

DNA

The double helix and the base-pairing rule



7

printable sheets

17

pages

All

answer keys included

DNA Teaching Pack

The double helix and the base-pairing rule

How to use this pack. The sheets are in a suggested teaching order: show the labeled diagram, have students label the blank one, then work through the practice sheets and finish with the quiz. Use them all over a week or pick the ones you need. The answer keys are together at the back.

What is inside

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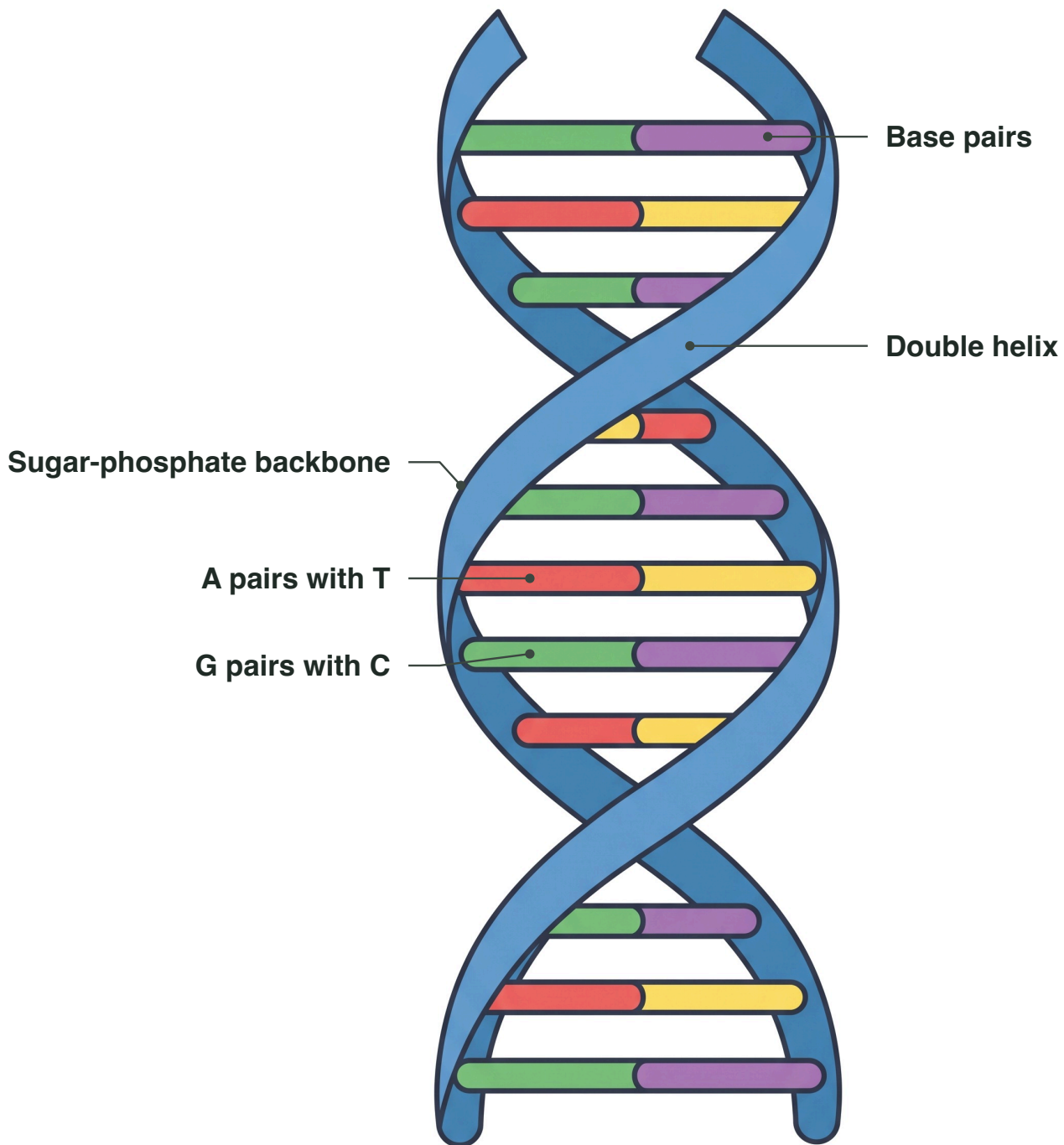
DNA Quiz 10

Answer keys

Every answer key, in the same order 12

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DNA Structure



DNA Structure

Name: _____

Write the name of each part on its line. Use the word bank.



Word bank

A pairs with T

Base pairs

Double helix

G pairs with C

Sugar-phosphate backbone

DNA Parts and Key Words

Use the labeled DNA structure diagram to help you.

Part A. Write the word or words that fit each description.

Word bank

A pairs with T

Base

Base pairs

Chromosome

Double helix

G pairs with C

Gene

Nucleus

Sugar-phosphate backbone

Trait

1. The rungs of the ladder. Each one is made of two parts joined in the middle. _____
2. A section of DNA that carries one set of instructions. _____
3. The twisted-ladder shape of a DNA molecule. _____
4. The pairing rule for the bases adenine and thymine. _____
5. The control center of the cell. It holds most of the cell's DNA. _____
6. The two long strands that form the sides of the ladder. _____
7. A tightly coiled package of DNA. _____
8. The pairing rule for the bases guanine and cytosine. _____
9. A feature of a living thing, such as eye color. _____
10. One of the four chemical "letters" of DNA. _____

Part B. Answer the questions.

1. DNA is shaped like a twisted ladder. Which part forms the sides of the ladder? Which part forms the rungs?

2. One strand of DNA has the bases A, G and T in a row. Which bases are across from them on the other strand?

3. Write these three in order from smallest to largest: chromosome, base, gene.

The Code Inside Your Cells

Read the text. Then answer the questions on the next page.

- 1 Why do you have your mother's eyes or your father's chin? The answer is a molecule called **DNA**. DNA carries the instructions for building and running a living thing. Every living thing has it. In your cells, almost all of the DNA is kept inside the **nucleus**.
- 2 A DNA molecule is shaped like a twisted ladder. Scientists call this shape a **double helix**. The two sides of the ladder are long strands called the **sugar-phosphate backbone**. They are chains of sugars and phosphates. The rungs of the ladder are the **base pairs**. Each rung is made of two **bases** joined in the middle.
- 3 DNA has four bases: **adenine**, **thymine**, **guanine** and **cytosine**. They are written as A, T, G and C. The bases follow a strict pairing rule. A always pairs with T, and G always pairs with C. So if you know the bases on one strand, you can work out the bases on the other strand.
- 4 The order of the bases is a code, like letters that spell out words. A **gene** is a section of DNA that carries one set of instructions. Most genes tell the cell how to make a protein. Proteins build your body and do much of its work. In this way, your genes shape your **traits**, such as eye color and blood type.
- 5 A cell holds a lot of DNA, so the DNA is packed tightly. Each long DNA molecule is coiled into a package called a **chromosome**. The nucleus of a human body cell holds 46 chromosomes. Half came from the mother and half from the father. Before a cell divides, it copies its DNA. First, the two strands separate. Next, new bases pair up with the bases on each strand. In the end, there are two matching DNA molecules, one for each new cell.



A DNA molecule. The blue strands are the backbone. The colored rungs are base pairs.

The Code Inside Your Cells: Questions

Go back to the text to find each answer. The paragraphs are numbered to help you.

1. What is this text mostly about?

- ☐ How cells divide in two
- ☐ What DNA is, how it is built and what it does
- ☐ Why people have different eye colors
- ☐ How proteins build the body

2. Where is almost all of the DNA in your cells kept?

- ☐ In the cell membrane
- ☐ In the cytoplasm
- ☐ In the nucleus
- ☐ In the proteins

3. What are the rungs of the DNA ladder made of?

4. Which base always pairs with guanine (G)?

- ☐ Adenine (A)
- ☐ Thymine (T)
- ☐ Cytosine (C)
- ☐ Another guanine (G)

5. One strand of DNA has the bases T, T, G, A in a row. What are the bases on the matching strand?

6. What is a gene?

- ☐ A kind of protein
- ☐ A section of DNA
- ☐ One of the four bases
- ☐ A package of 46 chromosomes

7. Number the steps 1, 2 and 3 to show how DNA is copied (paragraph 5).

- ☐ New bases pair up with the bases on each strand.
- ☐ There are two matching DNA molecules.
- ☐ The two strands separate.

8. How does the pairing rule help a cell make a matching copy of its DNA?

Base-Pairing Practice

The pairing rule: A pairs with T, and G pairs with C. Read the bases on one strand. Write the bases on the matching strand, in the same order.

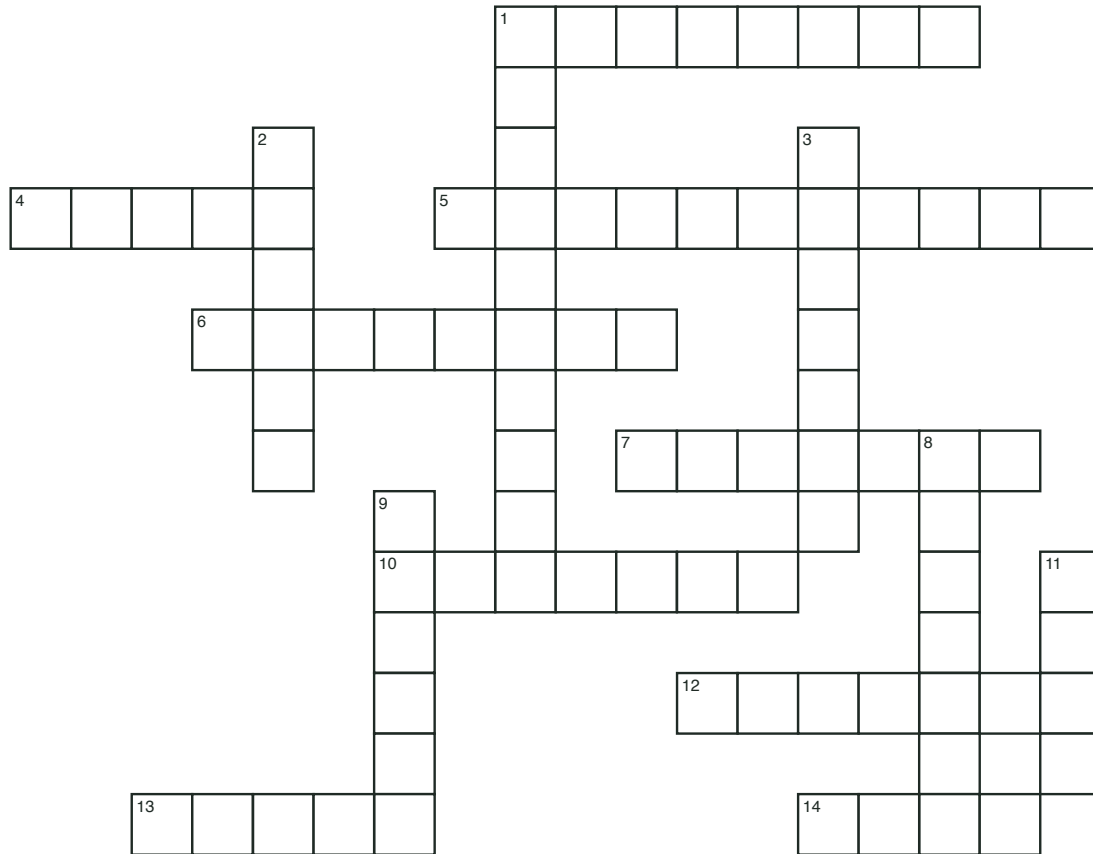
ONE STRAND READS	THE RULE TO USE	THE MATCHING STRAND
1. A	Adenine pairs with thymine.	_____
2. G	Guanine pairs with cytosine.	_____
3. T	Thymine pairs with adenine.	_____
4. C	Cytosine pairs with guanine.	_____
5. A G	Find the partner of each base, from left to right.	_____
6. C A T	A pairs with T. G pairs with C.	_____
7. T A C G	Each of the four bases shows up once.	_____
8. G A T C	Work one base at a time.	_____
9. A T G C	Check each pair: A with T, G with C.	_____
10. C T A G	The rule works both ways: T pairs with A, and C pairs with G.	_____

Your turn

One strand of DNA reads C C A T G A. Write the matching strand. Then tell how you worked it out.

DNA Crossword

Read each clue. Write the answer in the puzzle, one letter in each box. Use the word bank if you get stuck.



ACROSS

1. It pairs with guanine. Its letter is C.
4. A feature of a living thing, such as eye color.
5. The twisted shape of a DNA molecule (2 words).
6. The sugar-phosphate ____ forms the two sides of the DNA ladder.
7. It pairs with cytosine. Its letter is G.
10. It pairs with thymine. Its letter is A.
12. Most genes tell the cell how to make one of these.
13. Along with phosphate, it makes up the sides of the DNA ladder.
14. One of the four chemical "letters" of DNA.

DOWN

1. A tightly coiled package of DNA.
2. One side of the DNA ladder. A DNA molecule has two.
3. It pairs with adenine. Its letter is T.
8. The control center of the cell. It holds most of the cell's DNA.
9. DNA is shaped like a twisted one of these.
11. A section of DNA that carries one set of instructions.

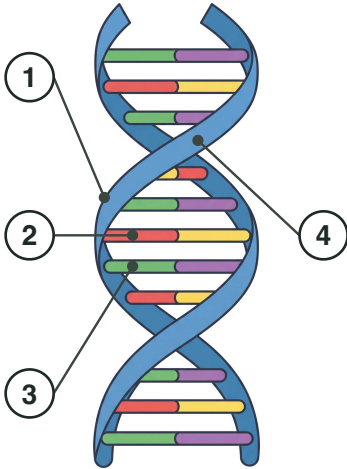
Word bank adenine backbone base chromosome cytosine double helix gene guanine
ladder nucleus protein strand sugar thymine trait

DNA Quiz

Score _____ / 12

In the picture, adenine is red and thymine is yellow. One number points to a single strand. Another points to the place where the two strands twist around each other.

Part A. This is a DNA molecule. Write the name of each part.



- 1 _____
- 2 _____
- 3 _____
- 4 _____

A pairs with T · Double helix · G pairs with C · Sugar-phosphate backbone

Part B. Choose the best answer.

1. What forms the rungs of the DNA ladder?
 - ☐ Sugars
 - ☐ Phosphates
 - ☐ Base pairs
 - ☐ Genes
2. Which base pairs with cytosine (C)?
 - ☐ Adenine (A)
 - ☐ Thymine (T)
 - ☐ Guanine (G)
 - ☐ Another cytosine (C)
3. What is a gene?
 - ☐ A section of DNA
 - ☐ A kind of cell
 - ☐ A kind of sugar
 - ☐ One of the four bases
4. Where is almost all of the DNA in a plant or animal cell?
 - ☐ In the cell membrane
 - ☐ In the nucleus
 - ☐ In the cytoplasm
 - ☐ In the vacuole
5. How many different bases does DNA have?
 - ☐ Two
 - ☐ Three
 - ☐ Four
 - ☐ Six
6. What is a tightly coiled package of DNA called?
 - ☐ A protein
 - ☐ A base pair
 - ☐ A trait
 - ☐ A chromosome

Part C. Write your answer.

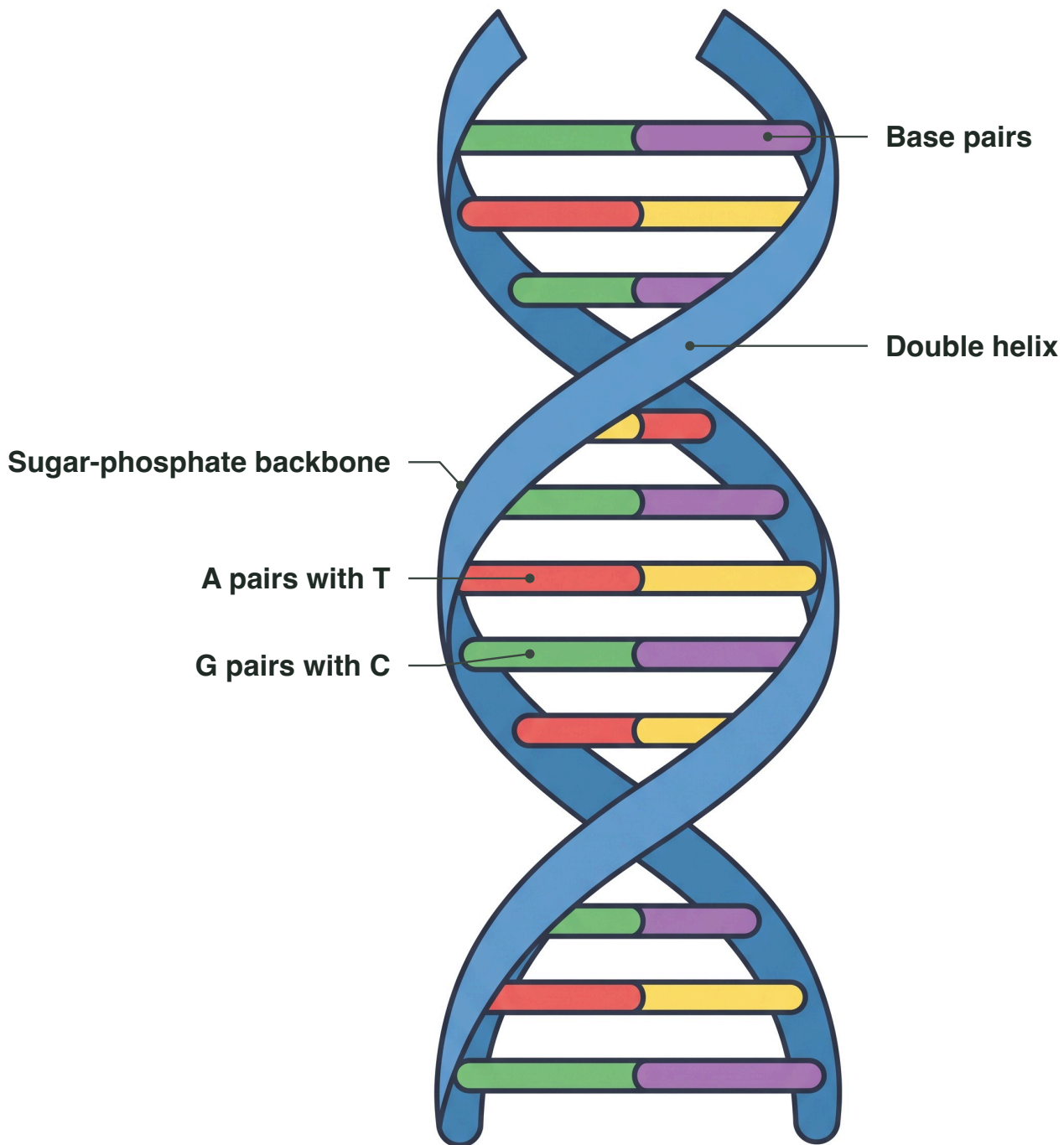
7. One strand of DNA reads G A T C. Write the bases on the matching strand.

8. What does DNA do for a living thing?

Answer Keys

In the same order as the sheets.

DNA Structure: Answer Key



DNA Parts and Key Words: Answer Key

Answers are in green. Written answers will vary; these are examples.

Part A. Write the word or words that fit each description.

Word bank

A pairs with T Base Base pairs Chromosome Double helix G pairs with C
Gene Nucleus Sugar-phosphate backbone Trait

1. The rungs of the ladder. Each one is made of two parts joined in the middle.	Base pairs
2. A section of DNA that carries one set of instructions.	Gene
3. The twisted-ladder shape of a DNA molecule.	Double helix
4. The pairing rule for the bases adenine and thymine.	A pairs with T
5. The control center of the cell. It holds most of the cell's DNA.	Nucleus
6. The two long strands that form the sides of the ladder.	Sugar-phosphate backbone
7. A tightly coiled package of DNA.	Chromosome
8. The pairing rule for the bases guanine and cytosine.	G pairs with C
9. A feature of a living thing, such as eye color.	Trait
10. One of the four chemical "letters" of DNA.	Base

Part B. Answer the questions.

1. DNA is shaped like a twisted ladder. Which part forms the sides of the ladder? Which part forms the rungs?

The sugar-phosphate backbone forms the sides. The base pairs form the rungs.

2. One strand of DNA has the bases A, G and T in a row. Which bases are across from them on the other strand?

T, C and A.

3. Write these three in order from smallest to largest: chromosome, base, gene.

Base, gene, chromosome.

The Code Inside Your Cells: Answer Key

Answers are in green. Written answers will vary; these are examples.

1. What is this text mostly about?

- ☐ How cells divide in two
- ☒ What DNA is, how it is built and what it does
- ☐ Why people have different eye colors
- ☐ How proteins build the body

2. Where is almost all of the DNA in your cells kept?

- ☐ In the cell membrane
- ☐ In the cytoplasm
- ☒ In the nucleus
- ☐ In the proteins

3. What are the rungs of the DNA ladder made of?

Base pairs. Each rung is two bases joined in the middle.

4. Which base always pairs with guanine (G)?

- ☐ Adenine (A)
- ☐ Thymine (T)
- ☒ Cytosine (C)
- ☐ Another guanine (G)

5. One strand of DNA has the bases T, T, G, A in a row. What are the bases on the matching strand?

A, A, C, T.

6. What is a gene?

- ☐ A kind of protein
- ☒ A section of DNA
- ☐ One of the four bases
- ☐ A package of 46 chromosomes

7. Number the steps 1, 2 and 3 to show how DNA is copied (paragraph 5).

- 2

 New bases pair up with the bases on each strand.
- 3

 There are two matching DNA molecules.
- 1

 The two strands separate.

8. How does the pairing rule help a cell make a matching copy of its DNA?

Each base pairs with only one other base (A with T, G with C). So each old strand shows exactly which bases the new strand needs.

Base-Pairing Practice: Answer Key

Answers are in green. The wording of the last explanation will vary.

ONE STRAND READS	THE RULE TO USE	THE MATCHING STRAND
1. A	Adenine pairs with thymine.	<u> T </u>
2. G	Guanine pairs with cytosine.	<u> C </u>
3. T	Thymine pairs with adenine.	<u> A </u>
4. C	Cytosine pairs with guanine.	<u> G </u>
5. A G	Find the partner of each base, from left to right.	<u> T C </u>
6. C A T	A pairs with T. G pairs with C.	<u> G T A </u>
7. T A C G	Each of the four bases shows up once.	<u> A T G C </u>
8. G A T C	Work one base at a time.	<u> C T A G </u>
9. A T G C	Check each pair: A with T, G with C.	<u> T A C G </u>
10. C T A G	The rule works both ways: T pairs with A, and C pairs with G.	<u> G A T C </u>

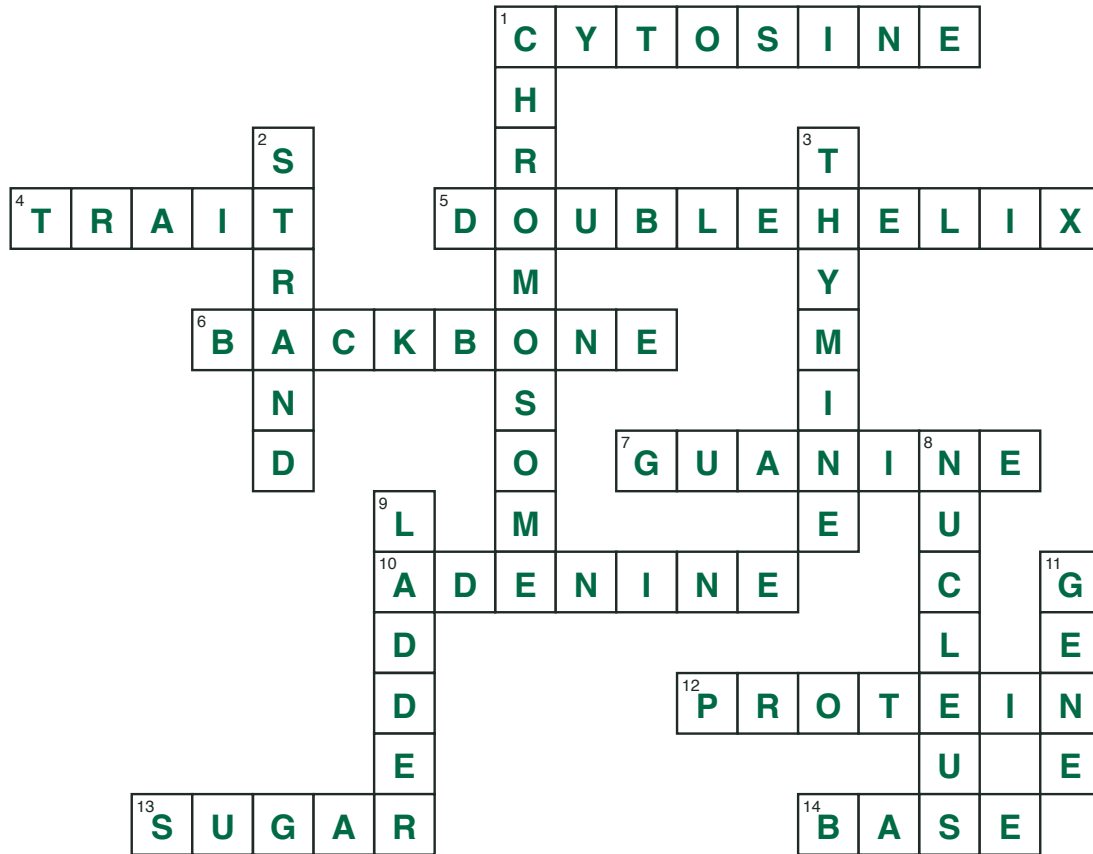
Your turn

One strand of DNA reads C C A T G A. Write the matching strand. Then tell how you worked it out.

G G T A C T. I wrote the partner of each base in order: T for each A, A for each T, C for each G and G for each C.

DNA Crossword: Answer Key

Answers are in green.



ACROSS

1. It pairs with guanine. Its letter is C.
4. A feature of a living thing, such as eye color.
5. The twisted shape of a DNA molecule (2 words).
6. The sugar-phosphate ____ forms the two sides of the DNA ladder.
7. It pairs with cytosine. Its letter is G.
10. It pairs with thymine. Its letter is A.
12. Most genes tell the cell how to make one of these.
13. Along with phosphate, it makes up the sides of the DNA ladder.
14. One of the four chemical "letters" of DNA.

DOWN

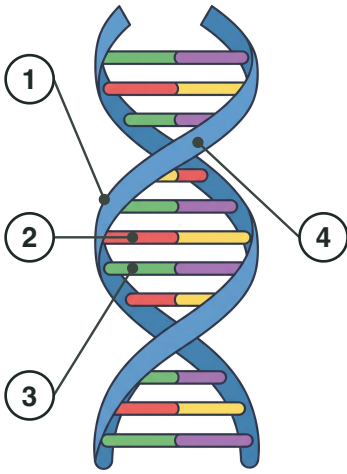
1. A tightly coiled package of DNA.
2. One side of the DNA ladder. A DNA molecule has two.
3. It pairs with adenine. Its letter is T.
8. The control center of the cell. It holds most of the cell's DNA.
9. DNA is shaped like a twisted one of these.
11. A section of DNA that carries one set of instructions.

Word bank adenine backbone base chromosome cytosine double helix gene guanine ladder nucleus protein strand sugar thymine trait

DNA Quiz: Answer Key

Answers are in green. Written answers will vary; these are examples.

Part A. This is a DNA molecule. Write the name of each part.



1 **Sugar-phosphate backbone**

2 **A pairs with T**

3 **G pairs with C**

4 **Double helix**

A pairs with T · Double helix · G pairs with C · Sugar-phosphate backbone

Part B. Choose the best answer.

1. What forms the rungs of the DNA ladder?

- ☐ Sugars
- ☐ Phosphates
- ☒ **Base pairs**
- ☐ Genes

2. Which base pairs with cytosine (C)?

- ☐ Adenine (A)
- ☐ Thymine (T)
- ☒ **Guanine (G)**
- ☐ Another cytosine (C)

3. What is a gene?

- ☒ **A section of DNA**
- ☐ A kind of cell
- ☐ A kind of sugar
- ☐ One of the four bases

4. Where is almost all of the DNA in a plant or animal cell?

- ☐ In the cell membrane
- ☒ **In the nucleus**
- ☐ In the cytoplasm
- ☐ In the vacuole

5. How many different bases does DNA have?

- ☐ Two
- ☐ Three
- ☒ **Four**
- ☐ Six

6. What is a tightly coiled package of DNA called?

- ☐ A protein
- ☐ A base pair
- ☐ A trait
- ☒ **A chromosome**

Part C. Write your answer.

7. One strand of DNA reads G A T C. Write the bases on the matching strand.

C T A G.

8. What does DNA do for a living thing?

It carries the instructions for building and running the living thing.