

# Study Guide B

## KEY CONCEPT

DNA was identified as the genetic material through a series of experiments.

## VOCABULARY

bacteriophage

**MAIN IDEA:** Griffith finds a “transforming principle.”

Write the results of Griffith’s experiments in the boxes below.

Experiments	Results
1. Injected mice with R bacteria	
2. Injected mice with S bacteria	
3. Killed S bacteria and injected them into mice	
4. Mixed killed S bacteria with R bacteria and injected them into mice	Found live S bacteria in the mice’s blood

5. Which type of bacteria caused disease, the S form or the R form?

\_\_\_\_\_

6. What conclusions did Griffith make based on his experimental results?

\_\_\_\_\_

\_\_\_\_\_

**MAIN IDEA:** Avery identifies DNA as the transforming principle.

7. Avery and his team isolated Griffith's transforming principle and performed three tests to learn if it was DNA or protein. In the table below, summarize Avery's work by writing the question he was asking or the results of his experiment.

Avery's Question	Results
What type of molecule does the transforming principle contain?	
	The ratio of nitrogen to phosphorus in the transforming principle is similar to the ratio found in DNA.
Which type of enzyme destroys the ability of the transforming principle to function?	

**MAIN IDEA:** Hershey and Chase confirm that DNA is the genetic material.

8. Proteins contain \_\_\_\_\_ but very little \_\_\_\_\_.
9. DNA contains \_\_\_\_\_ but no \_\_\_\_\_.
10. Summarize the two experiments performed by Hershey and Chase by completing the table below. Identify what type of radioactive label was used in the bacteriophage and whether radioactivity was found in the bacteria.

Experiment	Bacteriophage	Bacteria
Experiment 1		
Experiment 2		

### Vocabulary Check

11. Explain what a bacteriophage is and describe or sketch its structure.

\_\_\_\_\_

# Study Guide B

## KEY CONCEPT

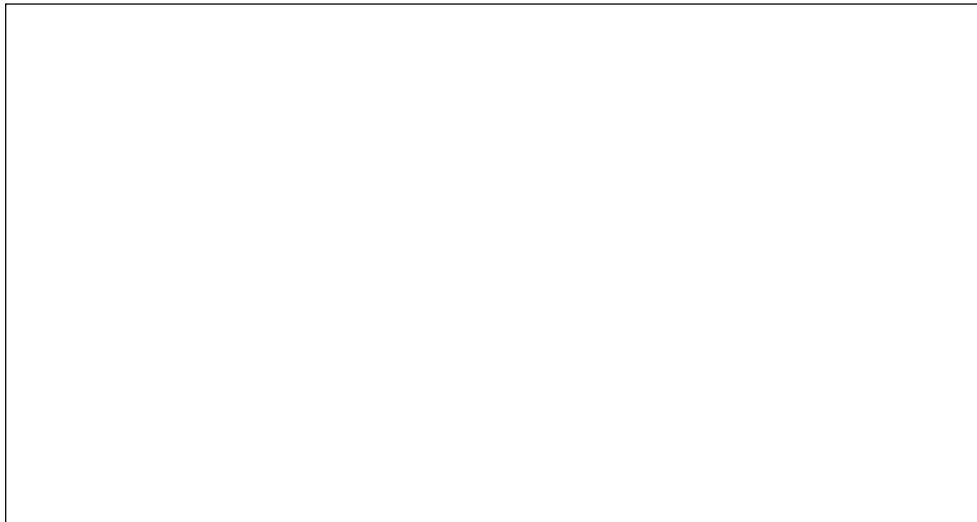
DNA structure is the same in all organisms.

## VOCABULARY

nucleotide	base pairing rules
double helix	

**MAIN IDEA:** DNA is composed of four types of nucleotides.

In the space below, draw a nucleotide and label its three parts using words and arrows.



1. How many types of nucleotides are present in DNA?

\_\_\_\_\_

2. Which parts are the same in all nucleotides? Which part is different?

\_\_\_\_\_

\_\_\_\_\_

**MAIN IDEA:** Watson and Crick developed an accurate model of DNA's three-dimensional structure.

3. What did Franklin's data reveal about the structure of DNA?

\_\_\_\_\_

4. How did Watson and Crick determine the three-dimensional shape of DNA?

\_\_\_\_\_

5. How does DNA base pairing result in a molecule that has a uniform width?

\_\_\_\_\_

**MAIN IDEA:** Nucleotides always pair in the same way.

6. What nucleotide pairs with T? with C?

\_\_\_\_\_

**In the space below, draw a DNA double helix. Label the sugar-phosphate backbone, the nitrogen-containing bases, and the hydrogen bonds.**

### Vocabulary Check

7. Explain how the DNA double helix is similar to a spiral staircase.

\_\_\_\_\_  
\_\_\_\_\_

8. How do the base pairing rules relate to Chargaff's rules?

\_\_\_\_\_  
\_\_\_\_\_

## Study Guide B

### KEY CONCEPT

DNA replication copies the genetic information of a cell.

### VOCABULARY

replication	DNA polymerase
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**MAIN IDEA:** Replication copies the genetic information.

1. What is DNA replication?

\_\_\_\_\_

2. Where does DNA replication take place in a eukaryotic cell?

\_\_\_\_\_

3. When is DNA replicated during the cell cycle?

\_\_\_\_\_

4. Why does DNA replication need to occur?

\_\_\_\_\_

5. What is a template?

\_\_\_\_\_

6. If one strand of DNA had the sequence TAGGTAC, what would be the sequence of the complementary DNA strand?

\_\_\_\_\_

**MAIN IDEA:** Proteins carry out the process of replication.

7. What roles do proteins play in DNA replication?

\_\_\_\_\_

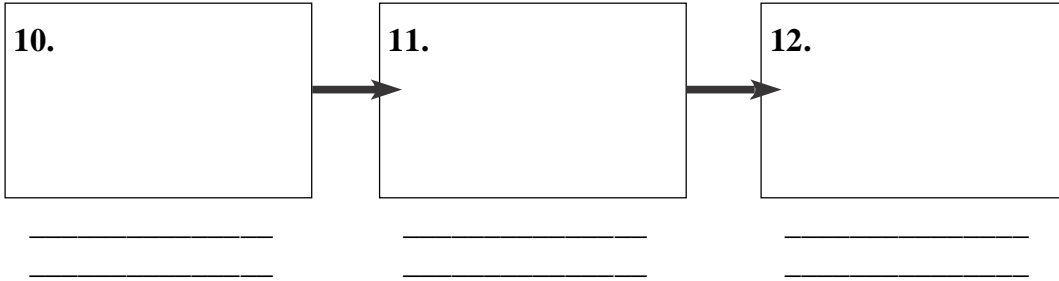
8. What must be broken for the DNA strand to separate?

\_\_\_\_\_

9. Why is DNA replication called semiconservative?

\_\_\_\_\_

Use words and diagrams to summarize the steps of replication, in order, in the boxes below.



**MAIN IDEA: REPLICATION IS FAST AND ACCURATE.**

13. Human chromosomes have hundreds of \_\_\_\_\_, where the DNA is unzipped so replication can begin.
14. DNA polymerase has a \_\_\_\_\_ function that enables it to detect errors and correct them.

### Vocabulary Check

15. Explain what DNA polymerase is by breaking the word into its parts.

\_\_\_\_\_

16. Write a short analogy to explain what replication is.

\_\_\_\_\_

### Be Creative

17. People sometimes like to display bumper stickers that relate to their trade or field of study. For example, a chemist may have a bumper sticker that says “It takes alkynes to make the world.” Then, chemists or other people who know that an alkyne is a molecule that contains carbon atoms joined by a triple bond get a nice little chuckle out of the play on words. Use your knowledge of DNA replication to write a bumper sticker.

\_\_\_\_\_

\_\_\_\_\_

# Study Guide B

## KEY CONCEPT

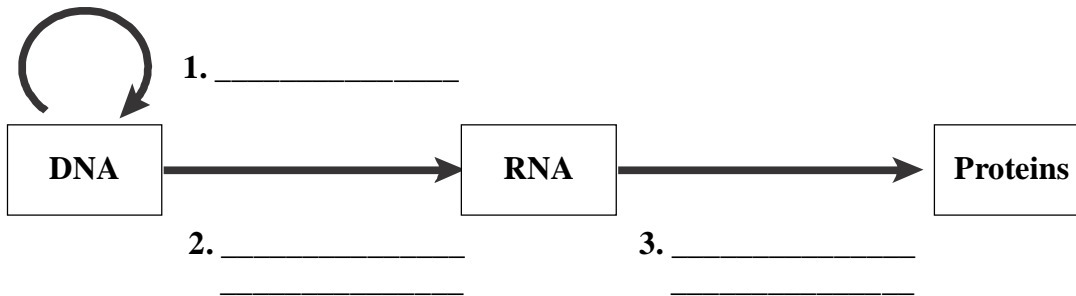
Transcription converts a gene into a single-stranded RNA molecule.

## VOCABULARY

central dogma	messenger RNA (mRNA)
RNA	ribosomal RNA (rRNA)
transcription	transfer RNA (tRNA)
RNA polymerase	

**MAIN IDEA:** RNA carries DNA's instructions.

Label each of the processes represented by the arrows in the diagram below. Write where each of these processes takes place in a eukaryotic cell in parentheses.



Fill in the table below to contrast DNA and RNA.

DNA	RNA
4. Contains the sugar deoxyribose	
5.	Has the bases A, C, G, and U
6. Typically double-stranded	

**MAIN IDEA:** Transcription makes three types of RNA.

7. What enzyme helps a cell to make a strand of RNA?

\_\_\_\_\_

8. Summarize the three key steps of transcription.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

9. Write the basic function of each type of RNA in the chart below.

Type of RNA	Function
mRNA	
rRNA	
tRNA	

**MAIN IDEA:** The transcription process is similar to replication.

10. List two ways that the processes of transcription and replication are similar.

\_\_\_\_\_

11. List two ways that the end results of transcription and replication differ.

\_\_\_\_\_

### Vocabulary Check

12. How does the name of each type of RNA tell what it does?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

13. What is transcription?

\_\_\_\_\_



# Study Guide B

## KEY CONCEPT

Translation converts an mRNA message into a polypeptide, or protein.

## VOCABULARY

translation	stop codon	anticodon
codon	start codon	

**MAIN IDEA:** Amino acids are coded by mRNA base sequences.

1. What is translation?

\_\_\_\_\_

2. What is a codon?

\_\_\_\_\_

3. Would the codons in Figure 5.1 be found in a strand of DNA or RNA?

\_\_\_\_\_

4. What is a reading frame?

\_\_\_\_\_

Refer to Figure 5.1 to complete the table below.

Codon	Amino Acid or Function
5. AGA	
6. UAG	
7.	tryptophan (Trp)
8. GGA	

**MAIN IDEA:** Amino acids are linked to become a protein.

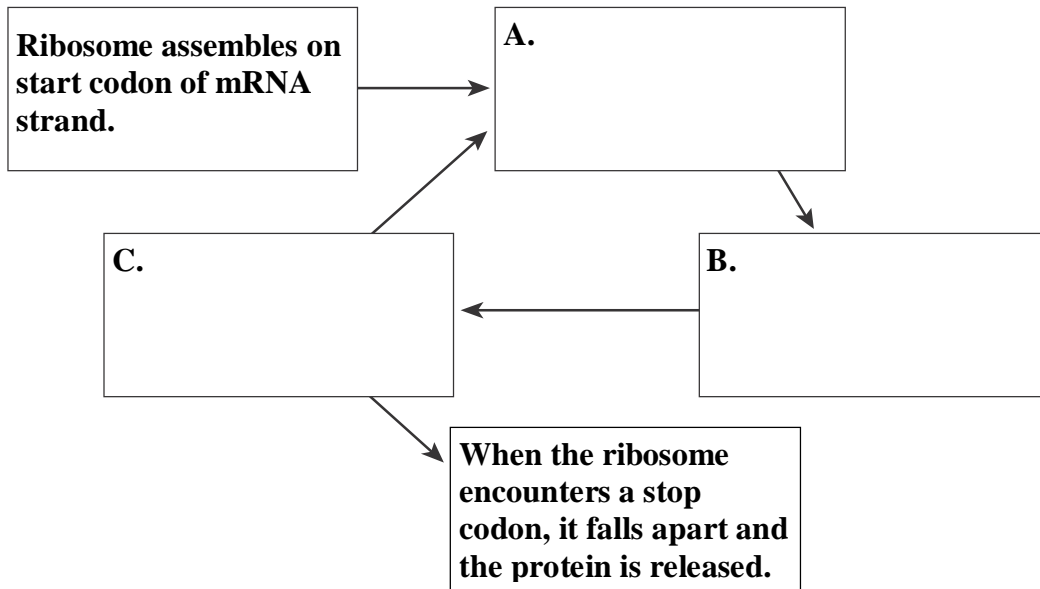
9. \_\_\_\_\_ and \_\_\_\_\_ are the tools that help a cell translate an mRNA message into a polypeptide.

10. The \_\_\_\_\_ subunit of a ribosome holds onto the mRNA strand.

11. The \_\_\_\_\_ subunit of a ribosome has binding sites for tRNA.

12. A tRNA molecule is attached to an \_\_\_\_\_ at one end and has an \_\_\_\_\_ at the other end.

Fill in the cycle diagram below to outline the steps of translation.



### Vocabulary Check

13. What are AGG, GCA, and GUU examples of?

\_\_\_\_\_

14. What is a set of three nucleotides on a tRNA molecule that is complementary to an mRNA codon?

\_\_\_\_\_

15. What do codons code for in addition to amino acids?

\_\_\_\_\_

# Study Guide B

## KEY CONCEPT

Gene expression is carefully regulated in both prokaryotic and eukaryotic cells.

## VOCABULARY

promoter	exon
operon	intron

**MAIN IDEA:** Prokaryotic cells turn genes on and off by controlling transcription.

1. Why is gene expression regulated in prokaryotic cells?

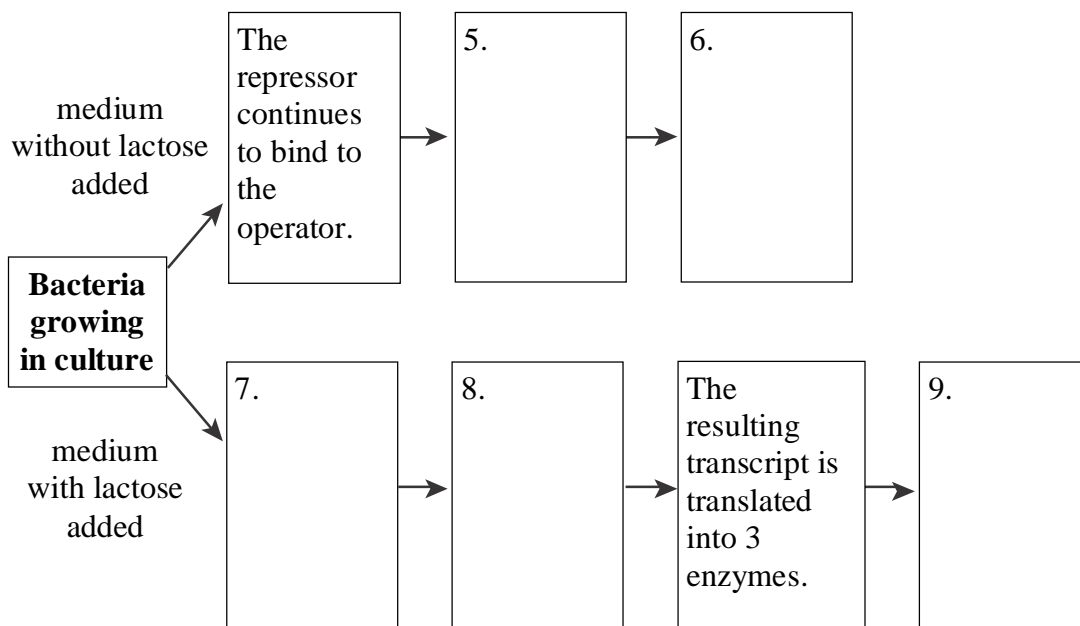
\_\_\_\_\_

2. In prokaryotic cells, gene expression is typically regulated at the start of \_\_\_\_\_.

3. A \_\_\_\_\_ is a segment of DNA that helps RNA polymerase recognize the start of a gene.

4. An \_\_\_\_\_ is a region of DNA that includes a \_\_\_\_\_, an \_\_\_\_\_, and one or more \_\_\_\_\_ that code for proteins needed to carry out a task.

**Complete the cause-and-effect diagram below about the *lac* operon.**



**MAIN IDEA:** Eukaryotic cells regulate gene expression at many points.

10. Why do the cells in your body differ from each other?

\_\_\_\_\_

11. What role do transcription factors play in a cell?

\_\_\_\_\_

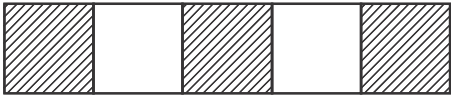


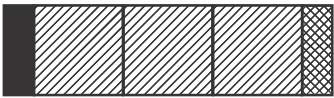


12. What is a TATA box?

\_\_\_\_\_

13. What is “sonic hedgehog” an example of?

\_\_\_\_\_

The diagrams below represent unprocessed and processed mRNA in a eukaryotic cell. Using the diagrams as a reference, fill in the legend with the corresponding element: cap, exon, intron, tail.

<b>Unprocessed mRNA</b>		<b>Legend</b>		_____
				_____
<b>Processed mRNA</b>				_____
				_____

### Vocabulary Check

14. What is the difference between an exon and an intron?

\_\_\_\_\_  
\_\_\_\_\_

15. Make an analogy to help you remember what a promoter is.

\_\_\_\_\_

# Study Guide B

## KEY CONCEPT

Mutations are changes in DNA that may or may not affect phenotype.

## VOCABULARY

mutation	frameshift mutation
point mutation	mutagen

**MAIN IDEA:** Some mutations affect a single gene, while others affect an entire chromosome.

1. List two types of gene mutations.

\_\_\_\_\_

2. List two types of chromosomal mutations.

\_\_\_\_\_

3. Which type of mutation affects more genes, a gene mutation or a chromosomal mutation?

\_\_\_\_\_

4. What leads to gene duplication?

\_\_\_\_\_

5. What is a translocation?

\_\_\_\_\_

**Below is a string of nucleotides. (1) Use brackets to indicate the reading frame of the nucleotide sequence. (2) Copy the nucleotide sequence into the first box and make a point mutation. Circle the mutation. (3) Copy the nucleotide sequence into the second box and make a frameshift mutation. Use brackets to indicate how the reading frame would be altered by the mutation.**

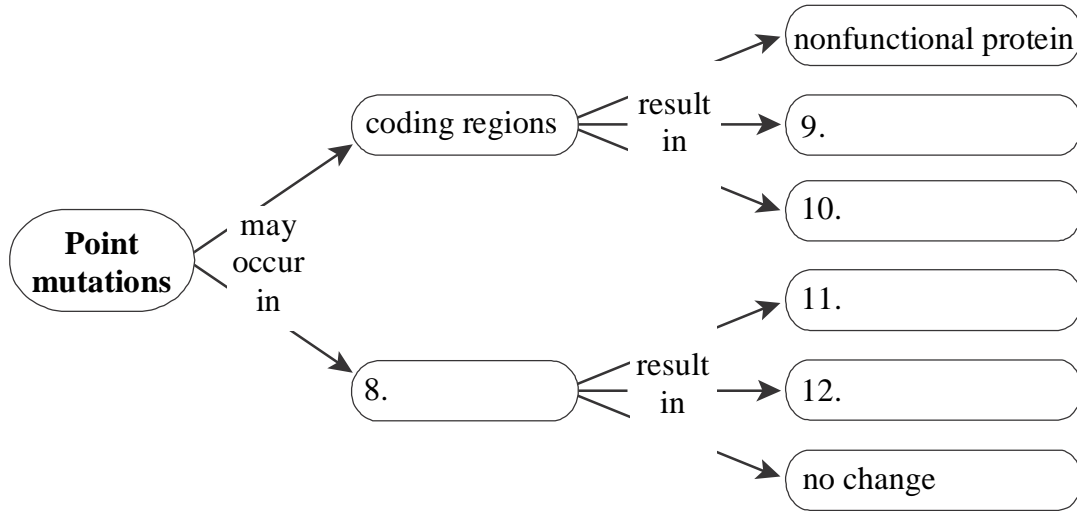
AGGCGTCCATGA
6.
7.

10.

Study Guide B *continued*

**MAIN IDEA:** Mutations may or may not affect phenotype.

Fill in the cause-and-effect diagram below to explain how a point mutation may or may not affect phenotype.



13. For a mutation to be passed to offspring, in what type of cell must it occur?

\_\_\_\_\_

**MAIN IDEA:** Mutations can be caused by several factors.

14. Can DNA polymerase catch and correct every replication error?

\_\_\_\_\_

15. What is a mutagen?

\_\_\_\_\_

16. How does UV light damage the DNA strand?

\_\_\_\_\_

\_\_\_\_\_

### Vocabulary Check

17. What is a mutation?

\_\_\_\_\_

18. If a nucleotide is deleted from a strand of DNA, what type of mutation has occurred?

\_\_\_\_\_