

# CHEMISTRY OF THE GENE

Name \_\_\_\_\_

## Work Sheet a

Section 9.1 Structure of DNA

*In your textbook, read about heredity and chemistry.*

*Use each of the terms below just once to complete the passage:*

**living**      **pneumonia**      **transforming principle**      **rough**      **dead**      **hereditary**  
**chemical**      **DNA**      **transformation**      **smooth**      **offspring**

In 1928, Fred Griffith experimented with the bacterium *Streptococcus pneumoniae*. One strain of these bacteria is called (1)\_\_\_\_\_. The other strain of these bacteria is called (2)\_\_\_\_\_. Griffith knew that smooth cells cause (3)\_\_\_\_\_ and that rough cells do not. He injected a mixture of (4)\_\_\_\_\_ smooth cells and living rough cells into mice. After some of the mice died of pneumonia, Griffith found (5)\_\_\_\_\_ smooth cells in their blood. He concluded that the dead smooth cells caused the living rough cells to become smooth. This kind of change in a bacterial trait is called a bacterial (6)\_\_\_\_\_.

Later, it was discovered that a(n) (7)\_\_\_\_\_ in the extract of the cell solution changed the form of one strain of bacteria. This change in traits was passed on to the (8)\_\_\_\_\_. This chemical was thus called the (9)\_\_\_\_\_.

In 1943, O. T. Avery showed that (10)\_\_\_\_\_ was the transforming principle in bacterial cells, but this did not convince scientists that DNA is the primary (11)\_\_\_\_\_ mechanism in all cells.

Answer the following questions.

12. Which scientists resolved the debate about whether protein, DNA, or a combination of the two controlled heredity? What type of viruses did they use in their experiment?

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13. After the bacteriophage injects its DNA into a cell, what part of it remains outside the cell?

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14. What did Hershey and Chase's experiment demonstrate?

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Name \_\_\_\_\_

## CHEMISTRY OF THE GENE

### Work Sheet b

Section 9.1 Structure of DNA continued

*In your textbook, read about a model of DNA.*

15. What are linked together to form long chains of DNA? \_\_\_\_\_

\_\_\_\_\_

16. What are the three parts of a nucleotide? \_\_\_\_\_

\_\_\_\_\_

17. What are the four nitrogen-containing bases? \_\_\_\_\_

\_\_\_\_\_

18. Which two scientists compiled all the information available about DNA, then built a structural model of DNA? \_\_\_\_\_

a. In what form were the nucleotides arranged in the model?

\_\_\_\_\_

b. What type of bonds in the model join the two chains of nucleotides together?

\_\_\_\_\_

19. Which of the nitrogen bases are pyrimidines? \_\_\_\_\_

20. Which of the nitrogen bases are purines? \_\_\_\_\_

21. In what way do the nitrogen bases bond? \_\_\_\_\_

22. What makes up the genetic code? \_\_\_\_\_

23. What is a gene? \_\_\_\_\_

24. *Complete the diagram of this part of a DNA molecule by writing the letter of each missing base. Use*

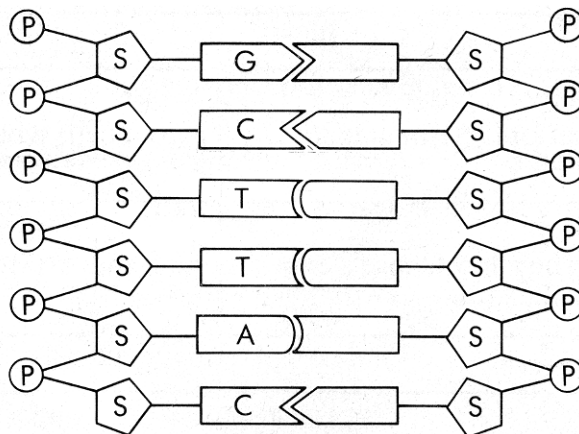
*these choices:*

C - cytosine

A - adenine

T - thymine

G - guanine



Name \_\_\_\_\_

## CHEMISTRY OF THE GENE

Worksheet b

Section 9.1 Structure of DNA continued

*In your textbook, read about replication of DNA. Answer the following questions.*

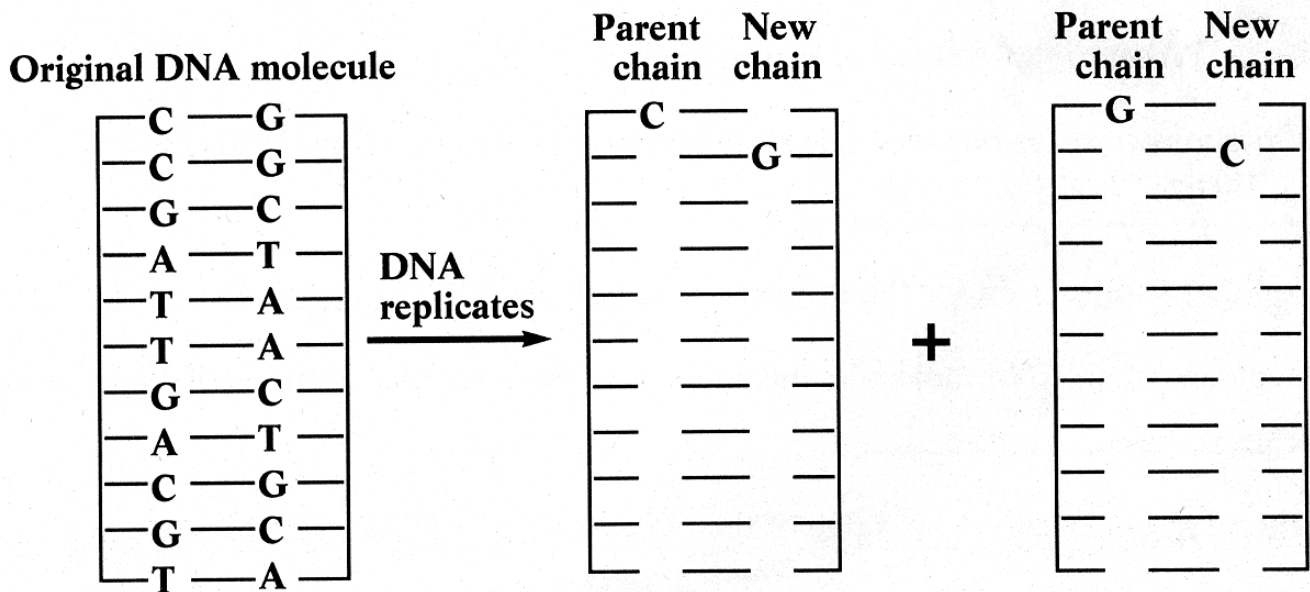
25. What is the result of DNA replication?

26. What did Watson and Crick correctly hypothesize about DNA replication?

27. What determines the sequence of new nucleotides that are put in place during replication?

28. Label the diagram by completing the sequence of nitrogen base pairs in the new DNA molecules. Use these letters: A, T, C, G.

29. Order the steps in DNA replication from 1 to 6.



\_\_\_\_\_ An enzyme breaks the hydrogen bonds between nitrogen bases that hold the two chains of nucleotides together.

\_\_\_\_\_ There are two new DNA molecules, each one a replica of the parent molecule.

\_\_\_\_\_ As the chains of nucleotides separate, a complex enzyme binds to each of the separated parent chains.

\_\_\_\_\_ A protein binds to a section called the origin

\_\_\_\_\_ Addition of nucleotides occurs in opposite directions on the two chains.

\_\_\_\_\_ The double helix begins to unzip.

Use the following key to identify the codons for each amino acid. Then, in the table, write the name of the amino acid for each codon.

Key: Amino Acids and Some DNA Codons

Amino Acid	Codon
phenylalanine	AAA, AAG
leucine	AAT, AAC, GAG
serine	AGA, AGG, AGT, AGC
histidine	GTA, GTG
glutamine	GTT, GTC
cysteine	ACA, ACG
stop	ATT

	Codon	Amino Acid
16.	A G C	
17.	A A A	
18.	A C G	
19.	G A G	
20.	G T C	
21.	G T A	
22.	A T T	

23. Read the statements below. Circle the letter of the statement(s) that correctly describe(s) DNA. .

- a. The DNA molecule unzips along the hydrogen bonds between the base pairs. Free nucleotides attach to the exposed bases according to base pairing rules. The new DNA molecule is identical to the parent molecule.
- b. In the DNA molecule, the uprights or sides of the ladder are made of bases, which pair randomly. The rungs of the ladder are phosphates and sugar molecules bonded together by strong nitrogen bonds.
- c. A gene is a particular section of DNA molecule. The base pair sequence of the gene controls cellular activity by determining which protein is manufactured in the cytoplasm.

Name \_\_\_\_\_ CHEMISTRY OF THE GENE

Worksheet c

Chapter 9 Vocabulary

Review the new words in Chapter 9 of your textbook.

**Use the terms in the list below to complete the paragraphs.**

Adenine	cytosine	guanine	polypeptide
bacteriophage	deoxyribonucleic acid	helix	replicate
codon	(DNA)	nucleotide	thymine

The chromosomes of eukaryotic cells contain almost equal amounts of proteins and a chemical referred to by the symbol (1) \_\_\_\_\_, which stands for (2) \_\_\_\_\_. This chemical can be broken down into the sugar deoxyribose, a phosphate group, and four nitrogen-containing bases. These bases are represented by symbols as follows: A, (3) \_\_\_\_\_, G, (4) \_\_\_\_\_, T, (5) \_\_\_\_\_, and C, (6) \_\_\_\_\_.

Each of the nitrogen bases attaches to a sugar molecule, which then attaches to a phosphate group, forming a molecule known as a(n) (7) \_\_\_\_\_. Each of these molecules is named for the specific base that it contains. Many such molecules link together to form paired chains of the chemical DNA. DNA molecules take the form of a spiral, known as a double' (8) \_\_\_\_\_.

A gene is a segment of a DNA molecule that carries a code for making a particular compound called a(n) (9) \_\_\_\_\_. What distinguishes the polypeptides from one another is the sequence and kinds of amino acids they contain. An amino acid is represented by a sequence of three of the four nitrogen-containing bases. This sequence is called a(n)(10) \_\_\_\_\_.

Much that has been learned about DNA comes from experiments with viruses, which must invade specific cells in an organism's body in order to reproduce themselves, or (11) \_\_\_\_\_. Many viruses attack bacteria. These viruses are known as (12) \_\_\_\_\_.