

Problem Set #4

- 31-32. Hiemenz and Lodge, Chapter 2, Problems 9, 10
33. Find the expression for the branching coefficient and the critical extent of reaction for the third system in Figure 10.4, i.e., $AB + BB + A_3$.
34. Categorize the following mixtures as to whether they can form linear, branched, or network structures.
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|----------------------|--------------------------|
| (a) $A_2 + B_2 + AB$ | (b) $AB_2 + A_2$ |
| (c) $AB + AB_2$ | (d) $A_3 + B_2 + A_2$ |
| (e) $AB + B_3$ | (e) $A_2B_2 + A_2 + B_2$ |
35. Hydrolysis of an aromatic polyamide with $M_n = 24,116$ gives 39.31% by weight *m*-aminoaniline, 59.81% terephthalic acid, and 0.88% benzoic acid. Draw the repeat unit structure of the polymer. Calculate the degree of polymerization and the extent of reaction. Calculate what the degree of polymerization would have been if the amount of benzoic acid were doubled.
36. At what extent of reaction would gelation occur in a mixture of phthalic acid, glycerol, and ethylene glycol, in the molar ratio 1.500:0.50:0.700?
37. Calculate the feed ratio of adipic acid and hexamethylene diamine necessary to achieve a molecular weight of approximately 10,000 at 99.5% conversion. What would the identity of the end groups be in the resulting polymer?
38. "Polyurethanes" often contain significant amounts of urea linkages. Furthermore, crosslinking of "polyurethanes" can proceed through both "allophanate" and "biuret" linkages. Show the reactions that form these linkages.