

Study Guide

CHAPTER 12

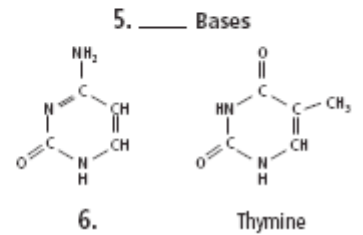
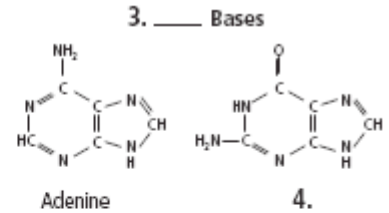
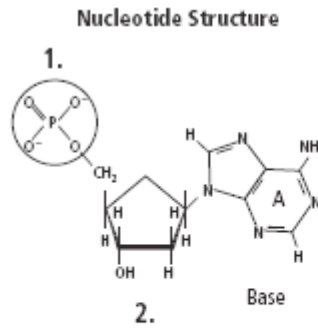
Section 1: DNA: The Genetic Material

In your textbook, read about nucleotides.

Label the diagrams of DNA nucleotides and bases. Use these choices:

cytosine guanine phosphate purine pyrimidine sugar

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____



In your textbook, read about DNA structure.

Write the term or phrase that best completes each statement. Use these choices:

adenine (A)	chromosome	cytosine	double helix
double-ring	genetic material	nitrogenous bases	nucleic acids
nucleotides	purine	single-ring	

7. _____, guanine (G), cytosine (C), and thymine (T) are the four _____ in DNA.
8. In DNA, _____ always forms hydrogen bonds with guanine (G).
9. The sequence of _____ carries the genetic information of an organism.
10. Chargaff's data states that the number of _____ bases equals the number of pyrimidine bases in DNA.
11. The twisted ladder shape of DNA is called a _____.
12. DNA is the _____ of all organisms.
13. The pyrimidine bases have a _____ structure.
14. The purine bases have a _____ structure.
15. DNA and RNA are the two _____ found in living cells.
16. DNA supercoils to make up the structure known as a _____.

Section 1 DNA: The Genetic Material (continued)

Main Idea

Discovery of the Genetic Material

I found this information on page _____.

DNA Structure

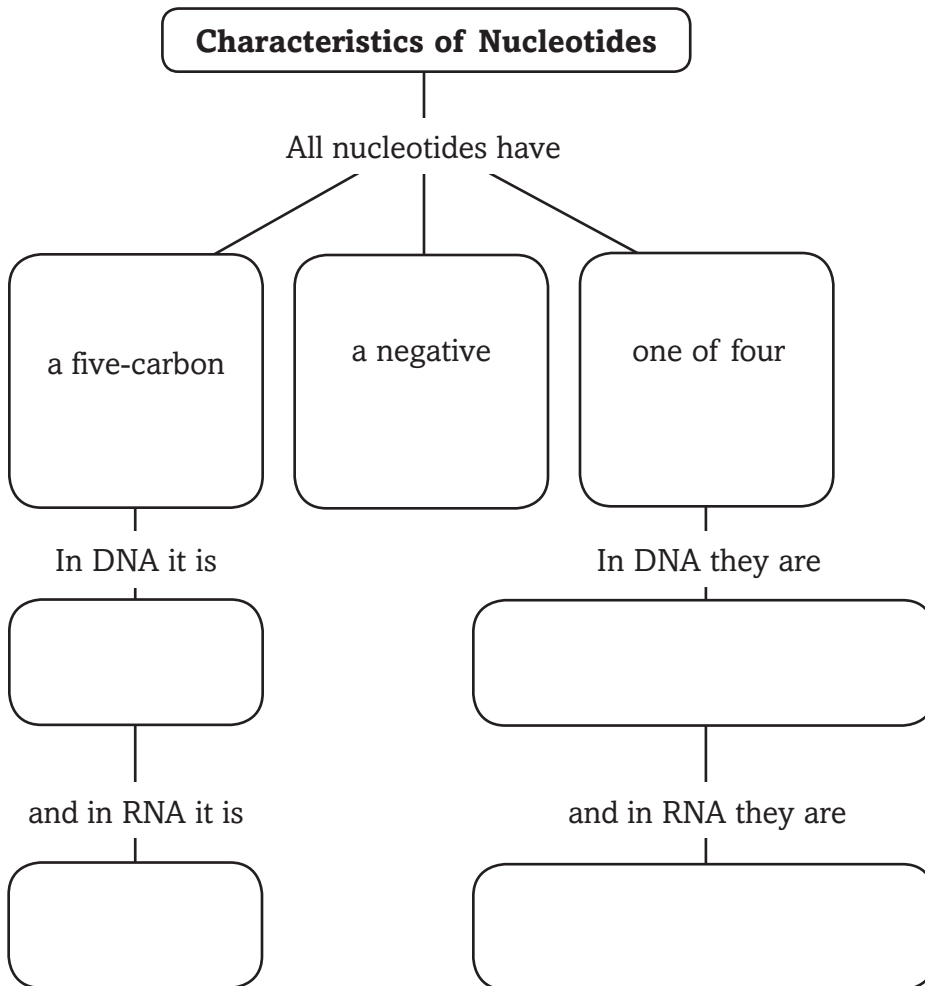
I found this information on page _____.

Details

Complete the table below about geneticists and their discoveries.

Scientist	Discovery	Year
Frederick Griffith		
Oswald Avery		
Alfred Hershey and Martha Chase		
James Watson and Francis Crick		

Organize the characteristics of nucleotides by filling in the graphic organizer below.



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CHAPTER 12 Section 2: Replication of DNA

In your textbook, read about semiconservative replication.

Match the description in Column A with the term in Column B.

Column A

- _____ 1. unwinds in multiple areas as DNA is replicated
- _____ 2. parental strands separate and serve as templates for new strands of DNA
- _____ 3. the DNA of prokaryotes
- _____ 4. keep the strands of DNA separate during replication
- _____ 5. elongates as DNA unwinds and is replicated continuously
- _____ 6. unwinds the double helix

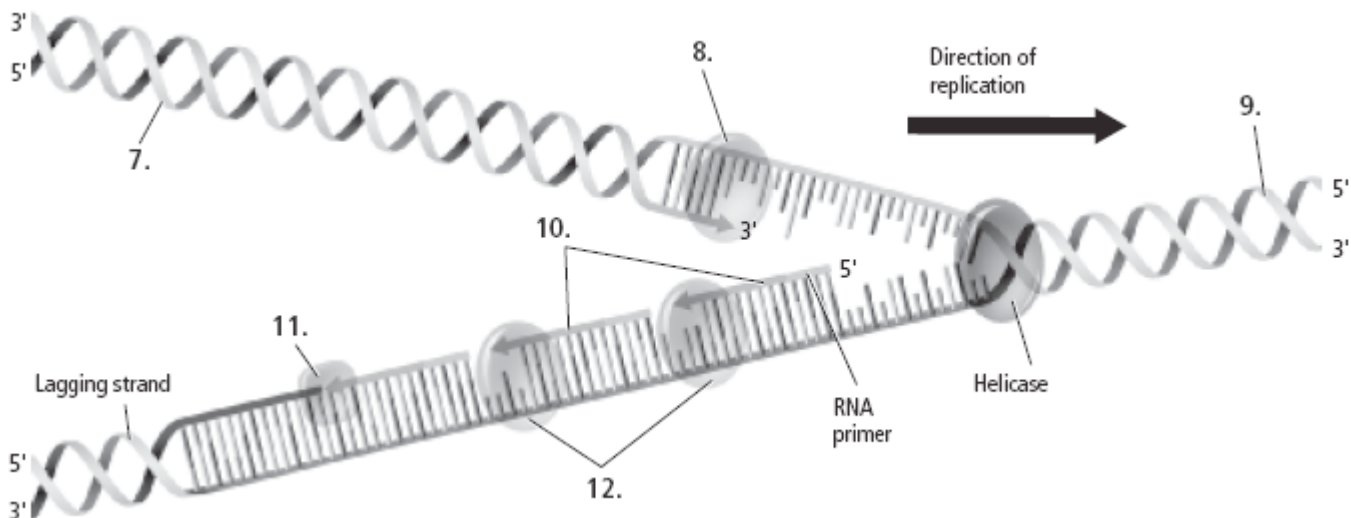
Column B

- A. semiconservative replication
- B. DNA helicase
- C. single-stranded binding proteins
- D. leading strand
- E. eukaryotic DNA
- F. circular DNA

In your textbook, read about base pairing.

Label the diagram showing DNA replication. Use these choices:

- | | | | | |
|------------|----------------|----------------|-------------------|--------------|
| DNA ligase | DNA polymerase | leading strand | Okazaki fragments | parental DNA |
| 7. _____ | | | 10. _____ | |
| 8. _____ | | | 11. _____ | |
| 9. _____ | | | 12. _____ | |



Section 2 Replication of DNA (continued)

Main Idea _____

I found this information on page _____.

Details _____

Complete the table below on the role of each protein in DNA replication. The first one has been done for you.

Protein	Stage of DNA Replication	Activity
DNA helicase	unwinding	unwinds and unzips the DNA
DNA ligase		
DNA polymerase		
RNA primase		
Single-stranded binding protein		

Comparing DNA Replication in Eukaryotes and Prokaryotes

I found this information on page _____.

Contrast the differences between prokaryotic and eukaryotic DNA replication.

	Eukaryotes	Prokaryotes
Number of origins for DNA replication		
Where replication takes place in the cell		

SUMMARIZE

Analyze how the activity of DNA polymerase is consistent with Watson and Crick's model of semiconservative replication.

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CHAPTER 12 Section 3: DNA, RNA, and Protein

In your textbook, read about the central dogma of biology.

For each statement below, write true or false.

_____ 1. The central dogma of biology, or the mechanism of reading and expressing genes in all living things, can be expressed as follows:
DNA → RNA → proteins.

_____ 2. The process of the synthesis of mRNA from DNA is called translation.

In your textbook, read about the code.

Refer to the figure. Respond to each statement.

3. **Express** the following sequence of DNA nucleotides as complementary mRNA codons.

T A C C G A T T A A C A A C T

4. **Write** the specific amino acid or code that each mRNA codon from statement 3 above represents.

5. **Identify** the start and stop mRNA codons.

First Base	Second Base				Third Base
	U	C	A	G	
U	UUU phenylalanine	UCU serine	UAU tyrosine	UGU cysteine	U
	UUC phenylalanine	UCC serine	UAC tyrosine	UGC cysteine	C
	UUA leucine	UCA serine	UAA stop	UGA stop	A
	UUG leucine	UCG serine	UAG stop	UGG tryptophan	G
C	CUU leucine	CCU proline	CAU histidine	CGU arginine	U
	CUC leucine	CCC proline	CAC histidine	CGC arginine	C
	CUA leucine	CCA proline	CAA glutamine	CGA arginine	A
	CUG leucine	CCG proline	CAG glutamine	CGG arginine	G
A	AUU isoleucine	ACU threonine	AUU asparagine	AGU serine	U
	AUC isoleucine	ACC threonine	AAC asparagine	AGC serine	C
	AUA isoleucine	ACA threonine	AAA lysine	AGA arginine	A
	AUG (start/ methionine)	ACG threonine	AAG lysine	AGG arginine	G
G	GUU valine	GCU alanine	GAU aspartate	GGU glycine	U
	GUC valine	GCC alanine	GAC aspartate	GGC glycine	C
	GUA valine	GCA alanine	GAA glutamate	GGA glycine	A
	GUG valine	GCG alanine	GAG glutamate	GGG glycine	G

In your textbook, read about translation and the role of the ribosome

Use each of the terms below only once to complete the passage.

anticodon cytoplasm mRNA protein
ribosome start codon translation tRNA

Once the (6) _____ is synthesized, it leaves the nucleus and enters the (7) _____. The 5' end of the mRNA connects to the (8) _____, where the code is read and translated to make a(n) (9) _____ in a process called (10) _____. In translation, (11) _____ interprets the mRNA codon sequence. Once the mRNA is associated with the ribosome, a tRNA with the (12) _____ CAU will bind to the mRNA (13) _____ AUG.

Section 3 DNA, RNA, and Protein (continued)

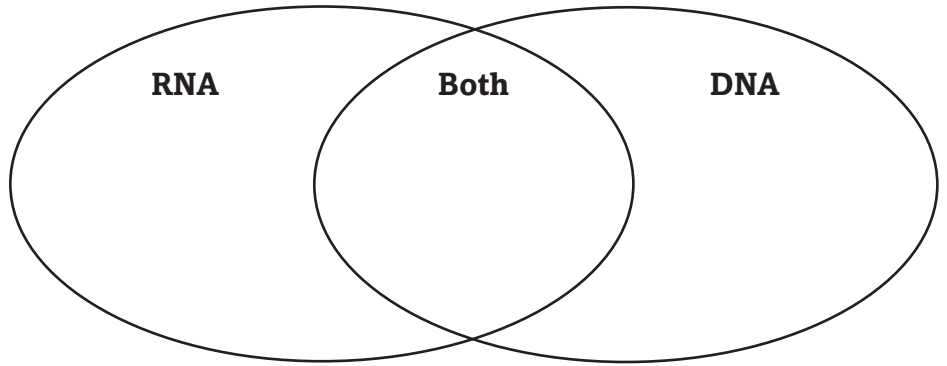
Main Idea _____

Details _____

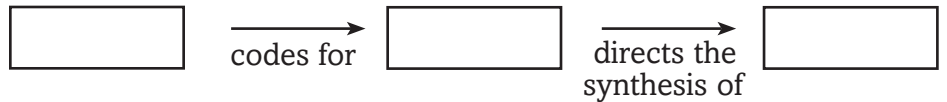
Central Dogma

I found this information on page _____.

Compare and contrast RNA and DNA by writing at least five characteristics of their structure and composition in the Venn diagram.



State the central dogma of biology.



Compare the function of each type of RNA molecule by completing the table.

Type of RNA	Function
mRNA	
rRNA	
tRNA	

Sequence the steps in transcription of RNA.

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CHAPTER 12 Section 4: Gene Regulation and Mutations

In your textbook, read about prokaryote and eukaryote gene regulation.

If the statement is true, write true. If the statement is false, replace the italicized term or phrase to make it true.

1. *Gene regulation* is the ability of an organism to control which genes are transcribed.

2. *A chromosome* contains the genes for the proteins needed for a specific metabolic pathway.

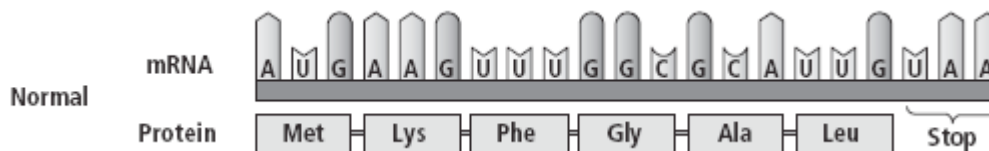
3. An operator is a segment of DNA that acts as an on/off switch for *translation*.

4. *Eukaryotes* can control gene expression using transcription factors.

5. Hox genes play an important role in determining the *gender* of an organism.

In your textbook, read about mutations.

Refer to the figure below. Respond to the following statement.



6. **Record** the mRNA codon sequence that would result from a substitution mutation of A instead of G in the amino acid alanine (Ala) in the above protein.

Complete the table by filling in the missing information. Use these choices:

frameshift

substitution

mRNA Sequence	Mutation Sequence	Type of Mutation
7. UGU-CCG-GAA-CGA	UGC-CGG-GAA-CGA	
8. GAA-CGU-AGC-GGU	GAU-CGU-AGC-GGU	
9. UGU-UUC-CCU-UAA	UGU-UCC-CUU-AA*	

Section 4 Gene Regulation and Mutation (continued)

Main Idea _____

Details _____

Mutations

I found this information on page _____.

Compare and contrast a point mutation and a frameshift mutation by defining each mutation and stating its consequence.

Point mutation happens when	consequence:
Frameshift mutation occurs when	consequence:

Analyze each type of DNA mutation and its result. Sketch what each change might look like.

Mutation	Result	Sketch
Missense mutation		
Nonsense mutation		
Chromosome rearrangement		
Chromosome deletion		

SUMMARIZE

Discuss why a mutagen can have longer-lasting effects in a sex cell than in a body cell.
