

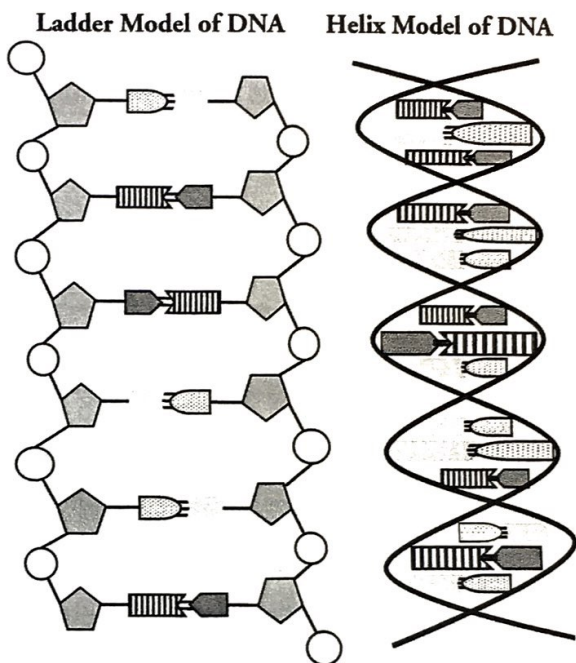
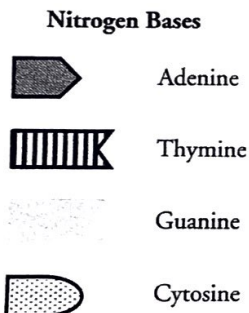
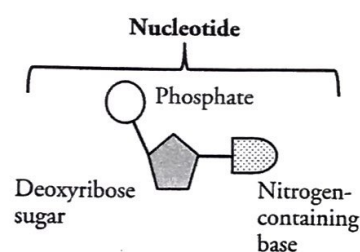
DNA Structure and Replication

How is genetic information stored and copied?

Why?

Deoxyribonucleic acid or **DNA** is the molecule of heredity. It contains the genetic blueprint for life. For organisms to grow and repair damaged cells, each cell must be capable of accurately copying itself. So how does the structure of DNA allow it to copy itself so accurately?

Model 1 – The Structure of DNA



1. Refer to the diagram in Model 1.

- What are the three parts of a nucleotide?
- What kind of sugar is found in a nucleotide?
- What are the four nitrogen bases shown in Model 1?

2. DNA is often drawn in a "ladder model." Locate this drawing in Model 1.

- Circle a single nucleotide on each side of the ladder model of DNA.
- Which part(s) of the nucleotide make up the rung, or parts your feet would step on, of the "ladder"?
- What part(s) of the nucleotide make up the rails, or parts your hands would hold, of the "ladder"?
- Look at the bottom and top of the "ladder" in Model 1. Are the rungs parallel (the ends match) or anti parallel (the ends of the strands are opposites)?

Name: _____ Date: _____ Period: _____

3. On the ladder model of DNA label each of the bases with the letters A, T, C, or G.

4. Refer to Model 1. When one nucleotide contains adenine, what type of base is the adenine attached to on the opposite nucleotide strand?

5. Refer to Model 1. When one nucleotide contains cytosine, what type of base is the cytosine attached to on the opposite nucleotide strand?

6. Use a complete sentence to write a rule for how the bases are arranged in the ladder model of DNA.

Read This!

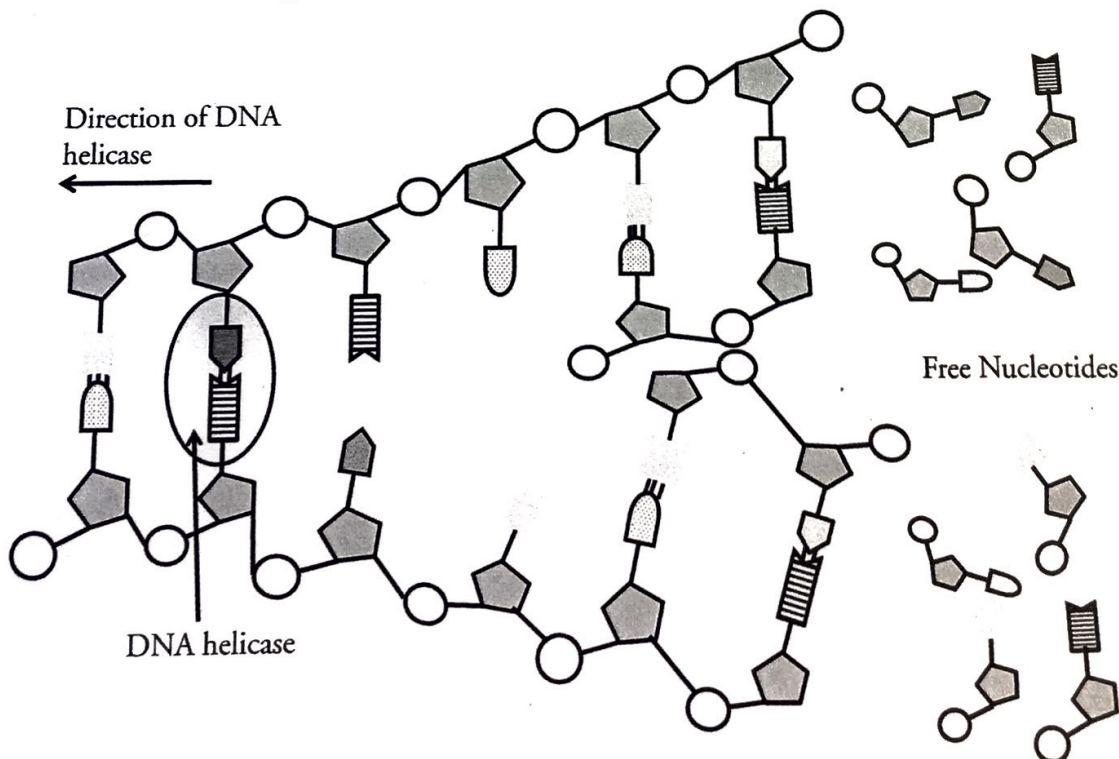
Erwin Chargaff (1905–2002), an Austrian-American biochemist, investigated the ratio of nucleotide bases found in the DNA from a variety of organisms. From his research, as well as research by Rosalind Franklin and Maurice Wilkins, Watson and Crick developed the **complementary base-pair** rule during their race to discover the structure of DNA. The complementary base-pair rule states that adenine and thymine form pairs across two strands, and guanine and cytosine form pairs across two strands.

7. Fill in the **complementary** bases on the strand below according to the base pair rule.

A T C C A G T T C G

8. The ladder model of DNA is a simplified representation of the actual structure and shape of a DNA molecule. In reality, the strands of DNA form a **double helix**. Refer to the double helix diagram in Model 1 and describe its shape using a complete sentence.

Model 2 – DNA Replication



Name: _____ Date: _____ Period: _____

9. Examine Model 2. Number the steps below in order to describe the replication of DNA in a cell.

- _____ Hydrogen bonds between nucleotides form.
- _____ Hydrogen bonds between nucleotides break.
- _____ Strands of DNA separate.
- _____ Free nucleotides are attracted to exposed bases on the loose strands of DNA.

10. What is the rule used to join the free nucleotides to the exposed bases of DNA?



11. This type of replication is called **semi-conservation replication**. Consider the meaning of these words (semi- half; conserve- to keep), explain why DNA replication is called semi conservation.

12. DNA molecules can be tens of thousands of base pairs in length. Mistakes in DNA replication can lead to mutation, which may or may not be harmful to an organism. How does semi-conservation replication help prevent mutations during DNA replication?

13. The proportions of the bases are consistent within a species; however they do vary between species. Using the base-pair rules, complete the following table to show the percentage of each type of base in the five different organisms.

Organism	Percentage of each type of base			
	Adenine	Guanine	Cytosine	Thymine
Human	31		19	
Cow	28	22		
Salmon			21	29
Wheat	27			
Yeast	31	19		

Refer to textbook pg. 356. Write the **entire question and the correct answer** for each of the questions identified below:

9.

10.

11.