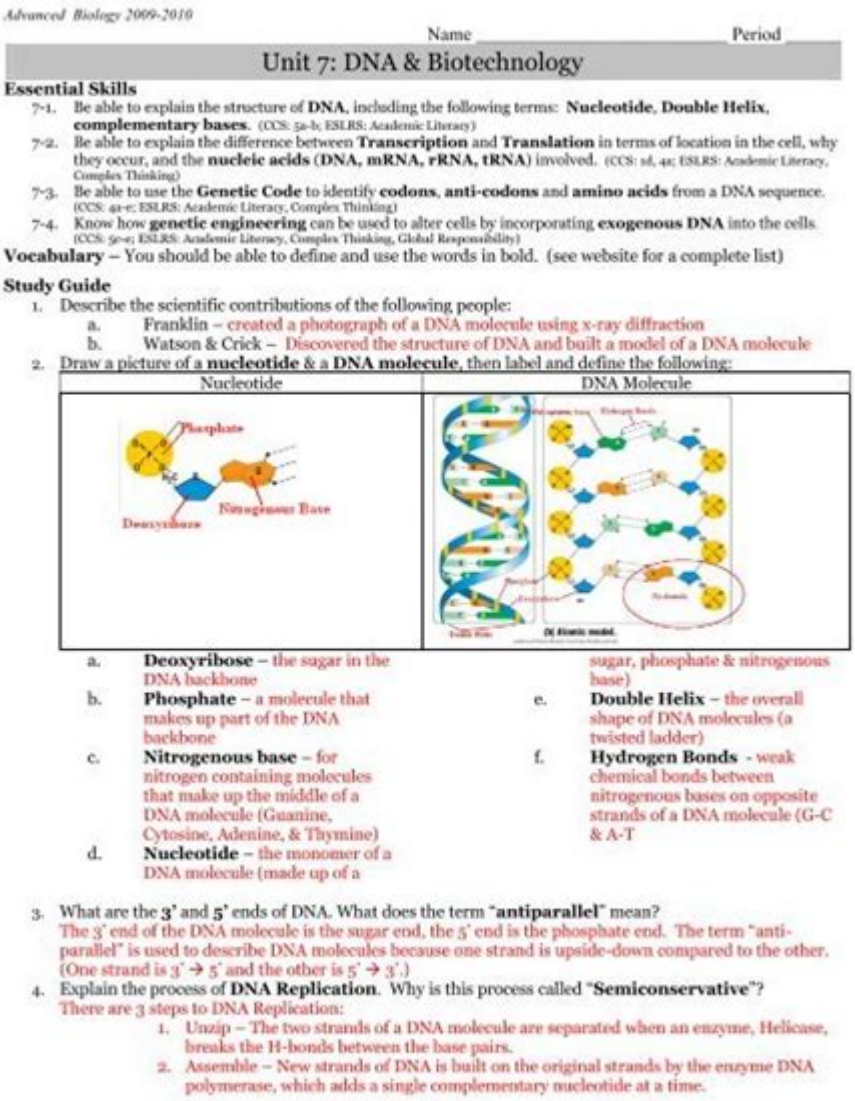
Dna Double Helix Worksheet Answer Key



Advanced Biology 2009-2010

Name _____ Period ____

Unit 7: DNA & Biotechnology

Essential Skills

7-1. Be able to explain the structure of **DNA**, including the following terms: **Nucleotide**, **Double Helix**, **complementary bases**. (CCS: 5a-b; ESLRS: Academic Literacy)

7-2. Be able to explain the difference between **Transcription** and **Translation** in terms of location in the cell, why they occur, and the **nucleic acids (DNA, mRNA, rRNA, tRNA)** involved. (CCS: 1d, 4a; ESLRS: Academic Literacy, Complex Thinking)

7-3. Be able to use the **Genetic Code** to identify **codons**, **anti-codons** and **amino acids** from a DNA sequence. (CCS: 4a-e; ESLRS: Academic Literacy, Complex Thinking)

7-4. *Know* how **genetic engineering** can be used to alter cells by incorporating **exogenous DNA** into the cells. (CCS: 5a-e; ESLRS: Academic Literacy, Complex Thinking, Global Responsibility)

Vocabulary – You should be able to define and use the words in bold. (see website for a complete list)

Study Guide

1. Describe the scientific contributions of the following people:
   a. Franklin – created a photograph of a DNA molecule using x-ray diffraction
   b. Watson & Crick – Discovered the structure of DNA and built a model of a DNA molecule
2. Draw a picture of a **nucleotide** & a **DNA molecule**, then label and define the following:

Nucleotide	DNA Molecule

   a. **Deoxyribose** – the sugar in the DNA backbone
   b. **Phosphate** – a molecule that makes up part of the DNA backbone
   c. **Nitrogenous base** – for nitrogen containing molecules that make up the middle of a DNA molecule (Guanine, Cytosine, Adenine, & Thymine)
   d. **Nucleotide** – the monomer of a DNA molecule (made up of a sugar, phosphate & nitrogenous base)
   e. **Double Helix** – the overall shape of DNA molecules (a twisted ladder)
   f. **Hydrogen Bonds** - weak chemical bonds between nitrogenous bases on opposite strands of a DNA molecule (G-C & A-T

3. What are the **3'** and **5'** ends of DNA. What does the term "**antiparallel**" mean?
   The 3' end of the DNA molecule is the sugar end, the 5' end is the phosphate end. The term "anti-parallel" is used to describe DNA molecules because one strand is upside-down compared to the other. (One strand is 3' → 5' and the other is 5' → 3'.)
4. Explain the process of **DNA Replication**. Why is this process called "**Semiconservative**"?
   There are 3 steps to DNA Replication:
   1. Unzip – The two strands of a DNA molecule are separated when an enzyme, Helicase, breaks the H-bonds between the base pairs.
   2. Assemble – New strands of DNA is built on the original strands by the enzyme DNA polymerase, which adds a single complementary nucleotide at a time.

DNA double helix worksheet answer key is a valuable educational resource that helps students understand the structure and function of DNA, the molecule that carries genetic information in living organisms. The worksheet typically includes questions and activities related to the double helix model of DNA, its components, and its role in heredity and protein synthesis. This article will provide a comprehensive overview of the DNA double helix, common questions found in worksheets, and the corresponding answers to facilitate learning.

Understanding the DNA Double Helix Structure

The DNA double helix is one of the most iconic structures in biology. This section will cover the essential components of the DNA molecule and how they contribute to its function.

Components of DNA

DNA, or deoxyribonucleic acid, is composed of several key components:

1. Nucleotides: The basic building blocks of DNA, each nucleotide consists of three parts:
- A phosphate group
- A deoxyribose sugar
- A nitrogenous base (adenine, thymine, cytosine, or guanine)

2. Nitrogenous Bases: There are four types of nitrogenous bases in DNA, which pair specifically:
- Adenine (A) pairs with Thymine (T)
- Cytosine (C) pairs with Guanine (G)

3. Sugar-Phosphate Backbone: The nucleotides are linked together by covalent bonds between the phosphate group of one nucleotide and the deoxyribose sugar of another, forming the sugar-phosphate backbone of the helix.

4. Antiparallel Strands: The two strands of DNA run in opposite directions (5′ to 3′ and 3′ to 5′), which is crucial for the replication and function of the molecule.

The Double Helix Model

In 1953, James Watson and Francis Crick proposed the double helix model of DNA, which describes how two strands of DNA coil around each other. Key features of the double helix include:

- Complementary Base Pairing: A pairs with T, and C pairs with G, ensuring accurate replication.
- Major and Minor Grooves: The twisting of the helix creates grooves that are important for protein binding.
- Stability: Hydrogen bonds between base pairs and hydrophobic interactions among the bases stabilize the structure.

The Role of DNA in Biology

DNA is not only a structural molecule but also plays a crucial role in various biological processes.

Genetic Information Storage

DNA serves as a repository of genetic information, encoding the instructions for building and maintaining an organism. Each segment of DNA that codes for a specific protein is known as a gene.

Replication

DNA replication is a vital process that ensures genetic information is passed on during cell division. The steps include:

1. Unwinding: The double helix unwinds, and the hydrogen bonds between the base pairs break.
2. Complementary Base Pairing: As the strands separate, new nucleotides are added to each original strand following base-pairing rules.
3. Formation of Two Identical Helices: The result is two identical copies of DNA, each containing one original and one new strand (semi-conservative replication).

Protein Synthesis

DNA is also responsible for directing the synthesis of proteins through two key processes: transcription and translation.

1. Transcription: The DNA sequence of a gene is transcribed into messenger RNA (mRNA) in the nucleus.
2. Translation: The mRNA is translated into a specific protein sequence at the ribosome, with the help of transfer RNA (tRNA) molecules that bring the appropriate amino acids.

Common Questions in DNA Double Helix Worksheets

Educational worksheets on the DNA double helix typically contain a variety of questions that test students' understanding of the structure and function of DNA. Here are some common question types:

Fill-in-the-Blank Questions

These questions often require students to complete sentences about DNA structure or function. Examples include:

- The DNA double helix consists of two _____ strands.
- The four nitrogenous bases in DNA are _____, _____, _____, and _____.

Multiple Choice Questions

These questions provide several options for students to choose from. For example:

- Which of the following bases pairs with adenine?
- A) Cytosine
- B) Thymine
- C) Guanine
- D) Uracil

- What is the shape of the DNA molecule?
- A) Linear
- B) Circular
- C) Double helix
- D) Single strand

Labeling Diagrams

Worksheets may include diagrams of the DNA structure for students to label, including:

- The sugar-phosphate backbone
- The nitrogenous bases
- Major and minor grooves

Answer Key for DNA Double Helix Worksheets

Providing an answer key is essential for educators and students alike. Below are sample answers for the types of questions previously mentioned.

Sample Fill-in-the-Blank Answers

- The DNA double helix consists of two antiparallel strands.
- The four nitrogenous bases in DNA are adenine, thymine, cytosine, and guanine.

Sample Multiple Choice Answers

- Which of the following bases pairs with adenine?
B) Thymine

- What is the shape of the DNA molecule?
C) Double helix

Labeling Diagrams Answers

When labeling a diagram, students should correctly identify:

- The sugar-phosphate backbone on the outer sides of the helix.
- The nitrogenous bases forming the rungs of the ladder.
- The major and minor grooves where proteins can bind.

Importance of DNA Education

Understanding the DNA double helix is fundamental to numerous fields, including genetics, molecular biology, and biotechnology. Education about DNA can lead to advancements in medicine, agriculture, and environmental science. By utilizing worksheets and answer keys, educators can effectively teach these concepts, allowing students to grasp the vital role DNA plays in life.

Future Directions in DNA Research

As our understanding of DNA continues to evolve, so does the potential for new discoveries and applications. Areas of interest include:

1. Gene Editing: Technologies like CRISPR-Cas9 allow for precise modifications to DNA, opening possibilities for treating genetic disorders.
2. Synthetic Biology: Researchers are exploring the design of synthetic DNA and organisms to create new biological systems.
3. Personalized Medicine: Understanding an individual's genetic makeup can lead to tailored medical treatments and interventions.

Conclusion

The DNA double helix worksheet answer key serves as a vital educational tool, enhancing students' knowledge of this essential biological molecule. By exploring the structure, function, and significance of DNA, students can better appreciate the complexities of genetics and molecular biology, paving the way for future discoveries in science and medicine. Through engaging worksheets and comprehensive answer keys, educators can foster a deeper understanding of DNA and its crucial role in life.

Frequently Asked Questions

What is the structure of the DNA double helix?

The DNA double helix consists of two long strands of nucleotides twisted around each other, forming a spiral shape, with the sugar and phosphate backbone on the outside and nitrogenous bases pairing in the center.

What are the key components of a DNA nucleotide?

A DNA nucleotide is composed of three main components: a phosphate group, a deoxyribose sugar, and one of four nitrogenous bases (adenine, thymine, cytosine, or guanine).

How do the nitrogenous bases pair in the DNA double helix?

In the DNA double helix, adenine pairs with thymine (A-T) and cytosine pairs with guanine (C-G) through hydrogen bonds, creating complementary base pairing.

What is the significance of the antiparallel strands in DNA?

The antiparallel nature of the DNA strands means that one strand runs in the 5′ to 3′ direction while the other runs in the 3′ to 5′ direction, which is crucial for DNA replication and function.

What role does the DNA double helix play in genetic information storage?

The DNA double helix serves as the storage structure for genetic information, where the sequence of nitrogenous bases encodes the instructions for building proteins and regulating cellular functions.

How is the DNA double helix related to the process of DNA replication?

During DNA replication, the double helix unwinds and separates into two strands, allowing each strand to serve as a template for synthesizing new complementary strands, ultimately resulting in two identical DNA molecules.

What is the purpose of a DNA double helix worksheet?

A DNA double helix worksheet is designed to help students learn and reinforce their understanding of DNA structure, function, base pairing, and the processes of replication and transcription.

Where can I find a reliable answer key for a DNA double helix worksheet?

Reliable answer keys for DNA double helix worksheets can often be found through educational resources, textbooks, or reputable online educational platforms that provide study materials and answers.

pdf

Dna Double Helix Worksheet Answer Key

DNA 的结构和功能是什么？ - 知乎
DNA，全称为脱氧核糖核酸（Deoxyribonucleic acid），是生物体内存储遗传信息的分子，是构成生物体的基本遗传物质之一。DNA的结构和功能如下： DNA的结构： 1. 双螺旋结构：DNA分 …

DNA 是如何储存遗传信息的？ - 知乎
DNA就是遗传信息，存在于染色体上，染色体上有遗传物质的结构和功能单位——基因（gene），基因是决定一定功能产物的DNA序列。这种功能产物主要是蛋白质和RNA。蛋白 …

如何根据核酸分子大小选择合适的琼脂糖凝胶浓度？ - 知乎
2.0%琼脂糖凝胶：适用于较小的DNA分子，如500 bp以下的线性DNA分子。需要注意的是，琼脂糖凝胶浓度的选择还取决于具体的实验目的和条件。因此，在选择琼脂糖凝胶浓度时，需要 …

为什么*DNA*会呈现双螺旋结构？ - 知乎
DNA分子中两条核苷酸链的整体几何形状为上图所示的双螺旋结构。每个螺旋对应一个核苷酸链，两条链通过腺嘌呤-胸腺嘧啶或鸟嘌呤-胞嘧啶对连接在一起。这些碱基对堆叠在一起，它们 …

基因、染色体、蛋白质、DNA、RNA 之间的关系是什么？ - 知乎
但是，RNA和DNA在组成上的主要差别是：①RNA的糖分子是核糖，DNA的是脱氧核糖，②四种碱基中有一种不同。所以让我们来总结一下他们的物质关系：染色体包含DNA，蛋白质（组 …

基因组**DNA**提取的原理和实验步骤是什么**？** - 知乎
外源DNA准备：提取和纯化含有目的基因的外源DNA，并将其溶解在合适的缓冲液中。授粉与处理：在植物开花期进行人工授粉，授粉后一定时间（如12-24小时），用微量注射器将外 …

转染时，为什么要将*PEI*加到质粒*DNA*中混合，而不是相反的？
按照以下体系配制DNA-PEI核酸-转染试剂复合物： 1.对于每孔细胞，使用100 μL无血清培养基稀释2 μg目的DNA，充分混匀成DNA稀释液。

DNA 和 RNA 有什么区别？ - 知乎
DNA的本质是脱氧核糖核酸，RNA是核糖核酸。DNA由脱氧 核糖核苷酸 组成，RNA由核糖核苷酸组成。也就是说DNA的基本单位是脱氧核糖核苷酸，脱氧核糖核苷酸与核糖核苷酸都是由一分 …

*DNA*电泳时，怎么判断*DNA*的电泳方向*？* - 知乎
DNA 分子的pI在4~4.5之间，而琼脂糖凝胶电泳常用缓冲液的pH一般在6~9之间，此时，缓冲溶液的pH大于DNA的 pI,DNA带负电荷。因此，在凝胶电泳时DNA分子会由负极向正极移动。

二苯胺检测**DNA**的原理是什么？ - 知乎
二苯胺检测DNA的原理主要是基于DNA分子中2-脱氧核糖残基在酸性溶液中加热降解后，与二苯胺反应生成蓝色化合物的特性进行鉴定。具体来说，DNA分子中的2-脱氧核糖在酸性条件下会 …

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DNA就是遗传信息，存在于染色体上，染色体上有遗传物质的结构和功能单位——基因（gene），基因是决定一定功能产物的DNA序列。这种功能产物主要是蛋白质和RNA。蛋白质和RNA决定了不同生物的性状不同，也决定了同种生物不同个体之间的性状差异。 1、DNA的组成 DNA，中文全称脱氧核糖核苷酸 ...

如何根据核酸分子大小选择合适的琼脂糖凝胶浓度？ - 知乎

2.0%琼脂糖凝胶：适用于较小的DNA分子，如500 bp以下的线性DNA分子。需要注意的是，琼脂糖凝胶浓度的选择还取决于具体的实验目的和条件。因此，在选择琼脂糖凝胶浓度时，需要考虑实验需要的分离效果和核酸分子的大小，并结合实验条件和经验进行调整。

为什么**DNA**会呈现双螺旋结构？ - 知乎

DNA分子中两条核苷酸链的整体几何形状为上图所示的双螺旋结构。每个螺旋对应一个核苷酸链，两条链通过腺嘌呤-胸腺嘧啶或鸟嘌呤-胞嘧啶对连接在一起。这些碱基对堆叠在一起，它们的平面垂直于两个螺旋的轴线。这将疏水碱基对置于结构内部，并允许亲水的糖和磷酸基团与外部的水接触。整个 ...

基因、染色体、蛋白质、*DNA*、*RNA* 之间的关系是什么？ - 知乎

但是，RNA和DNA在组成上的主要差别是：①RNA的糖分子是核糖，DNA的是脱氧核糖，②四种碱基中有一种不同。所以让我们来总结一下他们的物质关系：染色体包含DNA，蛋白质（组分包含关系），基因（区域包含关系）；DNA包含基因；蛋白质，DNA，RNA互不包含，各为 ...

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Find the complete DNA double helix worksheet answer key here! Enhance your understanding of DNA structure and function. Learn more and boost your studies today!

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