

### 3.034- practice set A

1) A polymer scientist has received a sample of poly(ethylene adipate) that was synthesized via an acid catalyzed polyesterification of ethylene glycol and adipic acid. The molecular weight of the sample was determined to be:

sample:  $M_n$  approximately 8300 g/mole

The suppliers of the sample are not sure if it is from a reaction they carried out with a **1% excess of diol** or a reaction they carried out using a **2% excess of diacid**.

In addition, in one of the reactions, the polymerization took place with complete removal of water, but in the other, a mole ratio ( $H_2O/OH$ ) of 0.05 was found in the reaction pot after the reaction was complete. They are also not sure which reaction had the unremoved water.

Make an educated guess as to whether the above sample was synthesized with the excess diol or with the excess diacid. **Support your guess with suitable calculations.**