Name:	Date:
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Student Exploration: Building DNA

Vocabulary: double helix, DNA, enzyme, mutation, nitrogenous base, nucleoside, nucleotide, replication

Prior Knowledge Questions (Do these BEFORE using the Gizmo.) **DNA** is an incredible molecule that forms the basis of life on Earth. DNA molecules contain instructions for building every living organism on Earth, from the tiniest bacterium to a massive blue whale. DNA also has the ability to **replicate**, or make copies of itself. This allows living things to grow and reproduce.

1.	Look at the DNA molecule shown at right. What does it look like?

This shape is called a **double helix**.

2. Based on this picture, how do you think a DNA molecule makes a copy of itself? (Hint: Look at the bottom two "rungs" of the ladder.)



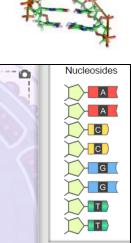
Gizmo Warm-up

The Building DNA Gizmo $^{\mathsf{TM}}$ allows you to construct a DNA molecule and go through the process of DNA replication. Examine the components that make up a DNA molecule.

- 1. What are the two DNA components shown in the Gizmo?
- A nucleoside has two parts: a pentagonal sugar (deoxyribose) and a nitrogenous base (in color). When a nucleoside is joined to a phosphate, it is called a nucleotide.

How many different nitrogenous bases do you see?

Note: The names of these nitrogenous bases are adenine (red), cytosine (yellow), guanine (blue), and thymine (green).



Phosphates

Activity A:

Get the Gizmo ready:

Build a DNA molecule

 If necessary, click Reset to start the building process.

Left side



Right side

1.	Build: Follow the steps given in the Gizmo to
	construct a molecule of DNA. (Note: For simplicity,
	this DNA molecule is shown in two dimensions, without the twist.)
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Stop when the hint reads: "The DNA molecule is complete." In the spaces at right, list the sequence of nitrogenous bases on the left-hand side of the DNA molecule and the right-hand side.

2.	Take a picture: Click the camera () to take a
	snapshot of your DNA molecule. Right-click the
	image and select Copy Image. Paste the image
	into a blank document, and label this image
	"Original DNA molecule."

3.	Explain: Describe the structure of the DNA molecule	you made.
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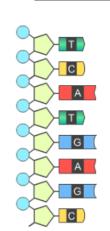
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R	What makes up the "rungs'	' of the DNA molecule?	
υ.	What makes up the rungs	OF THE DIAM HIGHERINE:	

4.	Fill in: Write the name	of the nitrogenous	base that joins to	each of the bases b	elow:
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Adenine (A) joins to	Thymine (T) joins to	
Cytosine (C) joins to	Guanine (G) joins to	

- 5. <u>Practice</u>: The left side of a DNA molecule is shown. Draw a complementary right side of the molecule.
- 6. <u>Challenge</u>: This DNA strand consists of eight pairs of nitrogenous bases. How many different sequences of eight bases can you make? Explain how you found your answer.





Activity	B
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Get the Gizmo ready:

DNA replication

• Be sure the hint reads: "The DNA molecule is complete." If not, click **Reset** and build a new DNA molecule.



Question: How does DNA make a copy of itself?

1.	Observe: An enzyme is a protein that facilitates certain cell processes. Click Release enzyme to release DNA helicase. What does this enzyme do to the DNA molecule?
2.	Observe: Click Release enzyme to release DNA polymerase.
	A. Notice that two groups of Nucleotides appear on the right. What are the <i>three</i> parts of a nucleotide?
	B. Drag one of the nucleotides to a corresponding nitrogenous base on one of the two strands. What is the role of DNA polymerase in this process?
3.	<u>Build</u> : Complete the two molecules of DNA by dragging nucleotides to their corresponding locations. When you have finished, compare the two completed daughter DNA molecules.
	What do you notice about the two molecules?
4.	<u>Take a picture</u> : Click the camera to take a snapshot of the DNA molecules, and paste the image into your document. Label this image "Daughter DNA molecules."
	How do these molecules compare to the original?
5.	Think and discuss: Why is DNA replication such an important process?
6.	Extend your thinking: Sometimes errors called mutations occur during DNA replication. What are some of the possible consequences of mutations?

