AP BIO INSTA-REVIEW

TOPIC 1.5

Structure and Function of Biological Macromolecules

SYI-1.C.1

Directionality of the subcomponents influences structure and function of the polymer–

a. Nucleic acids have a linear sequence of nucleotides that have ends, defined by the 3' hydroxyl and 5' phosphates of the sugar in the nucleotide. During DNA and RNA synthesis, nucleotides are added to the 3' end of the growing strand, resulting in the formation of a covalent bond between nucleotides.

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TOPIC 1.5

Structure and Function of Biological Macromolecules

SYI-1.C.1

Directionality of the subcomponents influences structure and function of the polymer–

b. DNA is structured as an antiparallel double helix, with each strand running in opposite 5' to 3' orientation. Adenine nucleotides pair with thymine nucleotides via two hydrogen bonds. Cytosine nucleotides pair with guanine nucleotides by three hydrogen bonds.

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Structure and Function of Biological Macromolecules

SYI-1.C.1

Directionality of the subcomponents influences structure and function of the polymer–

c. Proteins comprise linear chains of amino acids, connected by the formation of covalent bonds at the carboxyl terminus of the growing peptide chain.

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TOPIC 1.5

Structure and Function of Biological Macromolecules

SYI-1.C.1

Directionality of the subcomponents influences structure and function of the polymer–

d. Proteins have primary structure determined by the sequence order of their constituent amino acids, secondary structure that arises through local folding of the amino acid chain into elements such as alpha-helices and beta-sheets, tertiary structure that is the overall three-dimensional shape of the protein and often minimizes free energy, and quaternary structure that arises from interactions between multiple polypeptide units. The four elements of protein structure determine the function of a protein.

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What is at the 5' end of a nucleic acid?

A. Carbon

B. Hydroxyl

C. Nitrogenous Base

D. Phosphate

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TOPIC 1.5

What is at the 5' end of a nucleic acid?

D. Phosphate

Nucleotides are made of a pentose sugar. Each carbon is numbered, and we use the different numbers to identify the functional groups. 1' is the nitrogenous base, 3' is the hydroxyl of the sugar, and 5' is the phosphate group.

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AP BIO INSTA-REVIEW

TOPIC 1.5

What is the direction of DNA synthesis?

A. 3' to 5'

B. 5' to 3'

C. It's anti-parallel so either direction is correct

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TOPIC 1.5

What is the direction of DNA synthesis?

B. 5' to 3'

DNA polymerase is the enzyme responsible for DNA synthesis. The enzyme is only able to add to an open 3' end. This means that it will assemble the new DNA strand in the 5' to 3' direction.

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What does antiparallel mean in terms of the nucleic acids?

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TOPIC 1.5

What does antiparallel mean in terms of the nucleic acids?

Antiparallel describes the directionality of the two strands that are complementary base paired. The strands are equidistant (parallel) and in opposite directions (anti). This means that the 5' end is across from a 3' end.

AP BIO INSTA-REVIEW

TOPIC 1.5

What type of bond is between nitrogenous bases?

A. Covalent

B. Hydrogen

C. Ionic

D. Van der Waals

AP BIO INSTA-REVIEW

TOPIC 1.5

What type of bond is between nitrogenous bases?

B. Hydrogen

Hydrogen bonds are between the nitrogenous bases. There are 2 hydrogen bonds between adenine and thymine. There are 3 hydrogen bonds between cytosine and guanine.

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Why would a strand with more G/C bonding be more stable than A/T bonding?

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TOPIC 1.5

Why would a strand with more G/C bonding be more stable than A/T bonding?

There are 3 hydrogen bonds between G & C while there are 2 hydrogen bonds between A & T. So, if there are more G/C bonding there will be more hydrogen bonds between the nitrogenous bases than if there were more A/T bonding.

AP BIO INSTA-REVIEW

TOPIC 1.5

Where are new bonds formed in a growing polypeptide?

A. Amine group

B. Carboxyl group

C. Hydrogen

D. R-group

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TOPIC 1.5

Where are new bonds formed in a growing polypeptide?

B. Carboxyl group

There is an N terminus (amine group) and a C terminus (carboxyl group). The polypeptide is synthesized in the N terminus to C terminus direction. The new bonds will be formed at the C terminus binding to amine group of next amino acid.

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TOPIC 1.5

What is the bond between amino acids called?

A. Ester linkage

B. Glycosidic linkage

C. Peptide bond

D. Phosphodiester linkage

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TOPIC 1.5

What is the bond between amino acids called?

C. Peptide bond

Peptide bonds are specific covalent bonds between amino acids. This forms between the carboxyl group of one amino acid and the amine group of the next amino acid.

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Describe the orientation of the amino acids that form the peptide bond

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TOPIC 1.5

Describe the orientation of the amino acids that form the peptide bond

The amine group of one amino acid is bonded with a carboxyl group of the next amino acid. The formed bond will look like bond between a carbon double bonded to an oxygen (carboxyl) and to a nitrogen (amine).

AP BIO INSTA-REVIEW

TOPIC 1.5

What level of protein structure of is described as hydrogen bonds between backbone?

A. Primary

B. Secondary

C. Tertiary

D. Quaternary

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TOPIC 1.5

What level of protein structure of is described as hydrogen bonds between backbone?

B. Secondary

Secondary structure is described as the alpha helix or beta pleated sheets resulting from the hydrogen bonds between the backbone of the polypeptide.

AP BIO INSTA-REVIEW

TOPIC 1.5

What level of protein structure of is described as peptide bonds between amino acids?

A. Primary

B. Secondary

C. Tertiary

D. Quaternary

AP BIO INSTA-REVIEW

TOPIC 1.5

What level of protein structure of is described as peptide bonds between amino acids?

A. Primary

The peptide bond is between the amino acids. This describes the primary structure which is a "string" of amino acids.

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TOPIC 1.5

What level of protein structure of is described as bonding between two polypeptide chains?

A. Primary

B. Secondary

C. Tertiary

D. Quaternary

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TOPIC 1.5

What level of protein structure of is described as bonding between two polypeptide chains?

D. Quaternary

The final three-dimensional shape is the tertiary structure. When two different tertiary structures (polypeptides) bond together through R group interactions, then it is considered the quaternary structure.

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TOPIC 1.5

What level of protein structure of is described as alpha helix/beta-pleated sheet?

A. Primary

B. Secondary

C. Tertiary

D. Quaternary

AP BIO INSTA-REVIEW

TOPIC 1.5

What level of protein structure of is described as alpha helix/beta-pleated sheet?

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Secondary structure is described as the alpha helix or beta pleated sheets resulting from the hydrogen bonds between the backbone of the polypeptide.

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TOPIC

1.5

What level of protein structure of is described as bonding between R-groups or the final three-dimensional shape?

A. Primary

B. Secondary

C. Tertiary

D. Quaternary

AP BIO INSTA-REVIEW

TOPIC 1.5

What level of protein structure of is described as bonding between R-groups or the final three-dimensional shape?

C. Tertiary

The tertiary structure is the final three-dimensional structure resulting from the R group interactions. Polar or charged R groups will face the hydrophilic environment while nonpolar R groups will hide in the hydrophobic center.

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What happens if a protein loses its three-dimensional structure?

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TOPIC 1.5

What happens if a protein loses its three-dimensional structure?

The three-dimensional structure allows for the active site to bind to specific molecules. With a change in shape, the active site will change which will change the function of the protein.

AP BIO INSTA-REVIEW

TOPIC 1.5

What pairs with adenine in DNA?

A. Cytosine

B. Guanine

C. Thymine

D. Uracil

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TOPIC 1.5

What pairs with adenine in DNA?

C. Thymine

Adenine pairs with thymine.

AT, CG

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TOPIC

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Why does adenine pair with thymine?

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TOPIC 1.5

Why does adenine pair with thymine?

Adenine is a purine and thymine is a pyrimidine. If two purines bind, the DNA it too wide. If two pyrimidines binds, the DNA is too narrow. The purine and pyrimidine pairing allows for constant width.

Adenine and thymine form 2 hydrogen bonds. With the cytosine there would be 3 hydrogen bonds, so these binding "spots" don't pair up (yes, I'm making this one up but it sounds good, right?)

AP BIO INSTA-REVIEW

TOPIC 1.5

What is at the 5' end of the DNA?

A. Hydroxyl

B. Nitrogenous Base

C. Phosphate

D. Sugar

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TOPIC 1.5

What is at the 5' end of the DNA?

C. Phosphate

Nucleotides are made of a pentose sugar. Each carbon is numbered, and we use the different numbers to identify the functional groups. 1' is the nitrogenous base, 3' is the hydroxyl of the sugar, and 5' is the phosphate group.

AP BIO INSTA-REVIEW

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AP BIO INSTA-REVIEW

TOPIC 1.5

What is at the 3' end of the DNA?

A. Hydroxyl

Nucleotides are made of a pentose sugar. Each carbon is numbered, and we use the different numbers to identify the functional groups. 1' is the nitrogenous base, 3' is the hydroxyl of the sugar, and 5' is the phosphate group.

AP BIO INSTA-REVIEW

TOPIC

1.5

How many hydrogen bonds are between C & G?

A. 1
B. 2
C. 3
D. 4

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TOPIC 1.5

How many hydrogen bonds are between C & G?

c. 3

There are three bonds between C and G while there are two bonds between A and T.

Note: I remember this because C is the third letter in the alphabet

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TOPIC

1.5

How many hydrogen bonds are between A & T?

A. 1
B. 2
C. 3
D. 4

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TOPIC 1.5

How many hydrogen bonds are between A & T?

B. 2

There are two hydrogen bonds between A and T while there are three bonds between C and G.

Note: I remember this because it takes two lines to make the T.

AP BIO INSTA-REVIEW

TOPIC 1.5

What is the type of bond in the secondary structure of proteins?

A. Covalent

B. Hydrogen

C. Ionic

D. Peptide

AP BIO INSTA-REVIEW

TOPIC 1.5

What is the type of bond in the secondary structure of proteins?

B. Hydrogen

Secondary structure is described as the alpha helix or beta pleated sheets resulting from the hydrogen bonds between the backbone of the polypeptide.

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TOPIC 1.5

The tertiary structure involves interactions of the

A. Amino group

B. Carboxyl group

C. Hydrogen

D. R group

AP BIO INSTA-REVIEW

TOPIC 1.5

The tertiary structure involves interactions of the

D. R group

The tertiary structure is the final three-dimensional structure resulting from the R group interactions. Polar or charged R groups will face the hydrophilic environment while nonpolar R groups will hide in the hydrophobic center.

AP BIO INSTA-REVIEW

TOPIC 1.5

What is the type of bond found in the primary structure of proteins?

A. Covalent

B. Hydrogen

C. Ionic

D. Peptide

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TOPIC 1.5

What is the type of bond found in the primary structure of proteins?

D. Peptide

Yes, the peptide bond is a type of covalent bond. The peptide bond is the specific covalent bond found in proteins.

The primary structure is due to bonding between amino acids. There are peptide bonds between amino acids. Yes, I know that peptide bonds are a type of covalent bond but covalent was not the most correct option.

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TOPIC 1.5

Which describes the orientation for the new peptide bond?

A. Amino to Amino

B. Amino to Carboxyl

C. Carboxyl to Amino

D. Carboxyl to Carboxyl

First functional group is on the pre-peptide bond structure and the second functional group is on the post-peptide bond structure.

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TOPIC 1.5

Which describes the orientation for the new peptide bond?

C. Carboxyl to Amino

Proteins are synthesized in the N terminus to C terminus orientation. This means that the carboxyl of the amino acid before the peptide bond must bond with the amine of the amino acid after the peptide bond.

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TOPIC

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How does the structure of fat differ from the structure of a phospholipid?

A. Fat has an extra fatty acid

B. Fat has a phosphate group instead of a fatty acid

C. Phospholipid has an extra fatty acid

D. Phospholipids have a phosphate instead of a fatty acid

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TOPIC 1.5

How does the structure of fat differ from the structure of a phospholipid?

D. Phospholipids have a phosphate instead of a fatty acid

A fat has a glycerol with 3 fatty acids. A phospholipid has a glycerol with 2 fatty acids and a phosphate. The difference is that phospholipids have one less fatty acid (and a phosphate instead).

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TOPIC 1.5

When new nucleotides are added, which side does it add to?

A. 3' end
B. 5' end

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TOPIC 1.5

When new nucleotides are added, which side does it add to?

A. 3' end

DNA polymerase binds to an open 3' end so this means that new nucleotides will be added to this end to synthesize the new DNA strand in the 5' to 3' direction.