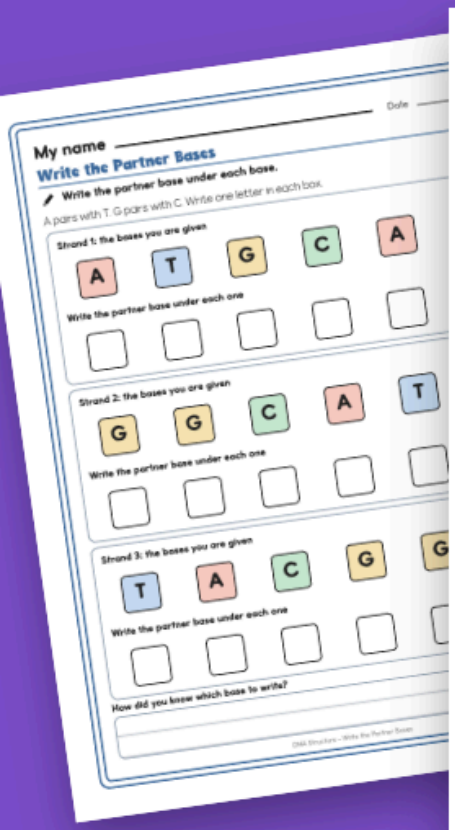
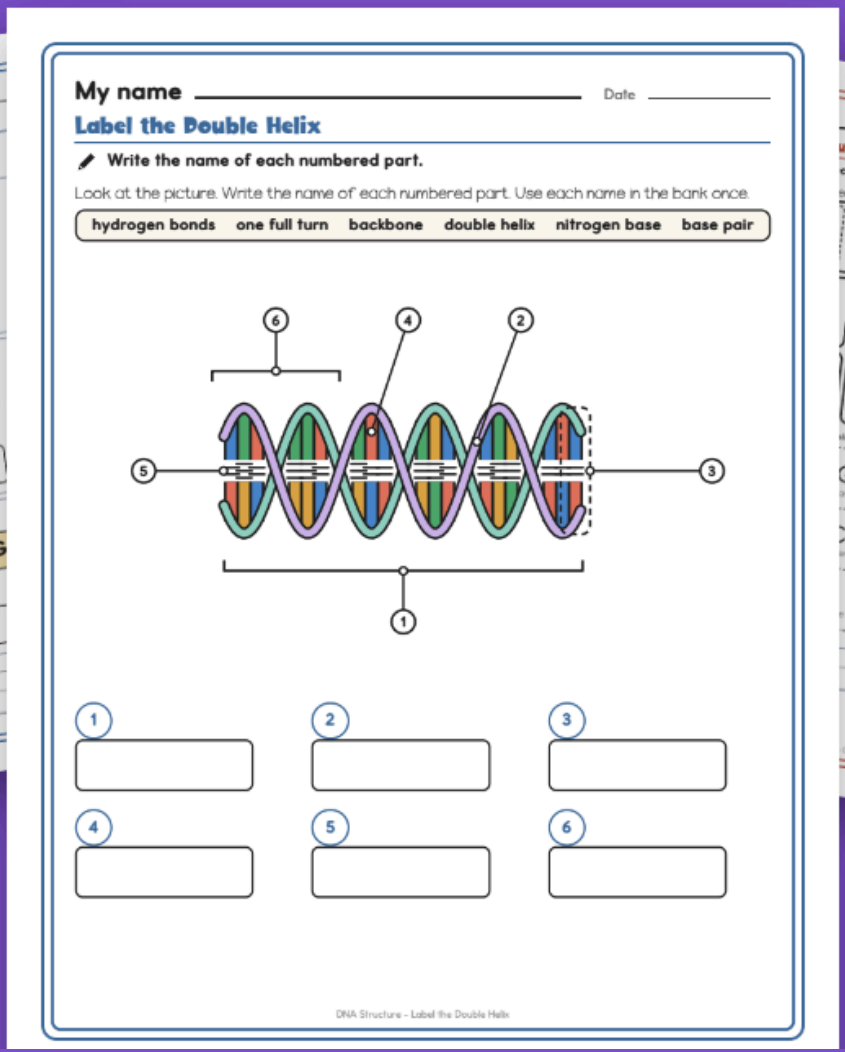
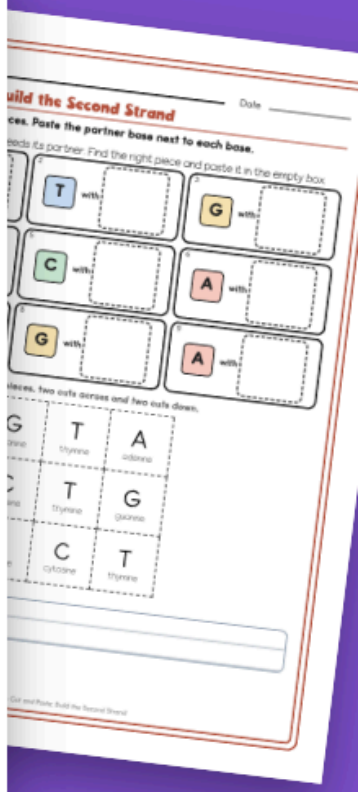
DNA STRUCTURE

WORKSHEETS
GRADES 8-10

26 STUDENT PAGES







Bright Path Sped

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- Open it in a PDF reader (Adobe Acrobat Reader, Preview, or your browser), click into a line or a box, type, and Save As.
- The name line, every answer box, every ruled work box and every check box on the student pages are type-in fields, and so are the tracker, class grid, team note and family page. You can also print any page and write by hand.
- It works offline. No account, no subscription, no internet connection needed after you download it.

Print at 100 percent

Turn off fit to page and shrink to fit so the ruled lines stay 0.34 inch apart. Every student page is black and white inside a colored border, so it still reads when copied in black and white.

Student work

A filled-in tracker, class grid or team note carries a real student's name. Keep it in the data folder, and use a first name only on any page that leaves your hands.

Need help?

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PREVIEW

How To Read a Page

The parts of a student page, then the kinds of sheet in the order they come.

The parts of a page

- **The answer box.** A bordered box for a letter, a number or a word. Click it to type, or print and write in it.
- **The ruled work box.** Lines 0.34 inch apart for sentences. Write one idea to a line.
- **The check box.** True or false, match or not a match, yes or not yet: click or mark.
- **The word bank.** A box of words to use. Some words are used once, some not at all.
- **The cut line.** Nine pieces in a short grid, edge to edge: a few straight cuts across and down.

Kind of sheet	How many	What the student does
Readings and cards	4 sheets	Read, answer, and keep the structure cards to look things up.
Words and matching	4 sheets, 22 items	Match words and parts; try a worked example.
Diagrams and chart	3 sheets, 24 items	Label the helix and the nucleotide, then fill in a chart of the four bases.
Base pairing	2 sheets, 26 items	Write the partner base for 18 bases, then check 8 pairs.
Order and story	2 sheets, 12 items	Put six steps in order, then fill in the story with the bank.
True or false and mistakes	3 sheets, 16 items	Check sentences, fix false ones, find Dev's mistakes.
Writing	2 sheets, 6 questions	Short answers with four ruled lines each.
Quizzes, exit tickets, cut and paste	12 items, 3 tickets, 18 pieces	Two quizzes, one exit sheet, two cut-and-paste pages.

Untimed, unscored on the page

No student page has a timer or a score on it. The keys and the tracker are for you. The answer keys are on pages 31 to 37.

Short answers

Their key (page 36) says what to look for, not one right sentence. Accept any answer that uses a fact from the readings or the structure cards.

Printing and the type-in fields

Every page prints clean in black and white. The name line, every answer box, every ruled box and every check box are type-in fields in any PDF reader: click one, type, then save. This is a fillable PDF, not a slideshow or a word-processor file.

Room to work

Short-answer boxes hold four lines. If a student needs more room, hand over one page a day, or let students write on scrap paper and copy their best sentences into the box.

PREVIEW

Preview · Bright Path Sped

My name _____ Date _____

Reading 1: The Parts of DNA

Read about the parts of DNA. Then answer.

DNA and the nucleotide

DNA stores the instructions that a living thing uses to grow and work. DNA is a long molecule made of small units called **nucleotides**. Every nucleotide has three parts: a **phosphate group**, a sugar called **deoxyribose**, and a **nitrogen base**. DNA has four kinds of nitrogen bases: **adenine** (A), **thymine** (T), **guanine** (G) and **cytosine** (C). Nucleotides join in a row to make a **strand**. The sugar of one nucleotide links to the phosphate of the next one. The sugars and phosphates together make the **backbone** of the strand, and the bases stick out from it.

Main idea: What is this reading mostly about?

Check what you read. Write the letter in the box.

1. What are the small units that make up DNA?
   - **A** Nucleotides
   - **B** Proteins
   - **C** Backbones

2. Which three parts does every nucleotide have?
   - **A** A phosphate group, a protein and a base
   - **B** Two sugars and a phosphate group
   - **C** A phosphate group, a sugar and a nitrogen base

3. Which part of a strand sticks out from the backbone?
   - **A** The phosphate groups
   - **B** The nitrogen bases
   - **C** The sugars

PREVIEW

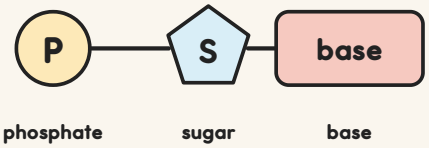
Preview · Bright Path Sped

My name _____ Date _____

Structure Cards 1

Read the cards. Keep them all week.

The nucleotide



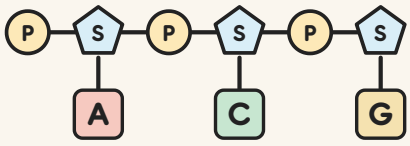
Made of	a phosphate group, a sugar and a nitrogen base
The sugar	deoxyribose
Job	it is one building block of a DNA strand
Joined by	the sugar of one links to the phosphate of the next

The four bases



Names	adenine (A), thymine (T), guanine (G), cytosine (C)
The rule	A pairs with T. G pairs with C.
In a strand	the bases stick out from the backbone
In the helix	the bases are on the inside, between the strands

The backbone



Made of	sugars and phosphates, one after the other
Where	on the outside of the double helix
Job	holds the strand together and holds the bases out
How many	each strand has one backbone, so DNA has two

Pick one card. Tell what it says in your own words.

PREVIEW

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My name _____ Date _____

Worked Example: Find the Partner

Read the example. Then try one.

How to find the partner base

Name the base. Look at the structure cards (pages 7 and 8) for the pairing rule. Write the partner. Then check with a different pair.

Example. The clue is made up for practice.

Start	Read the clue: One strand has the base G. What base is across from it?
Step 1	G is guanine. Name the base.
Step 2	Guanine pairs with cytosine. Use the pairing rule on the card.
Step 3	cytosine (C) Write the partner base.
Check	No. Adenine pairs with thymine, so the answer is right. Does adenine pair with guanine?

Your turn. Do the same steps.

Start	Read the clue: One strand has the base T. What base is across from it?
Step 1	Write the name of the base.
Step 2	Write the partner base. Use its letter and its name.
Check	Does adenine pair with guanine? ☐ yes ☐ no

PREVIEW

My name _____ Date _____

Which Base?

Which base is it? Write its name.

Each base name is used two times. Write the base that fits each clue.

adenine **thymine** **guanine** **cytosine**

1. This base pairs with thymine. _____
2. This is the partner of guanine on the opposite strand. _____
3. This base pairs with adenine, with two hydrogen bonds. _____
4. This base pairs with cytosine, with three hydrogen bonds. _____
5. One strand has A. The base across from it is this one. _____
6. One strand has C. The base across from it is this one. _____
7. One strand has T. The base across from it is this one. _____
8. In a base pair with guanine, this is the other base. _____

Pick one clue. Tell the rule that helped you.

PREVIEW

Preview · Bright Path Sped

My name _____ Date _____

Fill In the Chart: The Four Bases

Fill in the chart for each base.

Use the structure cards. Words and numbers from the bank can help. A word may be used more than once.

adenine thymine guanine cytosine 2 3

A **Base A**

Full name	
Pairs with	
Hydrogen bonds	

T **Base T**

Full name	
Pairs with	
Hydrogen bonds	

G **Base G**

Full name	
Pairs with	
Hydrogen bonds	

C **Base C**

Full name	
Pairs with	
Hydrogen bonds	

PREVIEW

My name _____ Date _____

Does the Pair Match?

Do the two bases match? Check one.

Check match if the two bases can be a base pair. Check not a match if they cannot.

1	A	and	T	☐ match	☐ not a match
2	G	and	C	☐ match	☐ not a match
3	A	and	G	☐ match	☐ not a match
4	T	and	C	☐ match	☐ not a match
5	C	and	G	☐ match	☐ not a match
6	T	and	A	☐ match	☐ not a match
7	A	and	C	☐ match	☐ not a match
8	G	and	T	☐ match	☐ not a match

Pick one pair that is not a match. Tell the partner each base really has.

PREVIEW

My name _____ Date _____

Fill In the Story

Fill in each blank. Use the word bank.

Read the story in order. Fill each blank with a word from the bank. Two words are not used.

strand	**protein**	**sugar**	**helix**
backbone	**nucleus**	**hydrogen**	**thymine**

1. A nucleotide is made of a phosphate group, a _____ and a nitrogen base.

2. Nucleotides join in a row to make a _____.

3. The sugars and phosphates make the _____ of the strand.

4. In the second strand, guanine pairs with cytosine and adenine pairs with _____.

5. The _____ bonds hold the two bases of each pair together.

6. The two strands twist into a double _____.

Pick one sentence. Tell what part of DNA it is about.

PREVIEW

Preview · Bright Path Sped

My name _____ Date _____

Short Answers 1

Answer each question in sentences.

Use facts from the readings and the structure cards. Write in sentences.

1. Name the three parts of a nucleotide. Which part is different in the four kinds of nucleotide?

2. What is the backbone of a DNA strand? Where is it in a double helix?

3. Tell how a strand of DNA is built from nucleotides.

PREVIEW

Preview · Bright Path Sped

My name _____ Date _____

Find the Mistake

Find the mistake. Then fix it.

Dev is made up for practice. Each sentence has one mistake.

1 **Dev wrote:**

"DNA has only one strand."

What is wrong?

Write it the right way.

2 **Dev wrote:**

"Adenine pairs with guanine."

What is wrong?

Write it the right way.

3 **Dev wrote:**

"The backbone of DNA is made of nitrogen bases."

What is wrong?

Write it the right way.

4 **Dev wrote:**

"A nucleotide has a phosphate group, a protein and a base."

What is wrong?

Write it the right way.

PREVIEW

My name _____ Date _____

Exit Tickets

Answer each ticket before you go.

Each ticket takes about two minutes. Your teacher may collect them at the door.

1. Name the three parts of a nucleotide.

2. Write one base pair and name the two bases in it.

3. What is one question about DNA that you still have?

PREVIEW

My name _____ Date _____

Cut and Paste: Build the Second Strand

Cut out the nine pieces. Paste the partner base next to each base.

Each base in the top box needs its partner. Find the right piece and paste it in the empty box.

1 **A** with	2 **T** with	3 **G** with
4 **C** with	5 **C** with	6 **A** with
7 **T** with	8 **G** with	9 **A** with

Cut on the dashed lines: nine pieces, two cuts across and two cuts down.

G guanine	T thymine	A adenine
C cytosine	T thymine	G guanine
A adenine	C cytosine	T thymine

Check one pair. Tell the rule you used.

PREVIEW

Answer Key: Readings, Words, Matching

Every letter is the position of the right option in the printed list.

Readings pages 5, 6

Item	Letter	Answer
5.1	A	Nucleotides
5.2	C	A phosphate group, a sugar and a nitrogen base
5.3	B	The nitrogen bases
6.1	B	Thymine
6.2	A	Hydrogen bonds
6.3	C	A double helix

DNA Words page 9

Word	Letter	Meaning
1. DNA	B	the molecule that stores the instructions for a living thing
2. nucleotide	E	one building block of DNA: a phosphate group, a sugar and a nitrogen base
3. base pair	C	two nitrogen bases held together by hydrogen bonds, A-T or G-C
4. complementary	F	matching: each base on one strand has a fixed partner on the other strand
5. backbone	A	the chain of sugars and phosphates along one strand
6. double helix	D	the twisted-ladder shape of the two DNA strands

Match the Parts page 11

Word	Letter	Meaning
1. Phosphate group	C	A part of a nucleotide that links to the sugar of the next nucleotide
2. Deoxyribose	F	The sugar in a DNA nucleotide
3. Adenine	H	The base that pairs with thymine
4. Thymine	B	The base that pairs with adenine
5. Guanine	G	The base that pairs with cytosine
6. Cytosine	D	The base that pairs with guanine
7. Hydrogen bond	A	A weak bond that holds the two bases of a pair together
8. Nitrogen base	E	The part of a nucleotide that sticks out from the backbone

Which Base? page 12

Clue	Base
1. This base pairs with thymine.	Adenine
2. This is the partner of guanine on the opposite strand.	Cytosine
3. This base pairs with adenine, with two hydrogen bonds.	Thymine
4. This base pairs with cytosine, with three hydrogen bonds.	Guanine
5. One strand has A. The base across from it is this one.	Thymine
6. One strand has C. The base across from it is this one.	Guanine
7. One strand has T. The base across from it is this one.	Adenine
8. In a base pair with guanine, this is the other base.	Cytosine

PREVIEW

Answer Key: True or False, Mistakes

The student in Find the Mistake is invented. Accept any wording that fixes a false sentence or a mistake.

True or False pages 20, 21

Item	Answer	The fix
20.1	True	-
20.2	True	-
20.3	False	Thymine pairs with adenine.
20.4	False	The bases are on the inside. The backbones are on the outside.
20.5	True	-
20.6	True	-
21.1	True	-
21.2	True	-
21.3	False	The strands are complementary, not identical: each base is matched with its partner.
21.4	True	-
21.5	False	A base pair is made of two nitrogen bases.
21.6	True	-

Find the Mistake page 24

Item	What went wrong	Right sentence
24.1	DNA has two strands.	DNA has two strands that twist into a double helix.
24.2	Adenine has a different partner.	Adenine pairs with thymine.
24.3	The backbone is made of other parts.	The backbone is made of sugars and phosphates. The bases are on the inside.
24.4	One part is wrong.	A nucleotide has a phosphate group, a sugar and a nitrogen base.

PREVIEW

Answer Key: Short Answers

These pages have no single right sentence. Accept any answer that uses a fact from the readings or the structure cards.

Short answers: what to look for pages 22, 23

Item	Look for
22.1	A phosphate group, the sugar deoxyribose and a nitrogen base. The nitrogen base is the part that differs: adenine, thymine, guanine or cytosine.
22.2	The backbone is the chain of sugars and phosphates along a strand. It is on the outside of the double helix.
22.3	Nucleotides join in a row. The sugar of one links to the phosphate of the next, and the bases stick out from the backbone. Accept any answer that says nucleotides join in a row.
23.1	A pairs with T, and G pairs with C. Hydrogen bonds hold the two bases of a pair together.
23.2	T-T-C-A. Adenine pairs with thymine and guanine pairs with cytosine, so each base is replaced by its partner.
23.3	The rails are the two sugar-phosphate backbones and the rungs are the base pairs. The ladder is twisted into a spiral. Any answer with rails as backbones and rungs as base pairs is correct.

Reading a short answer

- Look first for the fact: the name of the part, the base pair or the shape.
- Then look for a complete sentence that uses a word from the readings or the structure cards.
- A partly right answer is a prompt to reread the matching card together, not a mark against the student.

PREVIEW

DNA Structure Tracker

One student, every scored sheet. Filled example: page 42.

Student _____ Teacher _____ Month _____

Page	Page type and set	Items	Right	Date	Notes
5	Reading 1: The Parts of DNA	3			
6	Reading 2: Base Pairing and the Double Helix	3			
9	DNA Words	6			
11	Match the Parts of DNA	8			
12	Which Base?	8			
13	Label the Double Helix	6			
14	Label the Nucleotide	6			
15	Fill In the Chart: The Four Bases	12			
16	Write the Partner Bases	18			
17	Does the Pair Match?	8			
18	Put the Steps in Order	6			
19	Fill In the Story	6			
20	True or False 1	6			
21	True or False 2	6			
24	Find the Mistake	4			
25	Quiz A	6			
26	Quiz B	6			
29	Cut and Paste: Build the Second Strand	9			
30	Cut and Sort: The Parts of DNA	9			

How to fill this in

Write how many items the student got right with no prompt, and the date. A blank means not tried yet, never wrong. There are 136 items on the 19 scored sheets. Answer keys: pages 31 to 37. Filled example: page 42.

This unit we are working on (your own standard or wording)

PREVIEW

Team Note

Use this page between team meetings or when a student moves classes, to hand off what changed without writing a note from scratch. Everything below is observable, with a blank for the number or the wording your team already uses.

Student _____ Team member _____ Date _____

Kind of sheet	Covered since last note (Y/N)	Items right	Still blank
Readings and words			
Matching			
Diagrams and chart			
Base pairing			
Order and story			
True or false			
Quizzes			
Cut and paste			

What I saw (observable, not a conclusion)

- Matched ___ of 16 parts and clues (pages 11, 12).
- Labeled ___ of 12 parts on the two diagrams (pages 13, 14).
- Wrote ___ of 18 partner bases correctly (page 16).
- Got ___ of 12 true or false sentences right (pages 20, 21).
- Explained what the backbone and the base pairs are in a complete sentence: yes / no / with a reminder.

Next step

- Next page or set: ___, because ___ (what you saw).
- What to try in another class or at home: ___.
- What to keep doing because it is working: ___.
- Anything for the team meeting to decide: ___ (this page records what happened, never a label or a plan).

Summary, in one or two sentences, for whoever reads this next

A filled-in line, for reference

"Got 5 of 6 true or false sentences right on 10/17. Next step: reread Reading 2 and ask where the bases are in the double helix." That is the level of detail this page is built for. It matches the filled example on page 42.

PREVIEW

Riley's Tracker (Invented Student)

Riley M. is invented; nothing on this page describes a real student. The blank tracker is on page 38.

Student	Teacher	Month
Riley M. (an invented student)	Ms. Patel (invented)	October

Page	Page type and set	Items	Right	Date	Notes
5	Reading 1: The Parts of DNA	3	3	10/6	-
6	Reading 2: Base Pairing and the Double Helix	3	3	10/7	-
9	DNA Words	6	5	10/8	Mixed up backbone and nucleotide
11	Match the Parts of DNA	8	6	10/9	Swapped adenine and thymine
12	Which Base?	8	7	10/10	Missed one cytosine clue
13	Label the Double Helix	6	4	10/13	Named a base pair as a nitrogen base
14	Label the Nucleotide	6	5	10/13	Swapped phosphate and sugar
15	Fill In the Chart: The Four Bases	12	10	10/14	Wrote 2 bonds for G-C
16	Write the Partner Bases	18	15	10/15	Wrote A as the partner of G
17	Does the Pair Match?	8	8	10/15	-
18	Put the Steps in Order	6	5	10/16	Put the twist before the pairing
19	Fill In the Story	6	5	10/16	Wrote protein for strand
20	True or False 1	6	5	10/17	Thought the bases are outside the helix
21	True or False 2	6	6	10/17	-
24	Find the Mistake	4	3	10/20	Missed the backbone sentence
25	Quiz A	6	6	10/21	-
26	Quiz B	6	5	10/21	Missed the hydrogen bond count
29	Cut and Paste: Build the Second Strand	9	7	10/22	Pasted two T pieces where A goes
30	Cut and Sort: The Parts of DNA	9	-	-	-

How to read it

Riley M. has done **18 of 19** scored sheets and got **108 of 127** items right with no prompt. **5** sheets were all right and **13** carry a note. Every number comes from the table.

What the table points to

The lowest sheet is Label the Double Helix (4 of 6). That is where the next practice goes. The 1 sheet left blank is not tried yet, never wrong.

PREVIEW