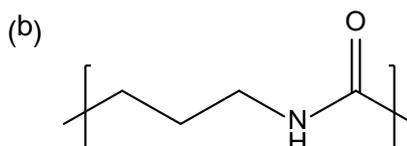
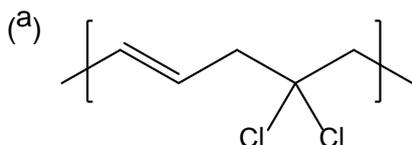


Total of 100 points. Each question is worth of 5 points.

- Commercial preparation of nylon 6 is mixed ring-opening and step polymerization.
 - Is the ring-opening polymerization cationic or anionic? Explain.
 - How is the final molar mass achieved?
- Each of the following polymers can be prepared by ring-opening polymerization of two different monomers and initiators. Show the monomers and initiators you may use.



- What are the three (3) most popular conducting polymers?
 - Draw the structures of the polymers of (a).
 - What is the feature the polymerization of the above polymers and that of PPO have in common?
- Regarding copolymer composition equation (CCE), answer the following questions.
 - How is monomer reactivity ratio defined?
 - How is steady-state condition assumed?
 - CCE stands only for an instant, and the composition drifts. What are the methods to get control of the drift?
- Answer the following questions.
 - How is ideal copolymerization defined? Is it more frequently observed in radical or in ionic copolymerization? Why?
 - The acetate group of polyvinyl acetate can be hydrolyzed to hydroxy group. The resulting polymer is a copolymer of vinyl alcohol and vinyl acetate, and the property of the copolymer depends on degree of substitution (DOS; fraction of vinyl alcohol in copolymer). The polymer with DOS less than 0.7 is not soluble in water, the polymer with DOS of 0.85 is soluble in water, and polymer with DOS of 1.0 is soluble only in hot water. How would you explain this observation?
 - While styrene monomer is soluble in methanol, polystyrene is not soluble in methanol. How would you explain?
 - While polyacrylonitrile is not soluble in toluene, a poly(acrylonitrile-co-styrene) of the certain composition is soluble in toluene. How would you explain?
 - While the copolymer of (d) above is soluble in toluene, a poly(acrylonitrile-*b*-styrene) is not soluble in toluene. How would you explain?

(continued on page 2)

6. Referring Table 9.1 given below, answer the question for the following two radical copolymerizations.

copolymerization #1: vinyl acetate (A) and vinyl chloride (B)

copolymerization #2: styrene (A) and methyl acrylate (B)

- For the polymerizations #1 and #2, sketch the plots of copolymer composition (F_A) against monomer feed ratio (f_A).
- Show the direction of composition drift for the curves in your sketch.
- Which polymerization #1 or #2 would have azeotropic copolymerization composition? Calculate the azeotropic composition.
- Which polymerization #1 or #2 would have higher alternating tendency? Explain why in terms of reactivity ratios AND monomer structures.
- Compare the Q and e values of the monomers. You are not asked to give numerical values. Rather show the order and your reasoning.

TABLE 9.1
Some Typical Values of Reactivity Ratios for Free-Radical Copolymerization at 60 °C

Monomer A	Monomer B	r_A	r_B
Styrene	Butadiene	0.78	1.39
Styrene	Methyl methacrylate	0.52	0.46
Styrene	Methyl acrylate	0.75	0.18
Styrene	Acrylonitrile	0.40	0.04
Styrene	Maleic anhydride	0.02	0
Styrene	Vinyl chloride	17	0.02
Vinyl acetate	Vinyl chloride	0.23	1.68
Vinyl acetate	Acrylonitrile	0.06	4.05
Vinyl acetate	Styrene	0.01	55
Methyl methacrylate	Methyl acrylate	1.69	0.34
Methyl methacrylate	<i>n</i> -Butyl acrylate	1.8	0.37
Methyl methacrylate	Acrylonitrile	1.20	0.15
Methyl methacrylate	Vinyl acetate	20	0.015
<i>trans</i> -Stilbene	Maleic anhydride	0.03	0.03
