

Proteins & Nucleic Acids Concept Questions - SOLUTIONS

Proteins

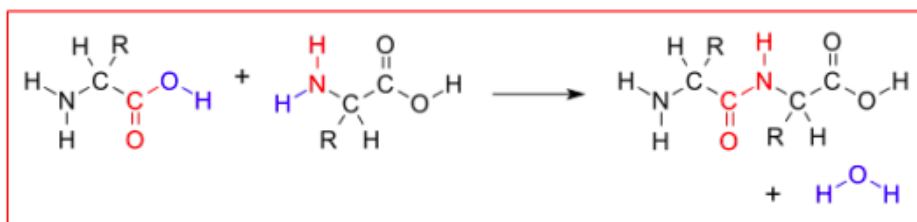
1. Why can a protein be called a polypeptide but a polypeptide cannot be called a protein?

A polypeptide is just a string of amino acids. A protein has a definite structure. A polypeptide is the first (primary) stage required in making proteins. Molecules are not considered proteins until they have a definite shape, which occurs in their tertiary structure.

2. Explain how the 3-dimensional shape of proteins is formed.

Hydrogen bonding occurs between side chains of amino acids to form alpha-helices and beta-pleated sheets in the secondary structure. Then the molecule interacts with the environment, hydrophobic molecules go inside, hydrophilic move towards outside, acids and bases pair together due to charges and disulfide bonds occur to make tertiary structure.

3. Use a diagram to show how a peptide bond is formed between two amino acids.



4. Discuss some of the interactions that can occur between the R groups of an amino acid sequence.

acidic (+) and basic (-) amino acids will group together, hydrogen bonding will occur between polar/hydrophilic side chains forming alpha-helices and beta-pleated sheets.

5. Some features of amino acids are common while others are not. Explain

There are many hydrophilic and hydrophobic amino acids, but only 2 acids and 3 bases. Cytosine is the only amino acid to contain sulfur.

6. How does having different R groups make amino acids ideal building blocks for proteins?

There are many ways they can interact with each other and their environments allowing for many different shapes which leads to many different functions.

7. Why are some amino acids soluble in water while others are not?

Depending on their side chains amino acids can be polar and will dissolve in water or nonpolar and not dissolve in water.

8. Name three functions of proteins in a living organism.

enzymes – speed up reactions
cell surface markers – antigens
structural support - cytoskeleton

9. Which elements are found in proteins but in neither carbohydrates or lipids.

Sulfur, nitrogen

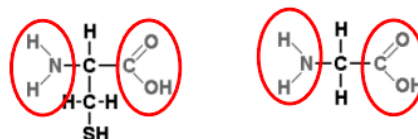
10. What type of compound is shown below? amino acid

11. What functional groups are present in both of the compounds found below? Circle and label all of the functional groups visible. amino, carboxyl

12. Describe what would have to occur to link the two compounds together. What substance is removed (produced)?

anabolic reaction leading to a peptide bond between the N of one and the C of the other amino acid. Water would also be produced.

13. What is the name of the bond that is formed between these two compounds? peptide bond



Nucleic Acids

1. Which element is found in nucleic acids but in neither carbohydrates nor proteins? **Phosphorous**
2. You connect a molecule of ribose, a phosphate, and a molecule of cytosine. What have you made? **nucleotide**
3. What does a nucleotide consist of?
pentose sugar (ribose / deoxyribose), nitrogenous base & phosphate
4. What are the five nitrogenous bases found in nucleic acids?
guanine, cytosine, adenine, thymine (DNA only), uracil (RNA only)
5. Differentiate between DNA and RNA.
DNA – double stranded, deoxyribose sugar, A/T/C/G
RNA – single stranded, ribose sugar, A/U/C/G
6. What type of bonds hold the sugar phosphate backbone of DNA & RNA together? **phosphodiester**
7. What type of bonds hold the nitrogenous bases of DNA together? **hydrogen**
8. What is ATP? **adenosine triphosphate – energy molecule for cells**