7.6: Aldehydes and Ketones

Is there a difference in reactivity between aldehydes and ketones? Not really; both types of compounds undergo nucleophilic attack, although, in general, aldehydes react faster than ketones for two reasons:

1. Aldehydes are less hindered at the carbonyl carbon than ketones (since there is always at least one H attached whereas ketones always have two bulkier alkyl groups).
2. Alkyl groups are electron-donating so the partial positive charge on the carbon is partially offset by induction from the alkyl groups.

In practice, however, there is generally little difference between the two and so unless we point out a difference you can assume that they undergo similar reactions.

The similarities between aldehydes and ketones are supported by an examination of their spectra. For example, both aldehydes and ketones display a strong carbonyl absorption around $1700\mathrm{cm}^{-1}$. As we will see shortly, not all carbonyls absorb in this area—their $\mathrm{C}=\mathrm{O}$ stretching frequencies are dependent on their electronic environment. In $\mathrm{C}-13$ NMR, both aldehydes and ketones show a low field peak for the $\mathrm{C}=\mathrm{O}$ around $200\mathrm{ppm}$ indicating that the electronic environment of the carbonyls are similar. The major difference in the spectra is the aldehyde proton resonance in the HNMR that appears downfield. This peak often appears as a singlet, even though it may be adjacent to a $\mathrm{C}-\mathrm{H}$ group, because the coupling constant is often small and, depending on the sensitivity of the instrument used, splitting may not be detectable.