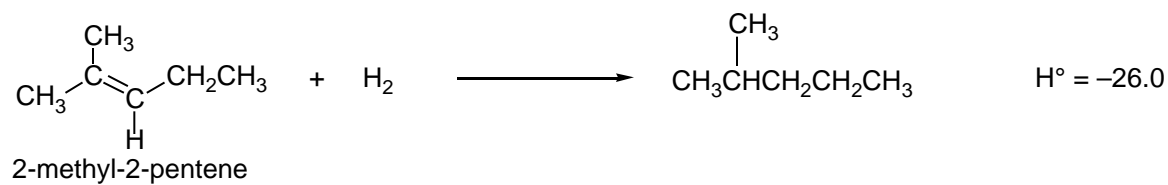
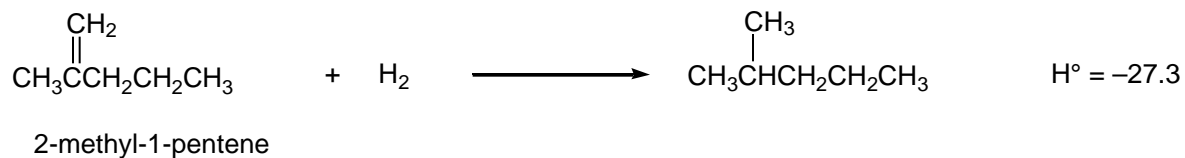
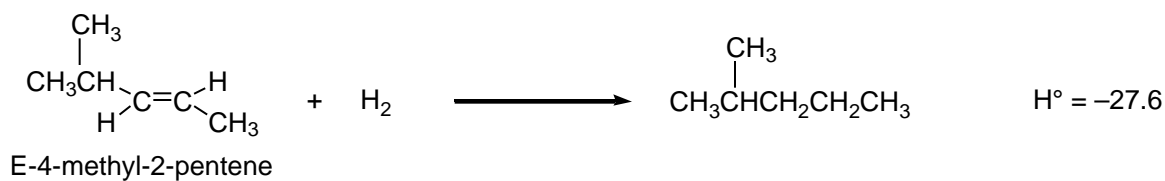
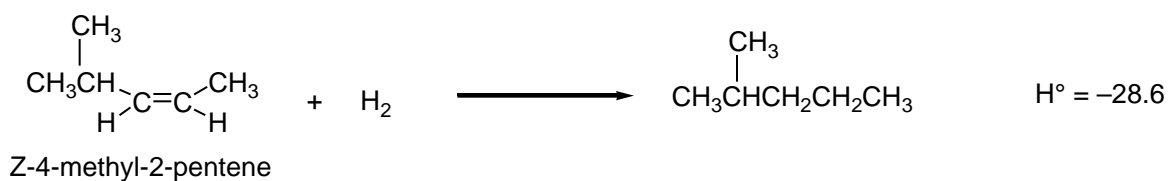
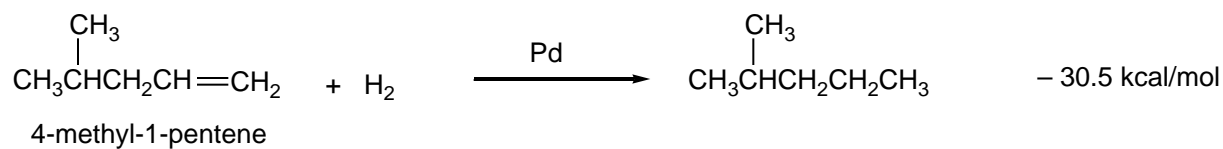


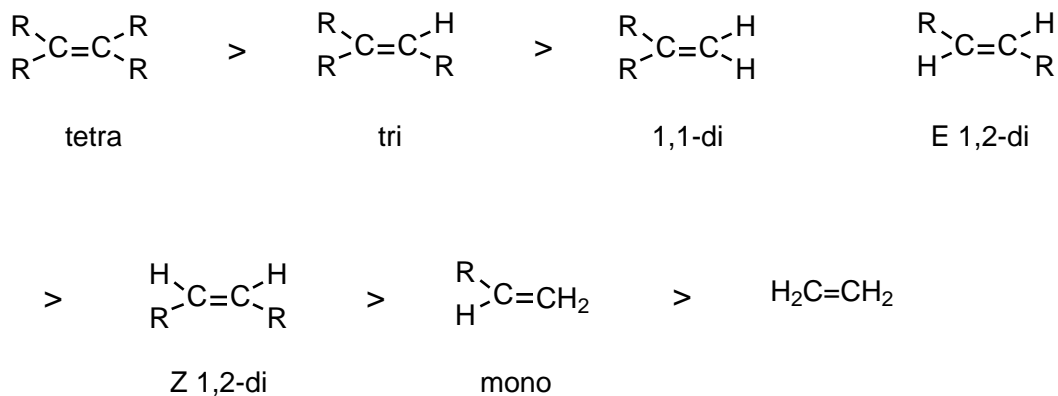
Stabilities of Alkenes

Heats of hydrogenation



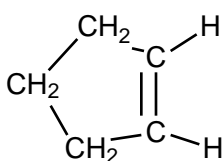
Stabilities of Alkenes

Alkyl Groups (Electron Donating)
Stabilize Alkenes

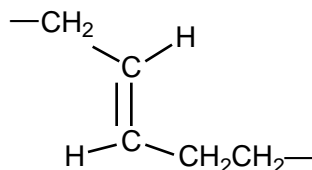


Cycloalkenes

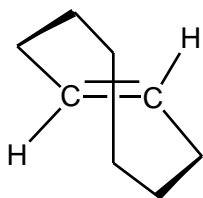
Same as acyclic, except trans double bonds cannot exist in small rings



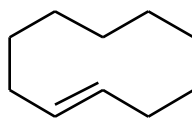
Z - fits fine



E - ends cannot reach



E-cyclooctene,
stable but reactive



C₁₀
cyclodecene is fine!

Characteristic Spectroscopic Data: Alkenes

^1H NMR: sp^2 (vinyl) H's are strongly deshielded by inductive and anisotropic effects. Adjacent sp^3 allylic hydrogens are slightly deshielded by inductive effects (sp^2 more electronegative than sp^3).

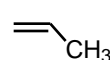
vinyl: terminal
4.6-5.0



vinyl: internal
5.2-5.7

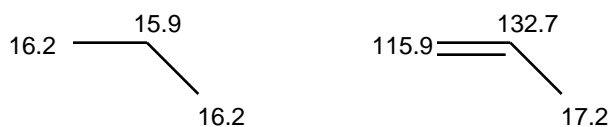


allyl
1.7-2.0



E and Z (trans and cis) 1,2-disubstituted alkenes can be differentiated by measuring their vicinal coupling constants: $J_{\text{cis}} < 11$ Hz, $J_{\text{trans}} > 11$ Hz

Alkenyl (sp^2) carbons are strongly deshielded in ^{13}C NMR spectra: 100 ± 20 ppm downfield from corresponding alkyl (sp^3) carbons.



Characteristic IR bands for alkenes include sp^2 C-H stretches at 3100 ± 50 cm^{-1} (contrast to < 3000 cm^{-1} for sp^3 C-H), and C=C stretches at 1650 ± 30 cm^{-1} (sometimes weak).