Organic Chemistry
Alkynes
Practice Set

1. (12.1) (a) Draw structures of the seven isomeric alkynes of formula C_6H_{10}. (b) Give the IUPAC and derived name of each. (c) Indicate which ones will react with Ag^+ or $Cu(NH_3)_2^+$. (d) Draw structures of the ozonolysis products expected from each compound.

2. (12.2) Outline all steps in the synthesis of propyne from each of the following compounds, using any needed organic or inorganic reagents.
   a. 1,2-dibromopropane
   b. Propylene
   c. Isopropyl bromide
   d. *n*-propyl alcohol
   e. 1,1-dichloropropane
   f. acetylene

3. (12.3) Outline all steps in the synthesis from acetylene of each of the following compounds, using any needed organic or inorganic reagents.
   a. Ethylene
   b. Ethane
   c. 1,1-dibromoethane
   d. Vinyl chloride
   e. 1,2-dichloroethane
   f. Acetaldehyde
   g. Propyne
   h. 1-butyne
   i. 2-butyne
   j. *cis*-2-butene
   k. *trans*-2-butene
   l. 1-pentyne
   m. 2-pentyne
   n. 3-hexyne

4. (12.4) Give structures and names of the organic products expected from the reaction (if any) of 1-butyne with:
   a. 1 mol H_2, Ni
   b. 2 mol H_2, Ni
   c. 1 mol Br_2
   d. 2 mol Br_2
   e. 1 mol HCl
   f. 2 mol HCl
   g. H_2O, H^+, Hg^{+2}
   h. Ag^+
   i. product (h) + HNO_3
   j. $LiNH_2$
   k. product (j) + C_2H_5Br
   l. product (j) + *tert*-butyl chloride
   m. C_2H_5MgBr
   n. product (m) + H_2O
   o. O_3, then H_2O
   p. hot $KMnO_4$

5. (12.5) Outline all steps in the synthesis from 2-butyne of each of the following compounds, using any needed organic or inorganic reagents.
   a. *cis*-2-butene
   b. *trans*-2-butene
   c. *meso*-2,3-dibromobutane
   d. racemic *threo*-3chloro-2-butanol
   e. *meso*-2,3-butanediol
   f. racemic 2,3-butanediol
   g. 2-butanone, $CH_3CH_2COCH_3$

6. (12.6) Outline all steps in a possible laboratory synthesis of each of the following, using acetylene and alcohols of four carbons or fewer as your only organic source, and any necessary inorganic reagents. (*Remember*: work backwards)
   a. *Meso*-3,4-dibromohexane b. racemic (2R,3R;2S,3S)-2,3-heptanediol

7. (12.9) *Muscalure* is the sex pheromone of the common house fly. On the basis of the following synthesis, give the structure of muscalure (and of course, of the intermediates A and B).

   n-$C_{13}H_{27}C{\equiv}CH$ + n-BuLi → A ($C_{15}H_{27}Li$)

   A + n-$C_8H_{17}Br$ → B ($C_{23}H_{44}$)

   B + H_2, Lindlar catalyst → *muscalure* ($C_{23}H_{46}$)