Two Molecules, One Message

Compare how DNA and RNA store and use genetic information

FB.4.1 "Compare and contrast the basic structure and function of nucleic acids (e.g., DNA, RNA)."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline two features DNA and RNA share, circle their structural differences, and number the steps that move information from DNA to a protein.

Making Insulin

1. After a meal, cells in the pancreas release insulin, a protein that helps the body manage blood sugar. To make insulin, a cell uses two nucleic acids: DNA and RNA. Both are long chains of units called nucleotides. Each nucleotide contains a sugar, a phosphate group, and a nitrogen base. The order of bases carries information, much as the order of letters changes a message. DNA stores the instructions for making insulin and many other molecules. RNA helps put those instructions to work. These shared building blocks make DNA and RNA related, but their structures suit different jobs.

2. In a human cell, DNA usually remains in the nucleus. Its two strands twist into a double helix. The sugar in its backbone is deoxyribose, and its four bases are adenine (A), thymine (T), cytosine (C), and guanine (G). Bases on opposite strands pair in a predictable way: A with T, and C with G. The paired strands help the cell copy DNA accurately before it divides. DNA's stable, double-stranded structure makes it well suited for long-term storage of genetic information. A pancreatic cell does not send its whole DNA molecule to the place where insulin is assembled.

3. Instead, the cell makes a messenger RNA (mRNA) copy of the insulin gene's instructions. RNA usually has one strand, contains ribose rather than deoxyribose, and uses uracil (U) instead of thymine. During copying, RNA bases match the DNA template: A in DNA pairs with U in RNA, while C pairs with G. The mRNA leaves the nucleus and reaches a ribosome, where its base sequence guides the order of amino acids in insulin. Other RNA molecules help assemble the protein. DNA preserves the recipe; RNA carries and uses information from that recipe.

2 ANSWER WITH EVIDENCE

Use the passage

1. What are two structural features DNA and RNA share, and which sugar is found in each?

2. How do DNA and RNA differ in their usual number of strands? How does the passage connect DNA's structure to its job?

3. Which base is found in RNA instead of thymine? Compare what pairs with A in DNA when DNA is copied and when an RNA copy is made.

4. When a pancreatic cell makes insulin, how do the jobs of DNA and mRNA differ? What feature lets both carry information?

3 YOUR TURN

Your own words

A skin cell needs to make a protein that helps repair a cut. Explain to a classmate why the cell needs both DNA and RNA for this task. Include one feature they share, two structural differences, and their different roles.

ANSWER KEY

Two Molecules, One Message

HIGH SCHOOL · FB.4.1

PART 1 · READ AND MARK

Underline two features DNA and RNA share, circle their structural differences, and number the steps that move information from DNA to a protein. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What are two structural features DNA and RNA share, and which sugar is found in each?	**Both are nucleotide chains, and each nucleotide contains a sugar, phosphate group, and base. DNA contains deoxyribose; RNA contains ribose.**
2	How do DNA and RNA differ in their usual number of strands? How does the passage connect DNA's structure to its job?	**DNA has two strands, while RNA usually has one. DNA's stable, double-stranded structure suits long-term information storage.**
3	Which base is found in RNA instead of thymine? Compare what pairs with A in DNA when DNA is copied and when an RNA copy is made.	**RNA uses uracil instead of thymine. A pairs with T in DNA and with U in an RNA copy.**
4	When a pancreatic cell makes insulin, how do the jobs of DNA and mRNA differ? What feature lets both carry information?	**DNA stores the instructions; mRNA carries a copy to a ribosome, where its sequence guides amino acid order. In both molecules, the order of bases carries information.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

A skin cell keeps the instructions for a repair protein in DNA. DNA and RNA are both chains of nucleotides whose base order carries information. DNA has two strands and contains deoxyribose, while RNA usually has one strand and contains ribose. The cell makes an mRNA copy of the needed instructions. DNA stores the information, and mRNA carries it to a ribosome, where it helps guide the order of amino acids in the repair protein.

Accept either sugar or base differences as structural comparisons. Students should distinguish DNA's storage role from RNA's role in using the instructions to make a protein.