Organic Chemistry 2323
Alkenes
Practice Set

1. (8.1) Give the structural formula of:
   a. 3,6 dimethyl-1-octene
   b. 3-chloropropene
   c. 2,4,4-trimethyl-2-pentene
   d. *trans*-3,4-dimethyl-3-hexene
   e. (Z)-3-chloro-4-methyl-3-hexene
   f. (E)-1-deuterio-2-chloropropene
   g. (R)-3-bromo-1-butene
   h. (S)-*trans*-4-methyl-2-hexene

2. (8.2) Draw out the structural formula and give the IUPAC name of:
   a. Isobutylene
   b. *cis*-$CH_3CH_2CH{=}CHCH_2CH_3$
   c. $(CH_3)_3CCH{=}CH_2$
   d. *trans*-$(CH_3)_2CHCH{=}CHCH(CH_3)_2$
   e. $(CH_3)_2CHCH_2CH{=}C(CH_3)_2$
   f. $(CH_3CH_2)_2C{=}CH_2$

3. (8.3) Indicate which of the following compounds show geometric (*cis-trans*) isomerism, draw the isomeric structures, and specify each as Z or E.
   a. 1-butene
   b. 2-butene
   c. 1,1-dichlorethene
   d. 1,2-dichloroethene
   e. 2-methyl-2-butene
   f. 1-pentene
   g. 2-pentene
   h. 1-chloropropene
   i. 1-chloroo-2-methyl-2-butene
   j. 4-ethyl-3-methyl-3-hexene
   k. 2,4-hexadiene ($CH_3CH{=}CHCH{=}CHCH_3$)

4. (8.5) Write balanced equations for preparation of propylene from:
   a. $CH_3CH_2CH_2OH$ (*n*-propyl alcohol)
   b. $CH_3CHOHCH_3$ (isopropyl alcohol)
   c. Isopropyl chloride
   d. *n*-propyl tosylate (use T's for tosyl)
   e. 1,2-dibromopropane
   f. the alkyne, $CH_3CH{\equiv}CH$

5. (8.6) Give structures of the products expected from dehydrohalogenation of:
   a. 1-bromohexane
   b. 2-bromohexane
   c. 1-bromo-2-methylpentane
   d. 2-bromo-2-methylpentane
   e. 3-bromo-2-methylpentane
   f. 4-bromo-2-methylpentane
   g. 1-bromo-4-methylpentane
   h. 3-bromo-2,3-dimethylpentane

6. (8.7) From the preceding problems, if more than one product can be formed, predicts the *major* product.

7. (8.8) Which alcohol of each pair would you expect to be more easily dehydrated?
    a. $CH_3CH_2CH_2CH_2CH_2OH$ or $CH_3CH_2CH_2CHOHCH_3$
    b. $(CH_3)_2C(OH)CH_2CH_3$ or $(CH_3)_2CHCHOHCH_3$
    c. $(CH_3)_2CHC(OH)(CH_3)_2$ or $(CH_3)_2CHCH(CH_3)\ CH_2OH$

8. (8.9) Arrange the compounds of each set in order of reactivity toward dehydrohalogenation by strong base:
    a. 2-bromo-2-methylbutane, 1-bromopentane, 2-bromopentane, 3-bromopentane
    b. 1-bromo-3-methylbutane, 2-bromo-2-methylbutane, 3-bromo-2-methylbutane
    c. 1-bromobutane, 1-bromo-2,2-dimethylpropane, 1-bromo-2-methylbutane, 1-bromo-3-methylbutane

9. (9.1) Give structures and names of the products (if any) expected from reaction of isobutylene with:
    a. H_2, Ni
    b. Cl_2
    c. Br_2
    d. I_2
    e. HBr
    f. HBr (peroxides)
    g. HI
    h. HI (peroxides)
    i. H_2SO_4
    j. H_2O, H^+
    k. Br_2, H_2O
    l. Br_2 + NaCl(aq)
    m. H_2SO_4 ($\rightarrow C_8H_{16}$)
    n. isobutane + HF
    o. cold alkaline $KMnO_4$
    p. hot $KMnO_4$
    q. HCO_2OH
    r. O_3; then Zn, H_2O
    s. $Hg(OAc)_2$, H_2O; $NaBH_4$
    t. $(BH_3)_2$; H_2O_2; OH^-

10. (9.3) Give the structures and names of the principal products expected from addition of HI to:
    a. 2-butene
    b. 2-pentene
    c. 2-methyl-1-butene
    d. 2-methyl-2-butene
    e. 3-methyl-1-butene (two products)
    f. vinyl bromide
    g. 2,3-dimethyl-1-butene
    h. 2,2,4-trimethyl-2-pentene

11. (9.20) Give the structure of the alkene you would start with, and the reagents and any special conditions necessary to convert it into each of these products:
    a. *tert*-butyl alcohol
    b. isopropyl iodide
    c. isobutyl bromide
    d. 1-chloro-2-methyl-2butanol
    e. 2-methylpentane
    f. 2,3-dimethyl-2,3-butanediol

12. (9.21) Starting with alcohols of four carbons or fewer, outline all steps in a possible synthesis of each of the following:
    a. 1,2-dichloropropane
    e. isobutane

b. 1,2-dichlorobutane
c. 1,2-propanediol
d. 1-bromo-2-methyl-2-propanol
f. ethyl isopropyl ether
g. ethyl isopropyl ether by a second method (*Hint:* See Problem 9.9, pg. 347)