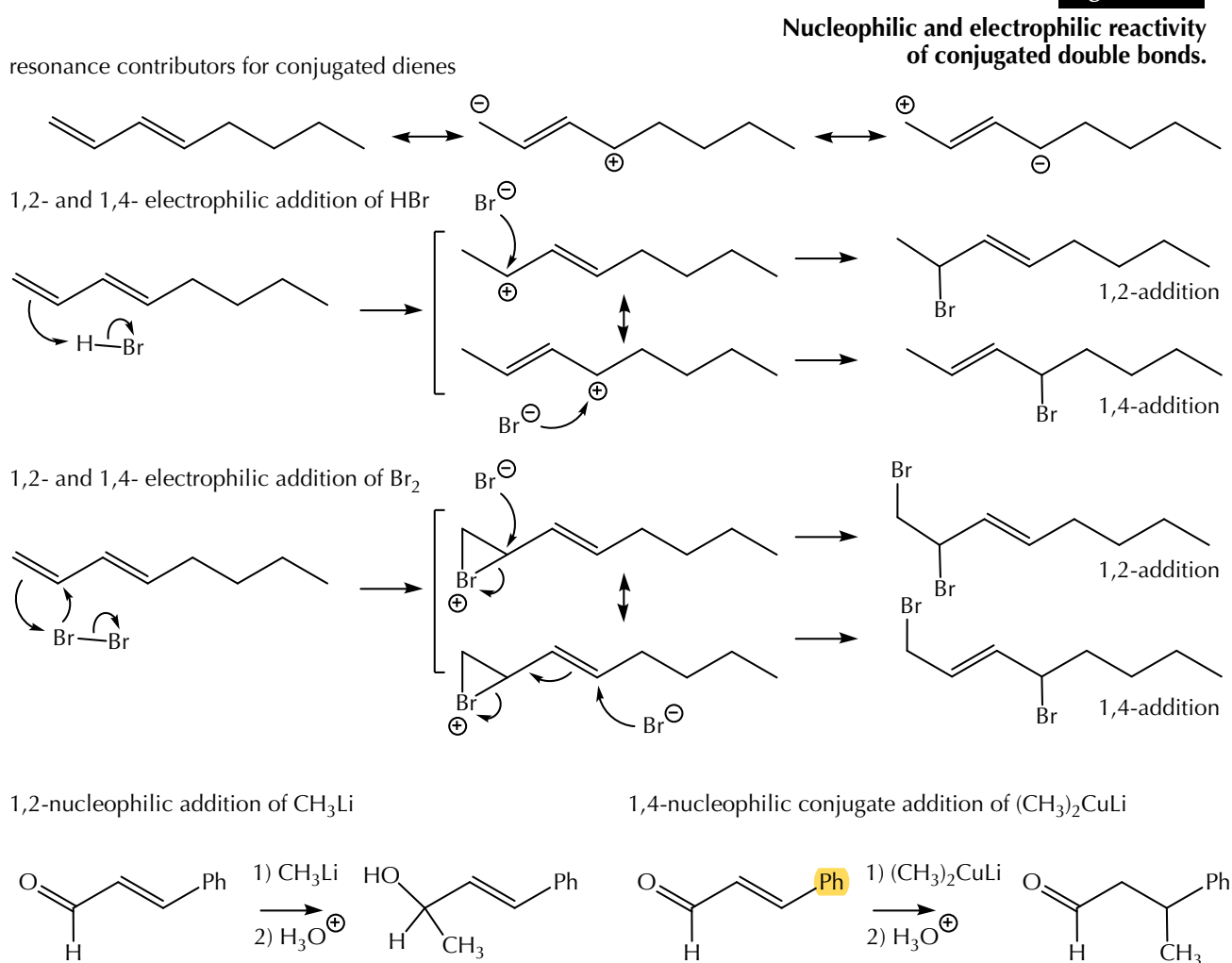


The double bonds in molecules with isolated double bonds, such as (*Z*)-1,4-octadiene, as the name implies, generally have independent reactivities as they are separated by at least one saturated atom. There is no special stability or instability that is predictable in such molecules, other than the usual reactivity of alkenes, such as the observation that more highly substituted double bonds are more stable than their less substituted counterparts.

You have seen examples of both electrophilic and nucleophilic pi bonds, and the delocalization present in conjugated double bonds creates unique reactivity. Recall from Chapter 14 that the electrophilic double bonds in the conjugated, α,β -unsaturated carbonyl compounds can undergo nucleophilic 1,2-additions of the carbonyl groups with the typically strong organometallic reagents, such as organolithiums, and also undergo 1,4- (conjugate) addition reactions with heteroatom nucleophiles, enols and enolates, and with organocopper reagents. Conjugated dienes act as nucleophiles and can also undergo 1,2- and 1,4-electrophilic addition reactions with many of the usual electrophilic reagents, for example HBr or Br₂ (Figure 1507).

Figure 1507



The delocalization in conjugated double bonds also creates unique structural properties. Ideally, the delocalization requires the conjugated double bonds to be coplanar, achieving the optimal, parallel relationship for the overlap of the pi bonds.

As illustrated in the drawings for (*E*)- and (*Z*)-1,3-octadiene (Figure 1508 on the next page), there are two possible coplanar conformations for conjugated dienes, related by a 180° rotation around the central single bond connecting the double bonds. The two conformations are called *s-trans* and *s-cis*, where the “s”