

**Student Name:** \_\_\_\_\_

**Class:** \_\_\_\_\_

**Due Date:** \_\_\_\_\_

## Introduction to DNA


**Introduction to DNA:** DNA (Deoxyribonucleic acid) is a molecule that contains the genetic instructions used in the development and function of all living organisms.

**Importance of DNA:** DNA is often referred to as the "building blocks of life" because it contains the instructions for the development and function of all living things.

**Objective:** By the end of this assignment, students will be able to describe the structure and function of DNA, identify the different components of a nucleotide, and explain the role of DNA in storing genetic information.

## DNA Structure

Diagram of the DNA double helix:

 DNA Double Helix Diagram

Label the following components:

- Sugar-phosphate backbone
- Nitrogenous bases (adenine, guanine, cytosine, thymine)
- Nucleotides
- Hydrogen bonds between nitrogenous bases

Description of the DNA double helix: The DNA double helix is a twisted ladder-like structure made up of two complementary strands of nucleotides.

## Nucleotides

Definition of a nucleotide: A nucleotide is a molecule composed of a nitrogenous base, a sugar molecule (deoxyribose), and a phosphate group.

Components of a nucleotide:

- Nitrogenous base (adenine, guanine, cytosine, or thymine)
- Sugar molecule (deoxyribose)
- Phosphate group

Function of nucleotides: Nucleotides are the building blocks of DNA and RNA, and are used to store genetic information.

## Sugar-Phosphate Backbone

Description of the sugar-phosphate backbone: The sugar-phosphate backbone is the structural framework of DNA, made up of alternating sugar and phosphate molecules.

Function of the sugar-phosphate backbone: The sugar-phosphate backbone provides the structural support for the DNA molecule and protects the genetic information stored in the nitrogenous bases.

## Nitrogenous Bases

Description of the nitrogenous bases: The nitrogenous bases are the molecules that store genetic information in DNA.

Types of nitrogenous bases:

- Adenine (A)
- Guanine (G)
- Cytosine (C)
- Thymine (T)

Base pairing: Adenine pairs with thymine, and guanine pairs with cytosine.

## Hydrogen Bonds

Description of hydrogen bonds: Hydrogen bonds are weak chemical bonds that hold the two strands of the DNA double helix together.

Function of hydrogen bonds: Hydrogen bonds provide stability to the DNA molecule and allow for the replication and transcription of genetic information.

## Short Answer Questions

1. What are the three main components of a nucleotide?

2. Description of the structure of the sugar-phosphate backbone.

3. What is the role of hydrogen bonds in the DNA double helix?

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

## Case Study - Genetic Inheritance

Read the following case study: "A family has a history of a specific genetic disorder. The disorder is caused by a mutation in a specific gene. The gene is inherited in an autosomal dominant pattern. If a parent has the disorder, what is the probability that their child will inherit the disorder?"

1. What is the probability that the child will inherit the disorder if the parent is heterozygous for the mutation?

2. How does the autosomal dominant pattern of inheritance affect the probability of the child inheriting the disorder?



## Extension Activities

Research and describe the process of DNA replication, including the roles of helicase, primase, and DNA polymerase.

Research and discuss the applications and implications of genetic engineering, including the use of CRISPR technology.

## Conclusion

Summary of key points: DNA is a molecule that contains the genetic instructions used in the development and function of all living organisms. The DNA double helix is a twisted ladder-like structure made up of two complementary strands of nucleotides.

Reflection: What did you learn about DNA structure and function? How does this knowledge help you understand the importance of DNA in living organisms?