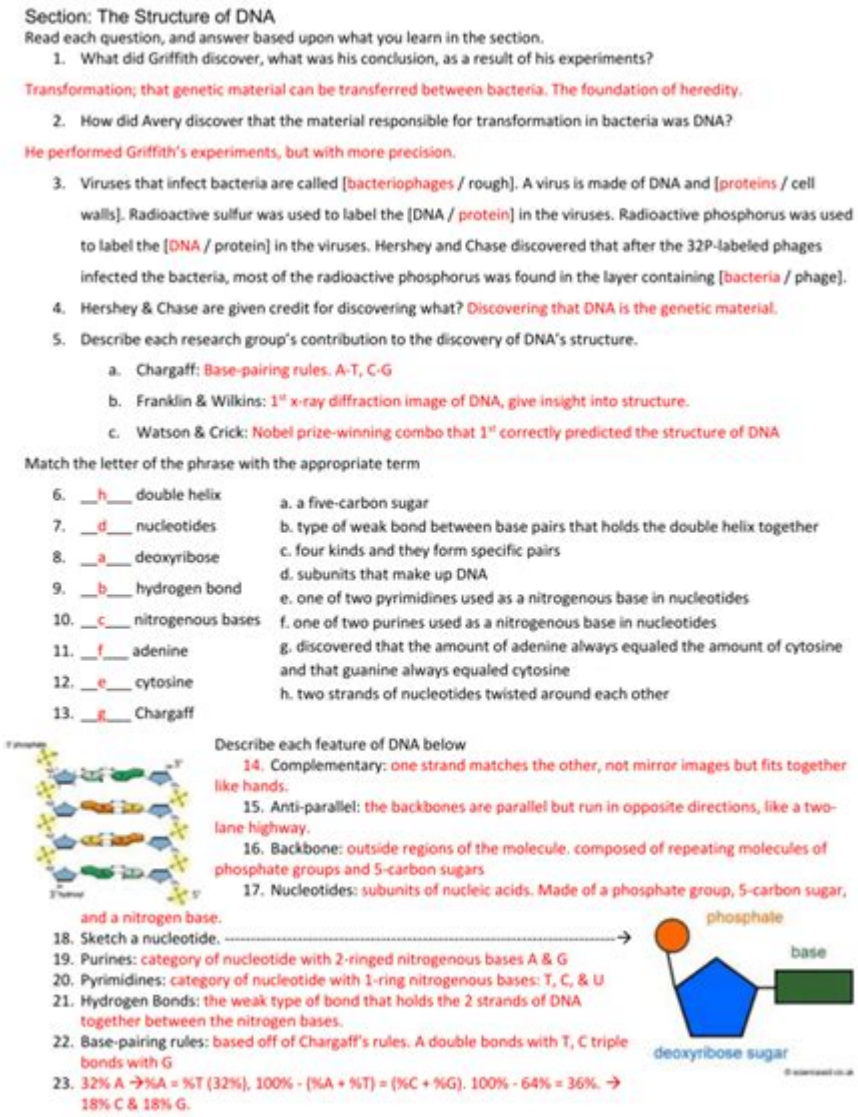
Nucleic Acids Worksheet Answers



Section: The Structure of DNA

Read each question, and answer based upon what you learn in the section.

1. What did Griffith discover, what was his conclusion, as a result of his experiments?

Transformation; that genetic material can be transferred between bacteria. The foundation of heredity.

2. How did Avery discover that the material responsible for transformation in bacteria was DNA?

He performed Griffith's experiments, but with more precision.

3. Viruses that infect bacteria are called [bacteriophages / rough]. A virus is made of DNA and [proteins / cell walls]. Radioactive sulfur was used to label the [DNA / protein] in the viruses. Radioactive phosphorus was used to label the [DNA / protein] in the viruses. Hershey and Chase discovered that after the 32P-labeled phages infected the bacteria, most of the radioactive phosphorus was found in the layer containing [bacteria / phage].
4. Hershey & Chase are given credit for discovering what? Discovering that DNA is the genetic material.
5. Describe each research group's contribution to the discovery of DNA's structure.
   a. Chargaff: Base-pairing rules. A-T, C-G
   b. Franklin & Wilkins: 1st x-ray diffraction image of DNA, give insight into structure.
   c. Watson & Crick: Nobel prize-winning combo that 1st correctly predicted the structure of DNA

Match the letter of the phrase with the appropriate term

6. __h__ double helix
7. __d__ nucleotides
8. __a__ deoxyribose
9. __b__ hydrogen bond
10. __c__ nitrogenous bases
11. __f__ adenine
12. __e__ cytosine
13. __g__ Chargaff

a. a five-carbon sugar
b. type of weak bond between base pairs that holds the double helix together
c. four kinds and they form specific pairs
d. subunits that make up DNA
e. one of two pyrimidines used as a nitrogenous base in nucleotides
f. one of two purines used as a nitrogenous base in nucleotides
g. discovered that the amount of adenine always equaled the amount of cytosine and that guanine always equaled cytosine
h. two strands of nucleotides twisted around each other

Describe each feature of DNA below

14. Complementary: one strand matches the other, not mirror images but fits together like hands.
15. Anti-parallel: the backbones are parallel but run in opposite directions, like a two-lane highway.
16. Backbone: outside regions of the molecule. composed of repeating molecules of phosphate groups and 5-carbon sugars
17. Nucleotides: subunits of nucleic acids. Made of a phosphate group, 5-carbon sugar, and a nitrogen base.
18. Sketch a nucleotide. ----------→

19. Purines: category of nucleotide with 2-ringed nitrogenous bases A & G
20. Pyrimidines: category of nucleotide with 1-ring nitrogenous bases: T, C, & U
21. Hydrogen Bonds: the weak type of bond that holds the 2 strands of DNA together between the nitrogen bases.
22. Base-pairing rules: based off of Chargaff's rules. A double bonds with T, C triple bonds with G
23. 32% A →%A = %T (32%), 100% - (%A + %T) = (%C + %G). 100% - 64% = 36%. → 18% C & 18% G.

Nucleic acids worksheet answers can often be a source of confusion for students studying biology at various levels. Understanding nucleic acids, their structure, function, and the role they play in genetics is crucial for grasping the fundamentals of molecular biology. This article will explore nucleic acids, provide answers to common worksheet questions, and offer insights into their significance in the biological world.

Understanding Nucleic Acids

Nucleic acids are large biomolecules essential for all known forms of life. They serve as the primary information carriers in cells, and they play a crucial role in the synthesis of proteins. There are two main types of nucleic acids: DNA (Deoxyribonucleic Acid) and RNA (Ribonucleic Acid).

1. DNA: The Genetic Blueprint

DNA is often referred to as the blueprint of life. It contains the instructions needed for an organism's development, reproduction, and functioning. Here are some key characteristics of DNA:

- Structure: DNA has a double helix structure, consisting of two long strands coiled around each other.
- Components: Each strand is made up of nucleotides, which consist of a sugar (deoxyribose), a phosphate group, and a nitrogenous base (adenine, thymine, cytosine, or guanine).
- Function: DNA stores genetic information and is responsible for heredity. It also guides the synthesis of RNA, which ultimately leads to protein production.

2. RNA: The Messenger

RNA plays several roles in the cell, most notably as a messenger carrying instructions from DNA for controlling the synthesis of proteins. Key features of RNA include:

- Structure: Unlike DNA, RNA is typically single-stranded and contains ribose as its sugar.
- Types: There are several types of RNA, including:
- mRNA (messenger RNA): Carries genetic information from DNA to the ribosome, where proteins are synthesized.
- tRNA (transfer RNA): Brings amino acids to the ribosome during protein synthesis.
- rRNA (ribosomal RNA): A major component of ribosomes, which are the sites of protein synthesis.
- Function: RNA is crucial in translating the genetic code into functional proteins.

Common Questions About Nucleic Acids

When working on worksheets about nucleic acids, students may encounter various types of questions. Below are some common question categories along with their answers.

1. Structure of Nucleic Acids

Question: What are the main components of a nucleotide?

Answer: A nucleotide consists of three main components:
- A nitrogenous base (adenine, thymine, cytosine, guanine in DNA; adenine, uracil, cytosine, guanine in RNA)
- A sugar molecule (deoxyribose in DNA; ribose in RNA)
- A phosphate group

Question: How do the nitrogenous bases pair in DNA?

Answer: In DNA, the nitrogenous bases pair according to specific rules:
- Adenine (A) pairs with Thymine (T)
- Cytosine (C) pairs with Guanine (G)

2. Function of Nucleic Acids

Question: What is the primary function of DNA?

Answer: The primary function of DNA is to store and transmit genetic information necessary for the growth, development, functioning, and reproduction of all living organisms.

Question: What role does RNA play in protein synthesis?

Answer: RNA plays a crucial role in protein synthesis by:
- Carrying the genetic code from DNA to the ribosome (mRNA)
- Bringing the appropriate amino acids to the ribosome (tRNA)
- Forming the core structure of the ribosome (rRNA)

3. The Process of Transcription and Translation

Question: What is transcription?

Answer: Transcription is the process by which the information in a gene is transferred to a messenger RNA (mRNA) molecule. This process involves:
1. The unwinding of the DNA double helix.
2. The synthesis of a complementary RNA strand from one of the DNA strands.
3. The processing of the mRNA before it exits the nucleus.

Question: What is translation?

Answer: Translation is the process of synthesizing proteins from the mRNA template. This occurs in the ribosome and involves:
1. The mRNA being read in sets of three nucleotides (codons).
2. tRNA molecules bringing the corresponding amino acids to the ribosome.
3. The formation of peptide bonds between amino acids to form a polypeptide chain, which folds into a functional protein.

Importance of Nucleic Acids in Biology

Nucleic acids are fundamental to the field of biology for several reasons:

1. Genetic Information

- Nucleic acids store and transmit genetic information from one generation to the next.
- They control the synthesis of proteins, which are critical for cellular structure, function, and regulation.

2. Biotechnology and Medicine

- Understanding nucleic acids has led to advancements in biotechnology, including genetic engineering, cloning, and gene therapy.
- Nucleic acid-based technologies are used in medical diagnostics, vaccine development, and the treatment of genetic disorders.

3. Evolution and Diversity

- The study of nucleic acids allows scientists to trace evolutionary relationships among species through comparative genomics.
- Genetic variation found within nucleic acids contributes to the diversity of life on Earth.

Conclusion

Nucleic acids are vital biomolecules that play a central role in the storage and transmission of genetic information. Understanding their structure and functions is essential for any student of biology. By answering common worksheet questions about nucleic acids, students can solidify their knowledge and gain a deeper appreciation for the complexity of life at the molecular level. Whether studying the intricacies of DNA and RNA or exploring their implications in biotechnology and medicine, nucleic acids remain a cornerstone of biological research and education.

Frequently Asked Questions

What are nucleic acids and what is their primary function?

Nucleic acids are biomolecules essential for all forms of life. Their primary function is to store and transmit genetic information, with DNA serving as the genetic blueprint and RNA playing a key role in protein synthesis.

What is the difference between DNA and RNA?

DNA (deoxyribonucleic acid) is double-stranded and contains the sugar deoxyribose, while RNA (ribonucleic acid) is single-stranded and contains the sugar ribose. Additionally, DNA uses thymine as a base, whereas RNA uses uracil.

How do nucleotides contribute to the structure of nucleic acids?

Nucleotides are the building blocks of nucleic acids, consisting of a nitrogenous base, a sugar, and a phosphate group. They link together through phosphodiester bonds to form the backbone of DNA and RNA strands.

What is a nucleic acids worksheet typically used for?

A nucleic acids worksheet is commonly used in educational settings to help students learn and reinforce concepts related to the structure, function, and types of nucleic acids, as well as their roles in genetics.

What are some common types of questions found in nucleic acids worksheets?

Common types of questions may include identifying the components of nucleotides, comparing DNA and RNA, explaining the process of transcription and translation, and solving problems related to base pairing.

How can students effectively study for a nucleic acids worksheet?

Students can effectively study by reviewing their notes, using flashcards for key terms, practicing with quizzes, and engaging in group discussions to clarify complex concepts related to nucleic acids.

What role do enzymes play in nucleic acid functions?

Enzymes, such as DNA polymerase and RNA polymerase, are crucial for synthesizing nucleic acids. They facilitate processes like DNA replication and RNA transcription by catalyzing the addition of nucleotides.

Why is understanding nucleic acids important in biology?

Understanding nucleic acids is fundamental in biology because they are key to genetic inheritance, cellular function, and the molecular mechanisms underlying life processes, including heredity and evolution.

What is the significance of base pairing in nucleic acids?

Base pairing is essential for the stability of the DNA double helix and for accurate replication and transcription. Adenine pairs with thymine (or uracil in RNA), and cytosine pairs with guanine, ensuring complementary sequences.

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