14.30 Predict the products of the reaction of (i) phenylacetaldehyde and (ii) acetophenone with the following reagents:

(a) NaBH₄, then H₃O⁺
(b) 2CH₃OH, HCl catalyst
(c) NH₂CH(CH₃)₂, HCl catalyst
(d) CH₃MgBr, then H₃O⁺

14.32 Show how the Wittig reaction might be used to prepare the following alkenes. Identify the alkyl halide and the carbonyl compound you would use in each case.

(a) C₆H₅CH=CH-CH=CHC₆H₅

(b) ![Chemical structure](image)

(c) ![Chemical structure](image)

(d) ![Chemical structure](image)

14.34 How would you synthesize the following substances from benzaldehyde and any other reagents needed?

(a) ![Chemical structure](image)

(b) ![Chemical structure](image)

(c) ![Chemical structure](image)

14.35 Carvone is the major constituent of spearmint oil. What products would you expect from reaction of carvone with the following reagents?

(a) HOCH₂CH₂OH, HCl
(b) LiAlH₄, then H₃O⁺
(c) CH₃NH₂
(d) \( \text{C}_6\text{H}_5\text{MgBr} \), then \( \text{H}_3\text{O}^+ \)
(e) 2 eq. \( \text{H}_2/\text{Pd} \)
(f) \( \text{CrO}_3, \text{H}_3\text{O}^+ \)

14.38 The \( \text{SN}_2 \) reaction of (dibromomethyl)benzene, \( \text{C}_6\text{H}_5\text{CHBr}_2 \), with \( \text{NaOH} \) yields benzaldehyde rather than (dihydroxymethyl)benzene, \( \text{C}_6\text{H}_5\text{CH(OH)}_2 \). Explain.

14.40 How would you synthesize the following compounds from cyclohexanone?
(a) 1-methylcyclohexene
(b) 2-phenylcyclohexanone
(c) cis-cyclohexane-1,2-diol
(d) 1-cyclohexylcyclohexanol

14.45 Tamoxifen is a drug used in the treatment of breast cancer. How would you prepare tamoxifen from benzene, the following ketone, and any other reagents needed?

14.48 Propose a mechanism to account for the formation of 3,5-dimethylpyrazole from hydrazine and pentane-2,4-dione. What has happened to each carbonyl carbon in going from starting material to product?

14.55 Compound A, MW = 86, shows an IR absorption at 1730 cm\(^{-1}\) and a simple \(^1\text{H} \) NMR spectrum with peaks at 9.7 \( \delta \) (1H, singlet) and 1.2 \( \delta \) (9 H, singlet). Propose a structure for A.

14.57 The \(^1\text{H} \) NMR spectrum shown is that of a compound with formula \( \text{C}_9\text{H}_{10}\text{O} \). If the unknown has an IR absorption at 1690 cm\(^{-1}\), what is a likely structure?