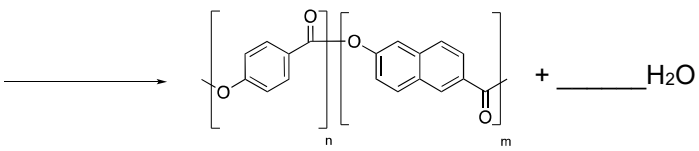
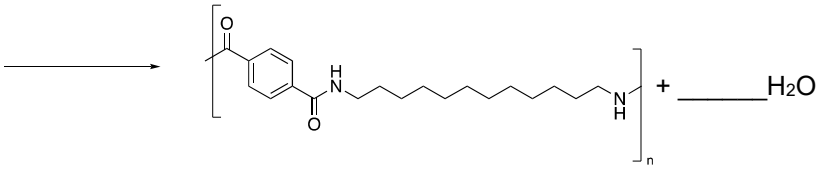
Polymer chemistry and macromolecular engineering
Fall 2024
HW 2

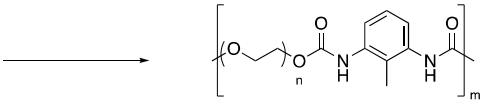
1) a. Draw an (idealized) molecular weight vs monomer conversion curve for chain polymerization and step polymerization.
   b. Briefly explain why they look different.
   c. How can we control the molecular weight of a condensation polymer.

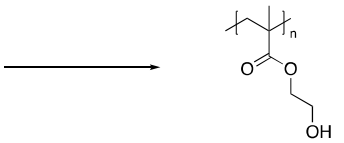
2) Identify the monomers or polymers in the following reactions and state if the polymer is an addition or a condensation polymer and if the polymerization is proceeding via a step growth (or ring opening) or chain growth mechanism.

a) 

b) 

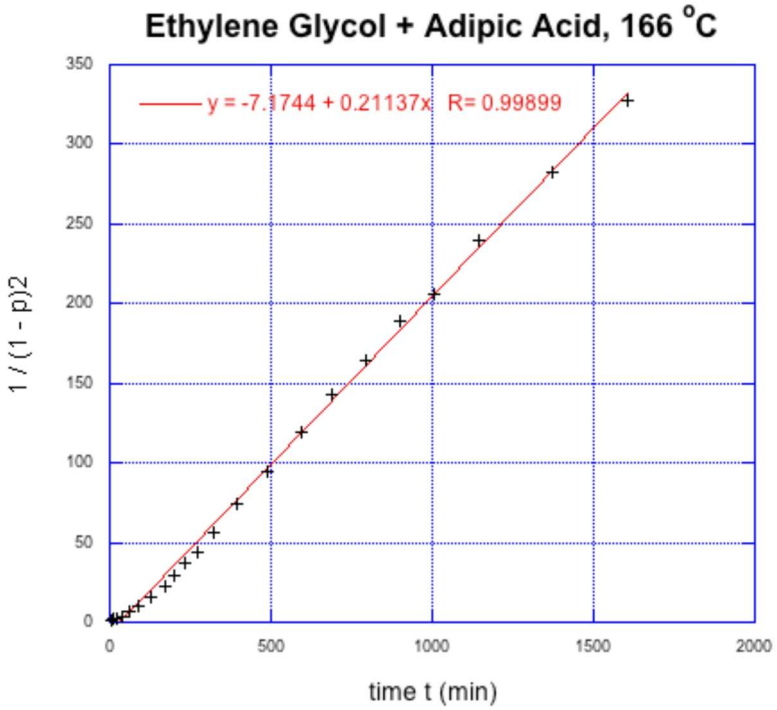
c) 

d) 

e) 

3) Increasing the conversion from 96 % to 98 % of an external catalyzed step polymerization took 90 minutes. Calculate the time needed to reach 95% conversion.

4) a. Given an initial alcohol group concentration $[M]_0$ = 17 M, determine the rate constant from Flory's data in $L^2\ mol^{-2}\ s^{-1}$.



b. The following data were obtained during externally catalysed condensation of 12-hydroxyl stearic acid (MW ~ 300) at 433.5 K. [COOH] was determined for each sample by titrating with ethanolic sodium hydroxide. How long it would take to build a M_n of 30,000 (ignore the end group molecular weight)?

t (h)	[COOH] (mol L^{-1})
0	3.10
2	0.48
3	0.34