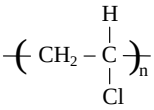
3.091 Fall Term 2004

Homework #12

with solution outlines

November 23, 2004 (to be tested 11/30)

from Module Chapter 7 "Organic Chemistry": 4, 8, 26, 28, 33, 56
from Module Chapter 10 "Polymer Chemistry": 8, 9 plus the following problems.

1. Poly (vinyl chloride) is represented by the formula 

(a) Draw molecular structures for tetramers (n=4) of the atactic, isotactic, and syndiotactic forms of PVC.

(b) Calculate the molecular weight of PVC composed of 4000 monomer units. Express your answer in g/mol.

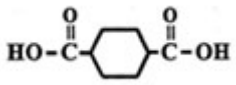
2. (a) Polyethylene exists either as a linear (straight-chain) polymer or as a branched polymer. Which is the high-density form? Explain.

(b) In visible light high-density polyethylene (HDPE) is opaque (white) while low-density polyethylene (LDPE) is transparent. Explain.

(c) Which form of PE is mechanically more flexible? Explain.

(d) Which form of PE has the higher melting point?

3. Show how the following monomer can be polymerized. What type of polymerization is used?



4. Show how $H_2C=CH_2$ can be polymerized. What type of polymerization is used?

5. Why can PE milk jugs be recycled while automobile tires cannot?

6. A polymeric ski boot has been designed to be flexible at room temperature but stiff out on the slopes. What is going on at the molecular level to confer this behavior?