Answer all the questions below then check your answers

1. Complete the sentences below:

a. A giant molecule made up of many repeating units is called a _____.

b. Polyamides are formed by the reaction of a diamine and a _____.

c. The reaction between amino acids to form peptides is an example of a _____ reaction.

d. Nylon is an example of a synthetic polymer called a _____.

e. What is the name of the bond formed between the monomers in a polyamide?

2. Which of the following is NOT a polyamide?

(a) Nylon

(b) Protein

(c) Polyester

(d) Kevlar

3. Multiple Choice: Which of the following is an example of a diamine?

   a) Ethanoic acid

   b) Hexamethylenediamine

   c) Ethylene glycol

   d) Glycerol

4. True/False: Nylon is a type of polyester.

5. What functional groups are present on the monomers involved in the formation of polyamides?

6. Fill in the gaps below to complete the sentence:

   During the formation of a polyamide, the amine group reacts with the _____ group present on the dicarboxylic acid, releasing a molecule of _____.

5. Complete the balanced chemical equation below which shows the formation of a dipeptide formed from two molecules of the amino acid glycine.

   $NH_2CH_2COOH + NH_2CH_2COOH \rightarrow$

6. Explain why water is released during the formation of a polyamide from a diamine and a dicarboxylic acid.

7. Draw the condensed structural formula of the dipeptide formed when the amino acids glycine (H_2NCH_2COOH) and alanine ($H_2NCH(CH_3)COOH$) react.

8. Explain how a condensation reaction forms a dipeptide.

9. Nylon-6,6 is formed from the reaction between 1,6-diaminohexane and hexanedioic acid. Draw the repeating unit of nylon-6,6.

10. Explain the process of condensation polymerisation, using the formation of nylon-6,6 as an example.

Answers

1. Complete the sentences below:

a. A giant molecule made up of many repeating units is called a _____.
Answer: polymer

b. Polyamides are formed by the reaction of a diamine and a _____.

Answer: dicarboxylic acid.

c. The reaction between amino acids to form peptides is an example of a _____ reaction.

Answer: condensation

d. Nylon is an example of a synthetic polymer called a _____.

Answer: polyamide

e. What is the name of the bond formed between the monomers in a polyamide?

Answer: Amide bond (or peptide bond)

2. Which of the following is NOT a polyamide?

(a) Nylon

(b) Protein

(c) Polyester

(d) Kevlar

Answer: (c) Polyester

3. Multiple Choice: Which of the following is an example of a diamine?

a) Ethanoic acid

b) Hexamethylenediamine

c) Ethylene glycol

d) Glycerol

Answer: b) Hexamethylenediamine

4. True/False: Nylon is a type of polyester.

Answer: False, nylon is a polyamide not a polyester.

5. What functional groups are present on the monomers involved in the formation of polyamides?

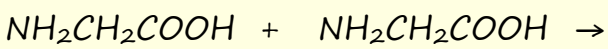
Answer: Amine groups ($-NH_2$) from diamines and carboxyl groups ($-COOH$) from dicarboxylic acids.

6. Fill in the gaps below to complete the sentence:

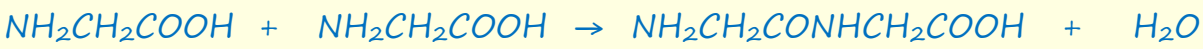
During the formation of a polyamide, the amine group reacts with the _____ group present on the dicarboxylic acid, releasing a molecule of _____.

Answer: carboxyl, water

5. Complete the balanced chemical equation below which shows the formation of a dipeptide formed from two molecules of the amino acid glycine.



Answer:



6. Explain why water is released during the formation of a polyamide from a diamine and a dicarboxylic acid.

Answer: Water is released during the formation of a polyamide because the amine group ($-NH_2$) of the diamine reacts with the carboxyl group ($-COOH$) of the dicarboxylic acid, forming an amide bond ($-CONH-$) and releasing a molecule of water as a by product.

7. Draw the condensed structural formula of the dipeptide formed when the amino acids glycine (H_2NCH_2COOH) and alanine ($H_2NCH(CH_3)COOH$) react.

Answer: $H_2NCH_2CONHCH(CH_3)COOH$

8. Explain how a condensation reaction forms a dipeptide.

Answer:

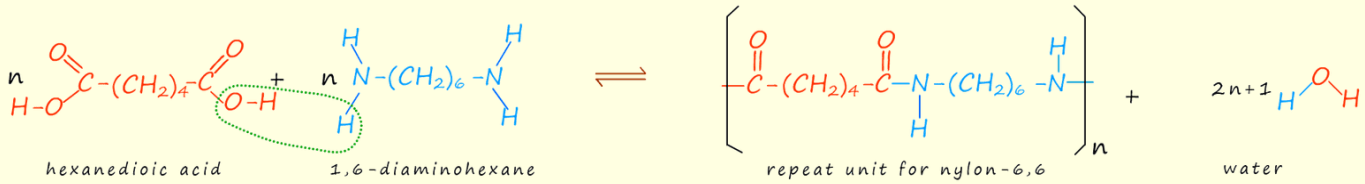
(1) The amine group of one amino acid reacts with the carboxylic acid carboxyl group present on another amino acid.

(2) A molecule of water is eliminated.

(3) An amide bond forms between the two amino acids, creating a dipeptide.

9. Nylon-6,6 is formed from the reaction between 1,6-diaminohexane and hexanedioic acid. Draw the repeating unit of nylon-6,6.

Answer: Reaction and repeat unit are shown below:



10. Explain the process of condensation polymerisation, using the formation of nylon-6,6 as an example.

Answer:

(1) The diamine (1,6-diaminohexane) and the dicarboxylic acid (hexanedioic acid) react.

(2) An amide bond forms between the monomers, releasing a water molecule.
(3) This process repeats, with the growing polymer chain reacting with more monomers at both ends.

(4) The reaction continues until a long-chain polyamide (nylon-6,6) is formed.