1) (8.9) The pKₐ of acetone, CH₃COCH₃, is 19.3. Which of the following bases is strong enough to deprotonate acetone?

a) KOH (pKₐ of H₂O=15.7)  
b) Na⁺ C=CH (pKa of C₂H₂ = 25)  
c) NaHCO₃ (pKₐ of H₂CO₃ = 6.4)  
d) NaOCH₃ (pKₐ of CH₃OH = 15.6)

2) (8.10) Show the terminal alkyne and alkyl halide from which the following products can be obtained. If two routes look feasible, list both.

a) CH₃CH₂CH₂C≡CCH₃  
b) (CH₃)₂CHC≡CCH₂CH₃

3) (8.11) How would you prepare cis-2-butene starting from propyne, an alkyl halide, and any other reagents needed? This problem can't be worked in a single step. You'll have to carry out more than one reaction.

4) (8.12) Beginning with 4-octyne as your only source of carbon, and using any inorganic reagents necessary, how would you synthesize the following compounds?

a) cis-4-octene  
b) Butanal  
c) 4-Bromo-octane  
d) 4-Octanol  
e) 4,5-Dichlorooctane  
f) Butanoic acid

5) (8.13) Beginning with acetylene and any alkyl halides needed, how would you synthesize the following compounds?

a) Decane  
b) 2,2-Dimethylhexane  
c) Hexanal  
d) 2-Heptanone

6) (8.23) Predict the products from reaction of 1-hexyne with the following reagents:

a) 1 equivalent of HBr  
b) 1 equivalent of Cl₂  
c) H₂, Lindlar catalyst  
d) NaNH₂ in NH₃, then CH₃Br  
e) H₂O, H₂SO₄, HgSO₄  
f) 2 Equivalents HCl

7) (8.25) Predict the products from the reaction of 2-hexyne with the following reagents:

a) 2 equivalents of Br₂  
b) 1 equivalent of HBr  
c) Excess HBr  
d) Li in NH₃  
e) H₂O, H₂SO₄, HgSO₄

8) (8.27) Hydrocarbon A has the formula C₉H₁₂ and absorbs 3 equivalents of H₂ to yield B, C₉H₁₉ when hydrogenated over a Pd/C catalyst. On treatment of A with aqueous H₂SO₄ in the presence of mercury(II), two isomeric ketones, C and D are produced. Oxidation of A with KMnO₄ gives a mixture of acetic acid (CH₃CO₂H) and the tricarboxylic acid E. Propose structures for compounds A-D, and write the reactions.

9) (8.31) Beginning with acetylene and any alkyl halides needed, how would you synthesize the following compounds?

a)  

b)  

10) (8.35) How would you synthesize the following compounds from acetylene and alkyl halides with 4 or fewer carbons.

a) pent-1-yne  
b) hex-3-yne  
c) 4-Methylpent-1-ene  
d)  

e)