Answer all the questions below then check your answers

1. Complete the sentence below:

   Polyesters are a type of _____ polymer.

2. Which of the following is a monomer used to make polyesters?

   A) Ethene

   B) Ethanoic acid

   C) Ethylene glycol or ethane-1,2-diol

   D) Propane

3. What is the functional group present in all polyesters? Draw this functional group

4. The monomers required to form a polyester are a dicarboxylic acid and a _____.

5. Which of the following is a product of the condensation reaction that forms a polyester?

   A) Water C) Methane

   B) Oxygen D) Carbon dioxide

6. Name one common item made from the condensation polymers polyethylene terephthalate (PET) and poly(lactic acid) (PLA)

7. Describe one environmental advantage of using poly(lactic acid) (PLA) over traditional plastics.

8. Complete the equation below to show the formation of a polyester made from the diol ethane-1,2-diol and the dicarboxylic acid terephthalic acid.

   $nHOCH_2CH_2OH + nHOOC\text{-}C_6H_4COOH \rightarrow$

9. Polyesters are formed through a condensation reaction between a diol and a _____ acid.

10. Explain the process of condensation polymerisation, including the type of monomers involved and the by product formed.

Answers

1. Complete the sentence below:

   Polyesters are a type of _____ polymer.

   Answer: condensation

2. Which of the following is a monomer used to make polyesters?

   A) Ethene

   B) Ethanoic acid

   C) Ethylene glycol or ethane-1,2-diol

   D) Propane

   Answer: C) Ethylene glycol

3. What is the functional group present in all polyesters? Draw this functional group

   Answer: Ester group (-COO-)

4. The monomers required to form a polyester are a dicarboxylic acid and a _____.

   Answer: diol

5. Which of the following is a product of the condensation reaction that forms a polyester?

   A) Water

   B) Oxygen

C) Methane

D) Carbon dioxide

Answer: A) Water

6. Name one common item made from the condensation polymers polyethylene terephthalate (PET) and poly(lactic acid) (PLA)

Biodegradable packaging- PET

Plastic drinks bottles- poly(lactic acid) (PLA)

7. Describe one environmental advantage of using poly(lactic acid) (PLA) over traditional plastics.

Answer: PLA is biodegradable and derived from renewable resources like corn starch, reducing reliance on fossil fuels and minimizing environmental pollution.

8. Complete the equation below to show the formation of a polyester made from the diol ethane-1,2-diol and the dicarboxylic acid terephthalic acid.

$nHOCH_2CH_2OH + nHOOC-C_6H_4COOH \rightarrow$

Answer:

$nHOCH_2CH_2OH + nHOOC-C_6H_4COOH \rightarrow [-OCH_2CH_2OOC-C_6H_4CO-]n + 2nH_2O$

9. Polyesters are formed through a condensation reaction between a diol and a _____ acid.

Answer: dicarboxylic

10. Explain the process of condensation polymerisation, including the type of monomers involved and the by product formed.

Answer: Condensation polymerisation is a chemical process whereby monomers with two functional groups/reactive ends groups on the end of each monomer react to form a polymer and a small molecule, such as water is also formed. For example, in forming a polyester, a diol (containing two hydroxyl groups) reacts with a dicarboxylic acid (containing two carboxyl groups). Each time a bond forms between a hydroxyl group and a carboxyl group, an ester link is created, and a molecule of water is released.