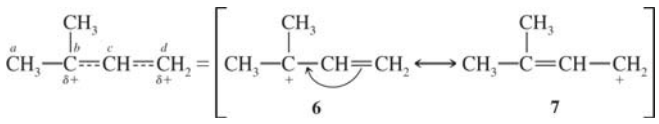
Resonance

- The real molecule cannot be represented by any single Lewis (line-bond) formula.
- The real molecule is a *hybrid* of the contributing Lewis (line-bond) structures.

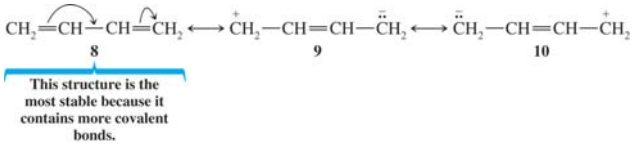
♦ Summary of Rules for Resonance

- **Rules for Writing Resonance Structures**
  - **➔Individual resonance structures are not a true representation of the real structure of a molecule**
    - **A hybrid of all major resonance structures gives an indication of the true structure**
  - **➔Only electrons may be moved in resonance structures, not atoms**
    - **Only π and nonbonding electrons are moved**
  - **➔All resonance structures must be proper Lewis structure**
  - **➔All atoms that are part of the delocalized π-electron system must lie in a plane or be nearly planar**

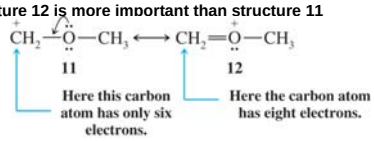
- **➔The energy of the actual molecule is lower than the energy calculated for any one contributing resonance structure**
  - **Allyl cation has much lower energy than either contributing structures 4 or 5**
- **➔A system** $CH_2{=}CH{-}\overset{+}{C}H_2 \longleftrightarrow \overset{+}{C}H_2{-}CH{=}CH_2$ **res is particularly stable**
  - **The allyl cation has two equivalent resonance structures and is therefore particularly stable**
- **➔The more stable a resonance structure is, the more important it is and the more it contributes to the hybrid**
  - **Structure 6 is a more stable tertiary carbocation and contributes more than structure 7**



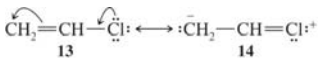
- **Estimating the Relative Stability of Resonance Structures**
  - ➔**Structures with more covalent bonds are more important**
    - Structure 8 is more important than 9 or 10



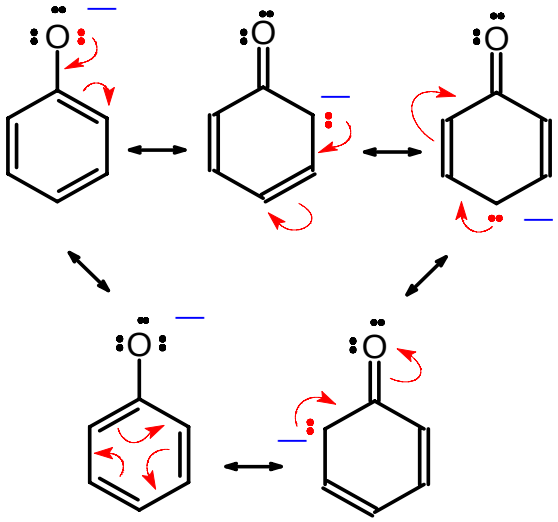
  - ➔**Structures in which all atoms have complete octets are more important**
    - Structure 12 is more important than structure 11



  - ➔**Separation of charge decreases stability**
    - Structure 13 is more important because it does not have a separation of charge

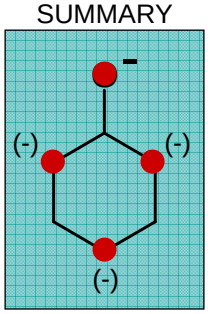


Phenolate Ion Resonance



Not all contributing structures are equal. Why?

SUMMARY



notice the alternate pattern

Benzyl Cation