

Homework 2  
due March 5, 2008

If you find yourself without enough information, make and justify a reasonable approximation. Also notice that sometimes the question contains an additional part at the end (e.g. problem 6). Be sure to answer it!

1. Textbook, chapter 2, problem 12
2. Textbook, chapter 3, problem 5
3. Textbook, chapter 3, problem 15
4. Textbook, chapter 4, problem 1
5. Textbook, chapter 4, problem 14
6. Figure 4.7 in the text contains stress relaxation data (in tension) for polyisobutylene, at a variety of temperatures. These data are available electronically via the class web page.
  - (a) Using these data, calculate the shift factors  $a_T$  required to shift each set to a reference temperature of  $T_r = -66^\circ\text{C}$ . Create a master curve.
  - (b) Now use the temperature dependence of these shift factors to calculate a self-consistent parameter set  $C_1$ ,  $C_2$ ,  $T_r$  for polyisobutylene. How well do the so-called “universal” values match your results? How do they compare to the values from the table of shift factors? (Note that you’ll have to rearrange the WLF equation a little bit to make the comparisons, since the reference temperatures are different.)
  - (c) Another stress relaxation experiment on that same polyisobutylene is conducted at  $-77^\circ\text{C}$ . What is the stress relaxation modulus after  $10^6\text{s}$ ?