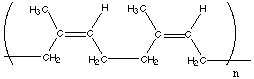
**Assignment: 1**  **Polymers**

1. **It is possible to make syndiotactic polystyrene, although most polystyrene is atactic. Syndiotactic polystyrene melts at 270°C while atactic polystyrene melts closer to 240°C. Why might this difference in structure result in different boiling points?**
2. **A materials engineer, with an eye towards cost, wants to obtain a material whose degree of polymerization is high. What types of measurements must be made in the laboratory to determine whether the degree of polymerization is acceptable?**
3. **Compounds like styrene, PhCH=CH2, are unstable as pure liquids. Such olefins tend to explode, even in the absence of oxygen. Particles of a sticky solid, which is soluble in benzene, can be found in debris resulting from the explosion. (A) Explain what property is responsible for this. (B) B. Write a plausible structure of the sticky solid which results from styrene decomposition. Very briefly describe the structural possibilities.**

**Assignment-2**  **Polymer**

1. **Discuss the structural features of a polymer which would make it a useful elastomer; specifically describe the underlying thermodynamic property which causes a stretched elastomer to return to its unstretched state. Mention the effect of molecular stereoisomers. Discuss the role of inter (between) chain interactions and mention those factors which determine the temperature range over which the elastomer is useful–for example what happens on a molecular level at low temperatures. Illustrate your discussion with an actual example, using molecular formulas.**
2. **When natural rubber, polyisoprene (shown below) is treated with a small amount of elemental sulfur, the resulting product ("vulcanized rubber") is a useful elastomer; before treatment with sulfur, polyisoprene is a gooey material. Upon stretching, such unvulcanized polyisoprene flows and exhibits little restoring force; it is not a useful elastomer. In general terms, explain what the sulfur is doing to make vulcanized rubber useful.**



1. **Why can't one use sulfur to vulcanize atactic polypropylene?**
2. **Professor Robert Waymouth (Stanford Chemistry) recently invented and patented a useful elastomer (a rubber) made entirely from propylene (1-propene). This material, which should compete with the elastomer used in "Air Jordan" basketball shoes, has no olefinic bonds, does not react with sulfur but nevertheless is a useful rubber; Waymouth’s new elastomer exhibits a strong restoring force when stretched. Waymouth’s compound is a block copolymer comprised of alternative sections of isotactic and atactic polypropylene. Pure isotactic polypropylene is not useful as an elastomer; it is high melting and is employed as a fiber for carpets, shirts, etc. Pure isotactic polypropylene does not stretch very much before breaking at room temperature.**

**By contrast, pure atactic polypropylene is lower melting; when stretched this polymer flows. Atactic polypropylene shows little restoring force upon stretching, it flows–much like unvulcanized polyisoprene (or well chewed chewing gum). In two or three sentences, propose a molecular explanation for the useful elastomeric properties of Waymouth’s new block copolymer.**