14.7   This problem asks if it is possible to have a poly(vinyl chloride) homopolymer with the given molecular weight data and a degree of polymerization of 1120. The appropriate data are given below along with a computation of the number-average molecular weight.

Molecular wt. Range	Mean M_i	x_i	x_iM_i
8,000-20,000	14,000	0.05	700
20,000-32,000	26,000	0.15	3900
32,000-44,000	38,000	0.21	7980
44,000-56,000	50,000	0.28	14,000
56,000-68,000	62,000	0.18	11,160
68,000-80,000	74,000	0.10	7440
80,000-92,000	86,000	0.03	2580

$$\overline{M}_w = \sum x_iM_i = 47,720 \text{ g/mol}$$

For PVC, from Table 14.3, each repeat unit has two carbons, three hydrogens, and one chlorine. Thus,

$$m = 2(A_C) + 3(A_H) + (A_{Cl})$$

$$= (2)(12.01 \text{ g/mol}) + (3)(1.008 \text{ g/mol}) + (35.45 \text{ g/mol}) = 62.49 \text{ g/mol}$$

Now, we will compute the degree of polymerization using Equation 14.6 as

$$DP = \frac{\overline{M}_n}{m} = \frac{47,720 \text{ g/mol}}{62.49 \text{ g/mol}} = 764$$

Thus, such a homopolymer is *not possible* since the calculated degree of polymerization is 764 not 1120.