Week 14 Polymers

QUESTION 1

What kind of reaction will bring about the formation of a polymer from the monomers succinic acid (HOOCCH₂CH₂COOH) and ethylenediamine (H₂NCH₂CH₂NH₂) as shown below?

![Chemical structures]

A. addition reaction  
B. condensation reaction  
C. ring opening reaction  
D. redox reaction  
E. double displacement reaction

QUESTION 2

Choose which polymer(s) are made by addition polymerization reactions:

I. Polyethylene  
II. Polyamide  
III. Polyester

A. I, II, and III  
B. I and III  
C. II and III  
D. I only  
E. III only

QUESTION 3

Below is a piece of a polymer. What is the structure of the monomer for this polymer?

![Polymer structure]

A.  
B.  
C.  
D.  
E.  

QUESTION 4

Which one of the following is likely to be the monomer unit of a polymer synthesized by addition polymerization?

A. HOOC(CH₂)₆COOH  
B. (CH₃)₃SiCl₂  
C. CH₃CH=CH₂  
D. CH₃COOH  
E. CH₃CH₂CH₃
QUESTION 5

Which one of the following pairs react via a **condensation reaction** to yield the products listed?

<table>
<thead>
<tr>
<th>Reactants</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. 2 alcohols</td>
<td>ether + water</td>
</tr>
<tr>
<td>B. alcohol and ester</td>
<td>acid + water</td>
</tr>
<tr>
<td>C. alcohol and carboxylic acid</td>
<td>ether + water</td>
</tr>
<tr>
<td>D. alcohol and amine</td>
<td>amide + water</td>
</tr>
<tr>
<td>E. amine and ether</td>
<td>amide + water</td>
</tr>
</tbody>
</table>

QUESTION 6

Which of the following are likely to be the monomer in an addition polymerization reaction?

I. H₂O
II. CHF=CHF
III. NH₂CH₃COOH
IV. CH₂OHCH₂OH

A. I only
B. II only
C. II and III
D. III and IV
E. I, III and IV

QUESTION 7

What is the monomer for the following polymers?

![Chemical structures]

I. II

A. A
B. B
C. C
D. D

QUESTION 8

As a polymer becomes more crystalline, what happens?

A. The polymer's melting point decreases.
B. The polymer's density decreases.
C. The polymer's stiffness decreases.
D. The polymer's yield stress (strength) decreases.
E. None of the above choices are correct.

QUESTION 9

What is a polymer called that is shaped irreversibly through chemical processes such as cross-linking?

A. thermoplastic
B. elastomer
C. thermosetting plastic
D. plasticizer
E. copolymer
QUESTION 10
What kind of interactions cause the polyvinylchloride below to be a stiffer polymer than polyethylene?

A. Dipole-dipole interactions between polymer chains
B. Hydrogen bonding between polymer chains
C. Covalent cross-linking between polymer chains
D. Ionic bonding between polymer chains
E. Metallic ions between polymer chains

QUESTION 11
Which of the following factors determine the physical properties of silicone polymers?

I. degree of cross-linking
II. length of chain
III. composition of side group

A. I only
B. II only
C. III only
D. I and III only
E. I, II and III

QUESTION 12
What are the monomers that form proteins and what type of reaction brings about the polymerization?

<table>
<thead>
<tr>
<th>Monomers</th>
<th>Reaction Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 2 amino acids</td>
<td>condensation</td>
</tr>
<tr>
<td>B alcohol + acid</td>
<td>addition</td>
</tr>
<tr>
<td>C 2 nucleic acids</td>
<td>condensation</td>
</tr>
<tr>
<td>D 2 amides</td>
<td>condensation</td>
</tr>
<tr>
<td>E amino acids</td>
<td>addition</td>
</tr>
</tbody>
</table>

QUESTION 13
A polymer that can be used to make artificial skin is shown below.

a. Is this an addition polymer or a condensation polymer? Hint: can you identify any functional groups?
b. What is the structure of the monomer(s) used to make it? (Draw the structure.)