

What are Condensation Polymers?

Worksheet

In condensation polymerization, two monomer molecules bond together and release HO (or HCl, NH, etc.). The repeating pattern is (unit byproduct release unit). Every ester or amide bond releases water.

Diol + Dicarboxylic Acid Polyester + n HO

Questions

1. A polyester made from ethylene glycol and terephthalic acid releases HO at each
 - A) Carbon-carbon bond
 - B) Ester linkage
 - C) Hydrocarbon end
 - D) Oxygen atom
2. How many functional groups does a monomer in condensation polymerization need?
 - A) 1
 - B) 2
 - C) 3
 - D) 4
3. If a reaction releases HO (or HCl or NH), it is ____ polymerization.
 - A) addition
 - B) condensation
 - C) thermal
 - D) radical
4. Nylon is an example of a ____ polymer.
 - A) addition
 - B) polyamide (condensation)
 - C) thermosetting
 - D) diene
5. In polyester synthesis, 100 diol molecules and 100 dicarboxylic acid molecules react completely. How many water molecules are released?
6. Nylon-66 is made from hexamethylene diamine (6 carbons) and adipic acid (6 carbons). Write the repeat unit.
7. Polyurethane forms from a diol and a diisocyanate. Does it release water like polyester?
8. Define: What is the key difference between addition and condensation polymers?
9. Define: Name two monomers used in polyester synthesis.
10. Define: What is an 'ester bond'?

Answer Key

1. B) Ester linkage - Ester (COO) forms from OH + COOH and releases HO at each condensation.
2. B) 2 - At minimum: a diol (2 OH), dicarboxylic acid (2 COOH), or similar with 2 reactive groups.
3. B) condensation - Condensation is defined by byproduct release. Addition has no byproduct.
4. B) polyamide (condensation) - Nylon forms by condensation between amino and carboxyl groups, releasing water.
5. Each ester linkage forms between one OH and one COOH, releasing one HO. 100 diols + 100 acids 100 ester bonds (approx.) 100 HO molecules released. (The final molecule has 100 monomers, so ~99 internal water releases, plus end caps.)
6. Hexamethylene diamine: $\text{HN(CH}_2\text{)}_6\text{NH}_2$ Adipic acid: $\text{HOOC(CH}_2\text{)}_4\text{COOH}$ Amide bond: $\text{NHCO(CH}_2\text{)}_4\text{CONH(CH}_2\text{)}_6$
Repeat unit: $[\text{NH(CH}_2\text{)}_6\text{NHCO(CH}_2\text{)}_4\text{CO}]_n$ Water released at each amide linkage.
7. Diol (OH OH) + Diisocyanate ($\text{N}=\text{C}=\text{O}$ $\text{N}=\text{C}=\text{O}$) A urethane bond forms: NHCOO (no byproduct released). This is NOT typical condensation-no water released. (Some urethane syntheses use water in a separate step, but the chain growth doesn't release it.)
8. Addition: no byproduct. Condensation: releases water or another small molecule at each bond formation.
9. A diol (e.g., ethylene glycol) and a dicarboxylic acid (e.g., terephthalic acid).
10. A $\text{C}=\text{O}$ bonded to O (COO), formed when an alcohol and carboxylic acid condense and release water.

Bounlu

All cards, step-by-step solutions and an AI tutor are in the Notek app.
Promy turns exam dates into automatic reminders.