Homework Set #2  
Chemistry 6750  
Fall 2003

___________________________  
Name

Handed Out: 9-19-03  
Due: 9-25-03 at 9:30am in class

Late Policy:  
One day late (9-26-03 10am): 50% off  
Two days late (9-27-03 10am): 75% off  
After 10am 9-27-03: no credit

You may work in groups of up to 3 students (NOT on question #6). However, each student must make contributions to the answers.

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<th>Questions</th>
<th>Points possible</th>
<th>Your Score</th>
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Total: 100
Question #1 (15 points)
Using Odian and/or the literature, draw the repeat unit for a) Teflon, b) Kevlar, c) Lycra, d) Surlyn, and e) Plexiglas. Pick one of the polymers and describe how it is synthesized, how it is processed, and what it is used for. Provide a structure-property relationship between the polymer structure and the application.
Question #2 (10 points)
Using organic terminology, why are chain polymerizations of alkenes exothermic and exoentropic?
Question #3 (20 points)
Suggest the polymer structures for the following reactions (provide mechanisms):

a)

\[ \text{R}^{+} + \text{structure} \]

b)

\[ \text{R}^{+} + \text{structure} \]

(It can form TWO very different polymers. Provide mechanisms for each possible structure)
Question #4 (15 points)
Cross-linked elastomers (a specific kind of polymers that have elastomeric properties) swell by as much as several 100 percent in volume when immersed in a solvent that dissolved its uncrosslinked counterparts. a) What happens in the swelling process and what happens when the swelling increases to the elasticity? b) How does the degree of cross-linking effect the degree of swelling? c) Would you expect high-density poly(ethylene) (you will find this in Odian or the literature) to swell in gasoline?
Question #5 (15 points)
Based on your groundbreaking knowledge of emulsion polymerizations. Suggest reaction conditions where n-bar (\(\bar{n}\)) > 0.5 or when n-bar < 0.5.
Question #6 (20 points) (You have to answer this question by yourself)
a) Find one article in the recent literature that describes a living polymerization and does all the polymerization characterization to prove that it is living. Describe the living tests in the paper.
b) Find a second article that states that it has a living polymerization but where the authors did not prove their claim. Suggest a couple of experiments to prove the authors claim.
Attach both articles.
Question #7 (10 points)
Under what conditions are radical polymerizations autoaccelerated?
Can ionic chain polymerization be autoaccelerated?