1. (Study Questions #3, Chapter 8)

Consider the following family of polyesters with the general structure:

\[
\begin{align*}
* - \left[ \begin{array}{c}
O - C - C - O - (CH_2 - CH_2)^m \end{array} \right]_n *
\end{align*}
\]

How would you expect the glass transition temperature \( T_g \) and the crystalline melting temperature \( T_m \) to vary with the values of “m” and “n”? Give reasons for your answer!

(10 points)

2. Assume two small molecules A and B with the same molecular/monomeric volume \( V_A = V_B \), and with a temperature dependent interaction parameter \( \chi = 0.2/T \). You make a mixture that contains 3 moles of A and 7 moles of B; from the Flory-Huggins theory (eq. 9.16 or eq. 9.25) estimate:

a. The temperature where the A / B mixture changes from miscible to immiscible

b. Imagine now that, without changing the volume fractions of A and B, you can polymerize B in polymers of length 10000 B monomers. Calculate now the same temperature.

c. Imagine now that you polymerize both A and B, again without changing the volume fractions. If poly(A) has a length of 3000 A monomers and poly(B) a length of 10000, calculate the new temperature.

d. Compare the answers from (b) and (c) above and comment about the miscibility of polymers with small molecules and of polymers with other polymers

(20 points)