

Biology: DNA

Purpose: This unit will introduce how DNA stores the code for making proteins and how the cell builds proteins from that code

Date	Topics/Activities	Objectives	HW Due
11/14 11/15	DNA Facts & Fallacies What is a chromosome? (Drill Demo) Cell Cycle Notes & Animations Cell Cycle Sequencing	Describe how body cells (somatic cells) divide during the process of mitosis and identify when DNA replication occurs.	
11/16 11/17	Review Homework Onion Root Tip Lab AND INTRODUCTION TO DNA Notes Vocabulary and Word Wall	Identify phases of cell division in plant cell. Compare & Contrast phases of cell division during mitosis	Cell Cycle Handout Read 5.1 & 5.1 Review
11/18 11/28	DNA Song & Caroling DNA Model Lab DNA Extraction Lab	Explain the structure and purpose of DNA Apply understanding of DNA's structure to extracting DNA	Eat Pumpkin or Apple Pie
11/29 11/30	Cell Cycle Review DNA Replication Notes & Animations DNA Replication Modeling & Comparison Chart	Understand how DNA's structure allows it to replicate Construct a DNA model	Teach DNA Song Read 8.2 & 8.2 Review
12/1 12/2	Protein Synthesis Notes Sequence the Steps to Protein Synthesis Macromolecule Pre-Test Begin Genes Make Proteins	Identify the steps to protein synthesis Organize the steps for protein synthesis	Read 8.3 & 8.3 Review Vocabulary pgs 1&2
12/5 12/6	mRNA Lab & tRNA Lab Compare & Contrast DNA & RNA Cracking the Code Video Vocabulary Review	Model how DNA is turned into proteins Summarize the role of RNA in creating proteins Compare & Contrast DNA & RNA	Finished How Genes Make Proteins Read 8.4 & 8.4 Review
12/7 12/8	Mutation Notes & Animations Protein Sentences / Balloon Activity	Describe the effect of mutations on an organism's DNA Solve puzzles to create complementary DNA strands	Read 8.5 & 8.5 Review
12/9 12/12	Review mRNA & tRNA most commonly missed questions Practice Test Review Stations	Review the standards for the unit assessment	DNA Study Guide
12/13 12/14	Review DNA TEST	Assess knowledge of DNA, RNA, and protein synthesis	Study for DNA Assessment
12/15 12/16	DNA test results: review or enrichment option	Review DNA Test Results: Review or Enrichment Options (Potential for Inquiry Activity)	
Winter Break			

Structure and Function of DNA.

DNA has the shape of a _____

Made of _____

Which have 3 parts:

A _____ sugar

A _____ group

1 of 4 nitrogen _____:

See page 311 in Dynamics of Life

How _____ stores the code for making proteins, how the code is passed onto _____, and how the cell uses the code to make _____.

See additional Handouts in the packet for specifics on mitosis

Mutations

Sometimes mistakes are made in the copying process. Any mistake or change in DNA is a _____.

It can be harmful, beneficial, or have no effect. Examples:

RNA: single strand
ribonucleic acid made of
ribose, phosphate
group, and 1 of 4 bases:
Adenine & _____
Guanine & _____

Replication of DNA

DNA makes _____
_____ in mitosis and
meiosis. This is how species
survive, grow and reproduce.
How?

_____ bonds holding the
two strands of DNA together
break apart. Free
_____ pair up at the
exposed sites on the old
strands of DNA. Two _____
_____ of DNA are made.

The Genetic Code

The sequence of _____
in a section of DNA
determines the _____
that is made. This section of
DNA is called a _____.
Each set of three bases
codes for a particular amino
acid known as a _____.
Codons represent the same
amino acid in all organisms.

Transcription

-Describe how the
instructions to make a
protein get to the
_____: Enzymes
make a _____ of
apart of the DNA that
codes for a protein. This
messenger RNA
(_____) goes out of
the nucleus to the
ribosome in the
cytoplasm

Translation

- Describe how mRNA is used to
synthesize the amino acid
sequence of a protein: _____
attaches to a ribosome. Transfer
RNA (tRNA) carries a
_____ to the ribosome.
tRNA _____
Pairs up with the mRNA codon. As
these amino acids are brought
together, peptide bonds form
between them forming the

A	B	C	D	E	F	G
H	I	J	DNA Unit Vocabulary	K	L	M
N	O	P		Q	R	S
T	U	V	W	X	Y	Z

DNA & Protein Synthesis - Option A

State Standard: H.1L.2, H.2L.4

1. Describe the structure of DNA and how proteins are formed from this code.

- Proficient:
 - Using pictures or descriptions **explain** the relationship between the sequence of bases, genes, chromosomes and proteins.
 - **Identify** and **label** phosphate groups, deoxyribose and ribose sugar, Nitrogen bases (cytosine, guanine, thymine, adenine, uracil), hydrogen bonds, the shape as a double helix.
 - Correctly **match** nucleotides using base-pairing rules
 - **Solve** the protein formed from a gene using an amino acid chart
- Exceeds:
 - **Compare and contrast** DNA and RNA

2. Explain the processes and enzymes that lead to the creation of proteins and how mistakes in DNA replication or environmental factors can alter these proteins.

- Proficient:
 - **List** the steps of transcription and translation using appropriate vocabulary (codon, anticodon, mRNA, tRNA, and ribosome)
 - **Describe** the different types of RNA: mRNA, rRNA, tRNA
 - **Explain** the purpose of polymerases in copying DNA and in correctly transcribing RNA
 - **Identify** types of mutations (DNA: Normal, Point, Frameshift Insertion, Frameshift Deletion) (Chromosomal: Duplication & Translocation)
- Exceeds:
 - **Predict** the change created by a mutation.
 - **Evaluate** the influence of a mutation (Frameshift Insertion, Frameshift Deletion, Point, Normal) on the production of a protein

3. Describe the outcome of the cell cycle (interphase and mitosis).*

- Proficient:
 - **Distinguish** between the outcome of interphase and phases of mitosis
 - **State** how sister cells are genetically similar
 - **Identify** when DNA replication occurs
- Exceeds:
 - **Compare and contrast** the purpose and outcomes of interphase of phases of mitosis.

*Note: Asexual reproduction is covered in more detail in genetics, where sexual and asexual reproduction are compared and contrasted.

Warm-Ups:

Date:

Date:

Date:

Date:

Date:

Date:

Date:

Date:

Date:

DNA Facts & Fallacies

This is what I know about DNA:	This is what I learned from others:
1.	1. _____ told me this:
2.	2. _____ shared this with me:
3.	3. _____ contributed this:
4.	4. _____ gave me the following information:

DNA Structure Notes

1. DNA Structure

This unit is about how DNA stores the _____ for making proteins and how the code is passed on to _____. DNA is the molecule that allows for _____ info to be passed on from parents.

Structure and Function of DNA. (185-87 in Modern Biology)

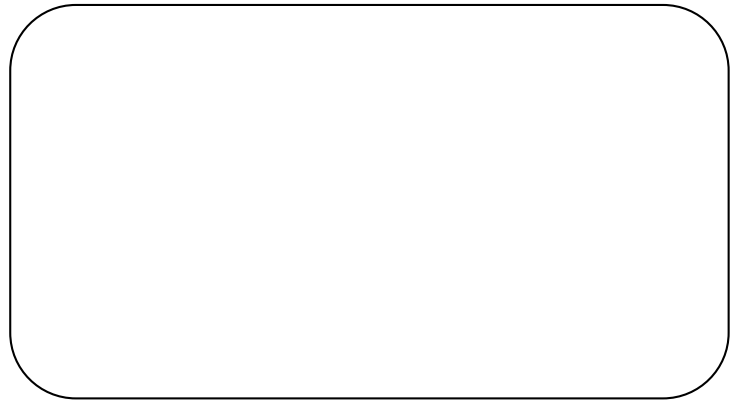
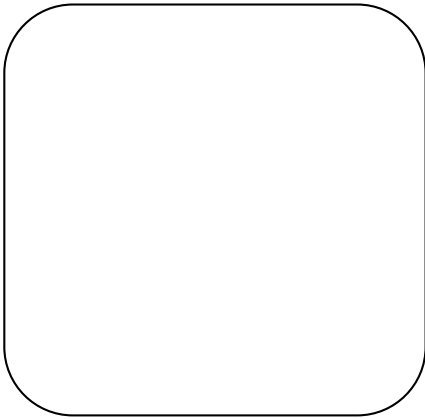
1. DNA is made of smaller, repeating units called _____
2. Each nucleotide has three parts:
 - a. _____ sugar
 - b. _____ group
 - c. _____ containing base
3. One of four nitrogen bases:
 - a. _____
 - b. _____
 - c. _____
 - d. _____
4. Bases always pair-up in the same way to form complimentary base pairs:
_____ to _____ and _____ to _____.
5. Sides of a DNA molecule are made of alternating: _____ and _____
_____ groups.
6. The nitrogen bases in the middle of the molecule are held together by double or triple
_____ bonds (weak bonds).
7. DNA is said to have the shape of a _____ or _____

Think-Pair-Share

DNA Replication Notes:

DNA Replication: How does it work?

8. DNA is “unzipped” by _____. Then _____ attaches the correct nucleotides to match the base pairs.



8. A mistake in just _____ base pair is a mutation.

DNA Song:



DNA Structure Model Lab

DNA is composed of repeating units called nucleotides. Each nucleotide has one sugar molecule (deoxyribose), a phosphate, and a nitrogen base. There are four nitrogen bases: adenine, thymine, guanine, and cytosine. You will be working with puzzle pieces that represent these nucleotides.

The DNA molecule is shaped like a spiral ladder or a double helix. The sugar and phosphate molecules alternate to form the upright portions of the ladder, while the nitrogen bases unit in the center to form the rungs of the ladder.

1. Connect 6 nucleotides together in a vertical strand with this pattern: cytosine, thymine, guanine, adenine, guanine, cytosine.
2. Find the nucleotides that match these nucleotides and use them to complete the right strand. The nucleotides on the right are c_____.
3. Name the molecules which alternate to form the outside, and upright, part of the ladder.
_____ and _____
4. Name the molecule attaching to each nitrogen base: _____
5. Name the **pairs** of molecules in the center forming the rungs of the ladder:
_____ & _____ and _____ & _____
6. Is the order of the nitrogen bases the same on both sides of the DNA molecule?
Yes or No
7. Why does adenine always pair with thymine, and guanine always pair with cytosine? (Use notes or book.)

8. If the left side of the DNA model was TAGGCTCA solve for the right side: _____
9. The oldest form of life in the fossil record is bacteria. Over time more complex organisms appeared in the fossil record as our planet changed and became less hostile to complex, multicellular, life. All organisms on earth share the same genetic alphabet. What could this suggest about the development of life on earth?
10. **Create a sketch** of you DNA model in the space below:

Chromosomes & Cell Cycle Notes

Chromosomes: _____

Cell Cycle:

1. Interphase:

Sketch of Phase

Notes:

Phase of _____.

Cell spends _____

At the end, _____ & _____
replicate

2. Prophase:

Sketch of Phase

Notes:

_____ Condense to form thick rods
called _____

_____ Disappears.

_____ Form.

3. Metaphase:

Sketch of Phase

Notes:

Spindle fibers help _____ line up along
equator of cell.

_____ Attaches to spindle fibers.

4. Anaphase:

Sketch of Phase

Notes:

Sister _____ separate into
_____.

Chromosomes move to _____ of
the cell

Each side of cell contains _____ number of
_____ as found in the original cell.

Each new cell is _____ to the parent cell

5. Telophase & Cytokinesis:

Sketch of Phase

Notes:

Chromosomes _____.

_____ Forms

_____ Reappears

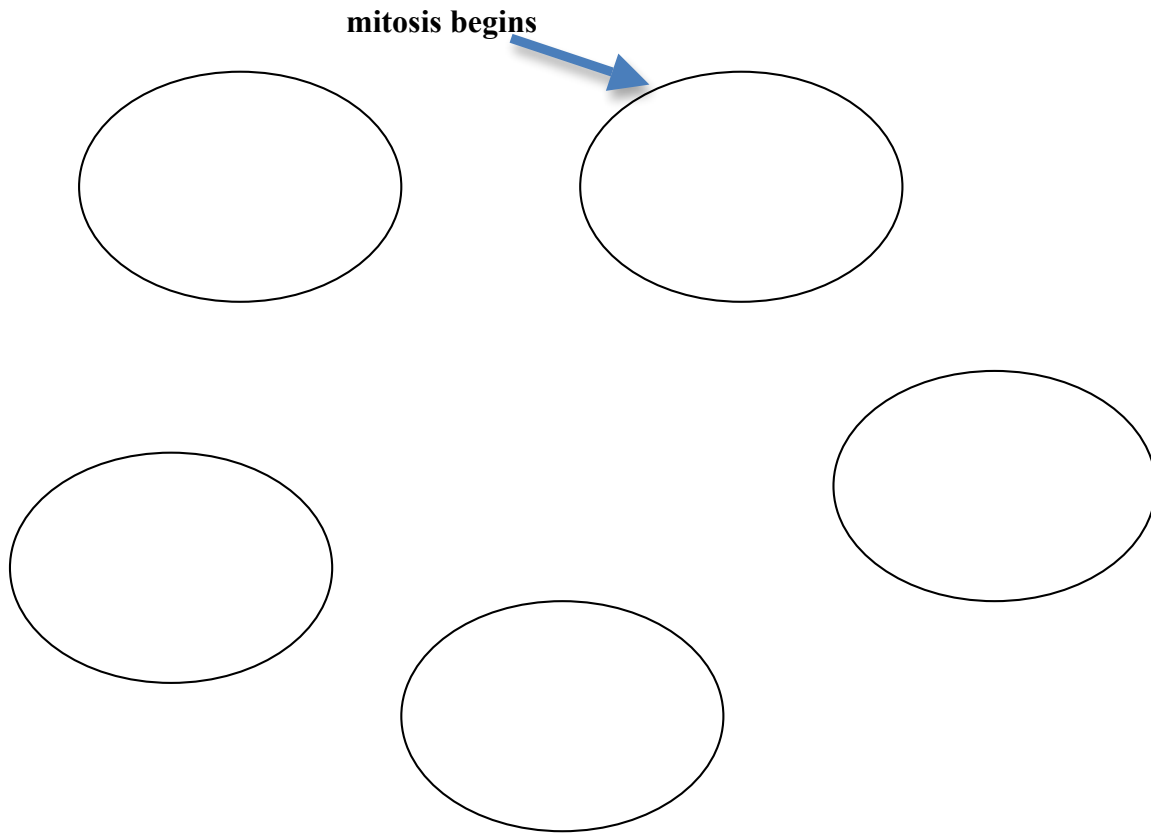
Cell finishes division and re-enters interphase stage.

1.

Name: _____ Period _____

Cell Cycle Sequencing

1. Paste or glue in the appropriate steps to the cell cycle below. Make sure steps are in the correct order.
2. **Label** the correct step in the cell cycle with the following headings: *chromosomes condense*, *chromosomes line-up on metaphase plate*, *chromosomes not distinct (noticeable)*, *DNA replicates*, *sister chromatids separate*, *spindle fibers not present*, *spindles disappear*, *spindle forms*, *two cells form*.
3. Answer analysis questions.



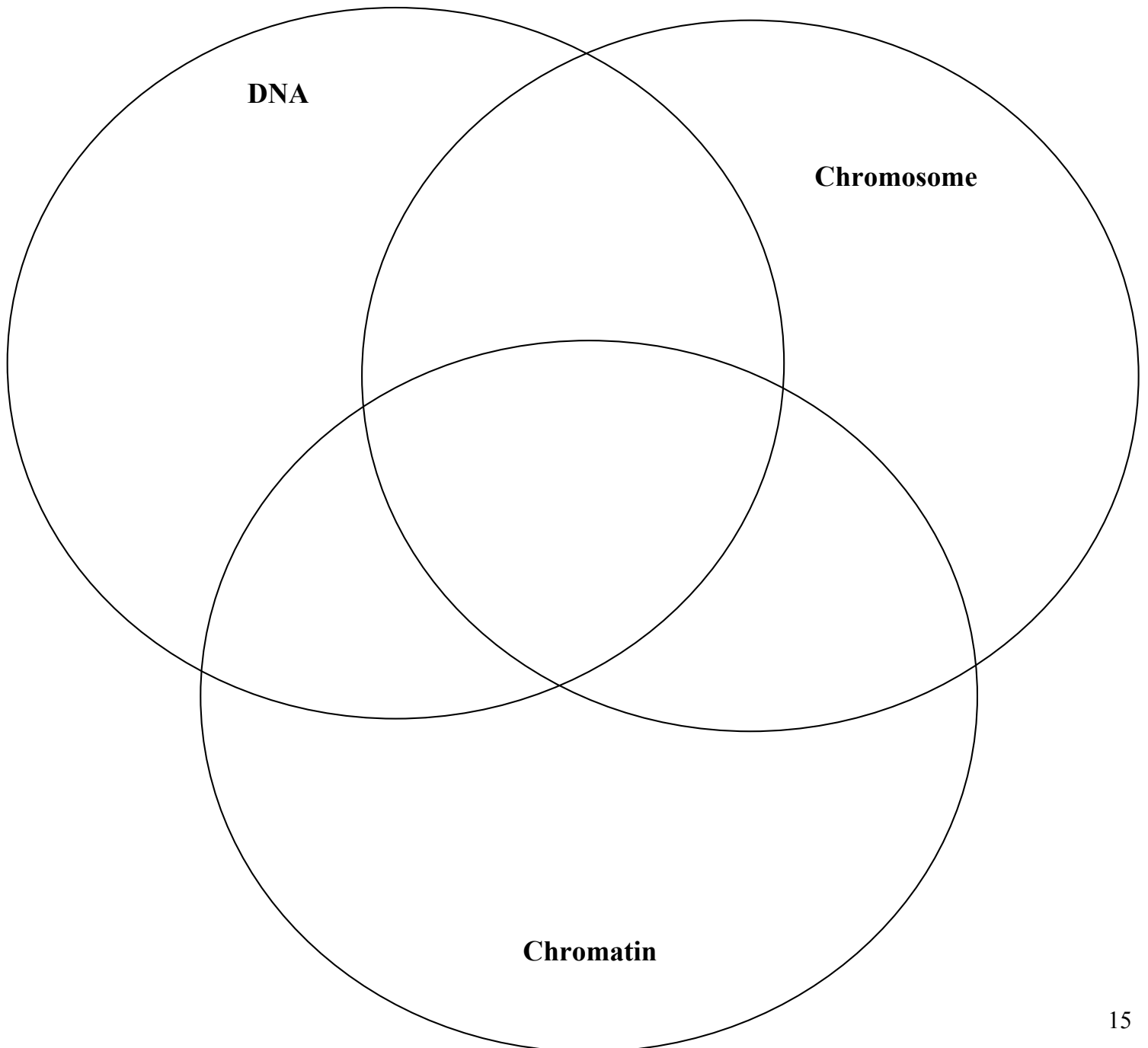
Analysis Questions

1. Human cells contain 46 chromosomes (23 sets) before mitosis. How many do they have after mitosis? _____
2. During anaphase, what structures are attached to the centromeres? _____

3. Describe the function of the centriole in animal cells? _____

4. In what phase does the cell spend most of its life? _____
5. Create a graphic representation of the cell's life cycle, showing how much time each phase takes.

What is a chromosome?



DNA Replication Model Lab

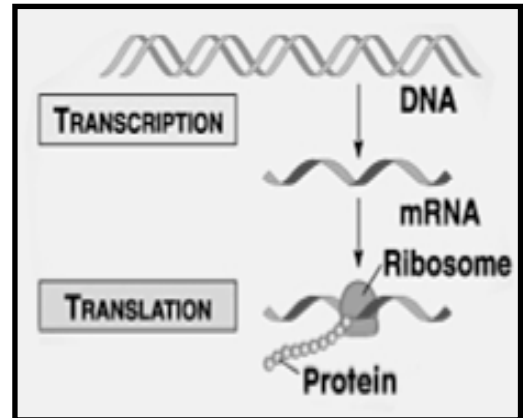
Your DNA model represents only a short length of DNA. An entire chromosome has thousands of rungs or base-pairs. Below you will practice replicating DNA using the model.

1. Make sure you have a DNA model with the following base sequence on the left side, CTGAGC, and the complementary base pair sequence of the right.
2. Open your DNA molecule by carefully pulling it apart down the center so that the two sides are about one foot apart.
3. You are breaking the _____ bonds that connect the nitrogen bases.
4. Using the left hand side of the nucleotide, find matching nucleotides to make a new right hand side. Using the right hand side of the molecule, find matching nucleotides to make a new left hand side.
5. Do the two molecules have the same number of base-pairs or rungs? _____
6. Do the two molecules look alike? _____
7. What cells are most actively copying their DNA? _____

8. How are cancer cells different from normal healthy cells with regards to their DNA and with regards to the process of DNA replication and cell division? _____

RNA & Protein Synthesis Notes

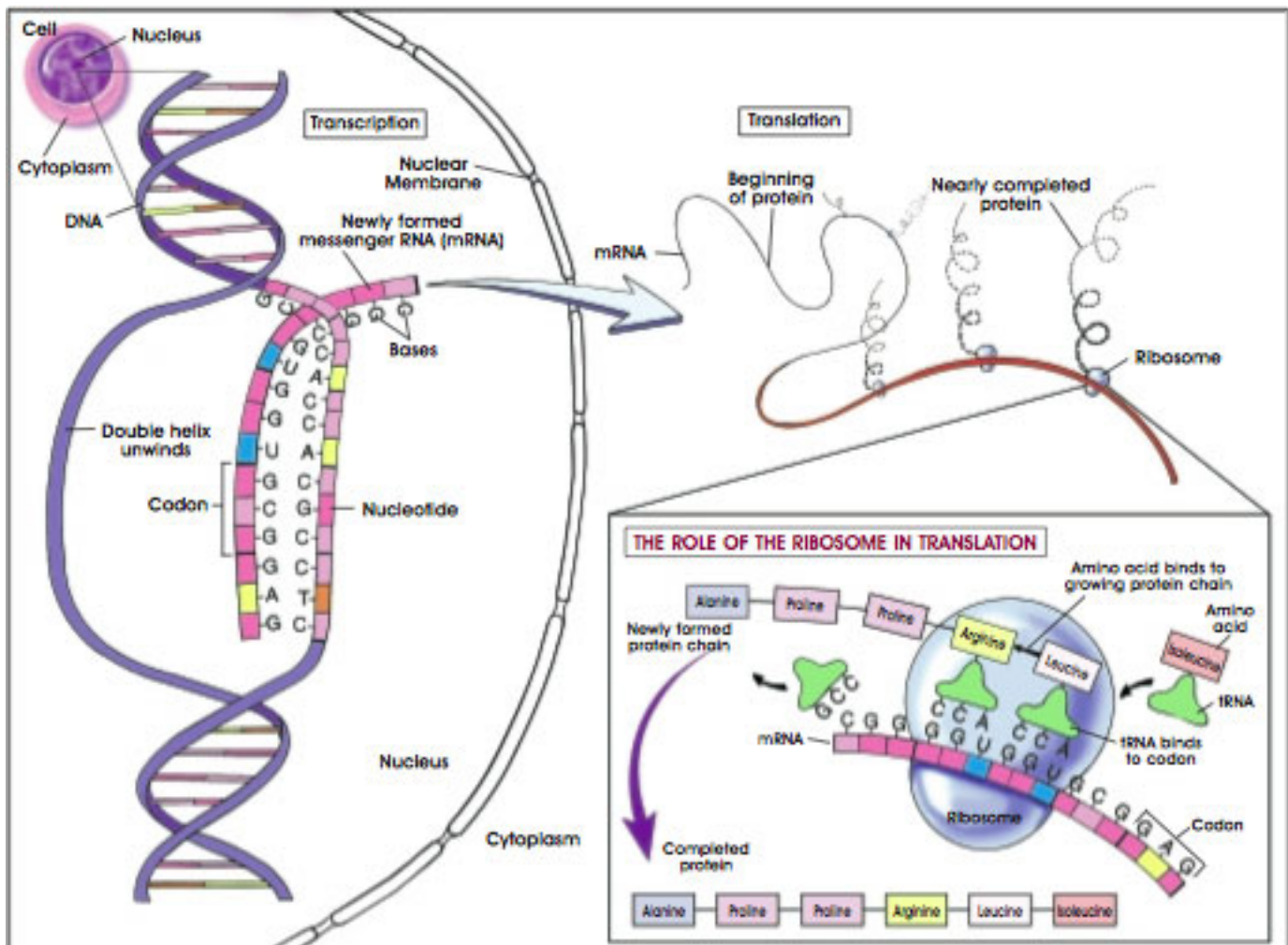
1. Proteins are made of _____. To get from DNA in the nucleus to proteins...there are a few steps.
2. DNA is a prisoner of the _____.
3. For the genetic information to leave the cell it must be copied into _____. *(RNA is the step between having genetic information and making something with that information.)*
4. RNA is also made of _____.
Each nucleotide is made of:
 - a. _____ sugar
 - b. phosphate group
 - c. one of four bases: adenine, cytosine, guanine, and _____.
5. RNA is a _____ strand of nucleotides (DNA is a _____ strand)
6. There are three types of RNA:
 - a. _____ (mRNA) - shape: _____
 - b. ribosomes (remember those good 'ol ribosomes in ALL cells) - shape: _____
 - c. _____ (tRNA) - shape: _____
7. RNA turns genetic information stored in DNA into proteins - called _____



Think – Pair – Share:

Steps to PROTEIN SYNTHESIS:

8. **TRANSCRIPTION:** mRNA _____ from DNA (similarly to how DNA is replicated). Then this “ribbon” of RNA slips out of the nucleus and attaches to a ribosome. Each set of three nucleotides of mRNA are called codons and code for a specific _____.
9. **TRANSLATION:** tRNA has a sequence of three bases that are _____ to the mRNA’s codon. The tRNA brings the amino acid from the cytoplasm by matching its anticodon to the mRNA.
10. Ribosomes provide a site for _____ to occur.
11. The chain of amino acids created by transcription and translation is called a: _____.



Sequence the Steps to Protein Synthesis

Cut out the steps to protein synthesis. Arrange them in order and glue or tape them to this paper. Describe each step in as much detail as possible. The words to use are:

transcription	translation	codon	anticodon	mRNA	tRNA
ribosome	amino acid	stop codon	start codon	nucleotides	
protein	DNA	nucleus			

1.		Name and describe this step. <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
		Where does the ribbon of mRNA go to when it leaves the nucleus? <hr/> <hr/> <hr/> <hr/>
2.		What is the function of tRNA? <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
		Which mRNA codon signals the beginning of protein synthesis? <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
3.		Describe the base pair rule that is illustrated here using words such as codon and anticodon. <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>

<p>4. Describe this step.</p>	<p>Describe each step in as much detail as possible. The words to use are:</p> <p>transcription translation ribosome amino acid DNA protein</p>
<p>Name and describe this step.</p>	<p>How are amino acids joined together to form a protein?</p>
<p>5. What is the function of tRNA?</p>	<p>What is the function of a stop codon?</p>
<p>6. Describe the base pair rule that is illustrated here using words such as codon and anticodon.</p>	<p>How can only 20 amino acids construct such a variety of proteins?</p>

COMPARE & CONTRAST

Main Topic

DNA: Code of Life

Subtopic

Subtopic

ALIKE

DIFFERENT

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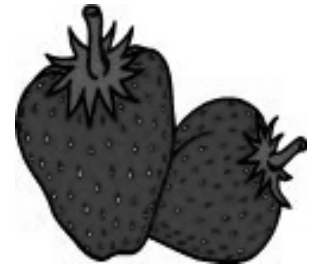
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DNA Extraction Lab



Background:

The DNA molecule is a very thin, long, strand. DNA found in each human cell is about 2 meters long. Even though DNA is invisible to the naked eye, we can observe DNA without powerful magnification by collecting many strands tangled together into a thick cable. This is similar to how one strand of thread is difficult to see, but a spool of thread is easily visible.

In this lab you will extract the DNA from strawberries. Strawberries release large amounts of DNA because they are octaploid, meaning they have 8 copies of every gene rather than the usual two.

SAFETY NOTE: NEVER TASTE LAB SUPPLIES, INCLUDING STRAWBERRIES, AND WASH HANDS AFTER EXPERIMENT.

Materials:

Strawberry puree
250 mL beaker
10 mL graduated cylinder
Paper towels

10 mL detergent solution
Test Tube
Stirring Rod
3 mL of ethanol

Procedure:

1. Obtain strawberry puree (strawberries & water). Using the filter pour about 25 mL of strawberry puree into a 250 mL beaker.
2. Measure 10mL of detergent solution and add to strawberry purée in beaker. Stir the solution GENTLY for 3 minutes.
RINSE GRADUATED CYLINDER WELL.
3. Transfer strawberry and detergent solution to a clear test tube. (It should be about $\frac{1}{2}$ - $\frac{1}{3}$ full.)
4. Very slowly, and gently, add 3mL of chilled ethanol DOWN THE SIDE OF THE TEST TUBE. (There should be a clear top layer and a red bottom layer.)
5. Let the test tube sit for 2-3 minutes. What begins to concentrate in the alcohol are thick clump of DNA.
6. Insert a stirring rod and gently stir the solution - not mixing the alcohol and strawberry solution. (DNA should spool around the stirring rod.)
7. Record observations on next page.
8. Clean-up: Rinse and dry test tubes and stirring rods and return to lab station.



Observations:

Analysis Questions

1. Think about where DNA comes from in the cell. What role might the detergent solution have played in allowing you to see DNA?
2. Why do you think it was necessary to add salt?
3. Why did you not see a double helix?
4. If you compared the DNA found in the strawberry to that found in your cheek cells, how would you expect it to compare?

DNA Animations:

Directions:

Visit the following websites. FIRST WATCH THE ANIMATION ALL THE WAY THROUGH. Then, watch it again and complete the questions (These links are on Mr. Rott's website under the DNA resources section).

Mitosis & Cytokinesis:

<http://highered.mcgraw-hill.com/olc/dl/120073/bio14.swf>

1. Chromosomes appear in which stage?
2. In the video, how many chromosomes did the cell begin with in prophase?
3. In the video, how many chromosomes did the two new cells end with after anaphase?

DNA Replication Fork:

<http://highered.mcgraw-hill.com/olc/dl/120076/micro04.swf>

1. What unwinds the double stranded DNA helix?
2. In what direction (3' or 5') can nucleotides only be added?
3. What is the difference between the leading strand and lagging strand?

How nucleotides are added in DNA Replication (ADVANCE BIOLOGY ONLY):

<http://highered.mcgraw-hill.com/olc/dl/120076/bio23.swf>

1. What is the name of the nucleotides where DNA replication begins?
2. What unwinds the double stranded DNA helix?
3. Which is the only end DNA polymerase III can add nucleotides to the new strand of DNA?
4. What does the RNA primer (10 nucleotides) do?

Protein Synthesis:

<http://highered.mcgraw-hill.com/olc/dl/120077/micro06.swf>

1. How many nucleotides make up a codon?
2. What is the difference between a codon and anti-codon?
3. When are amino acids no longer added to the polypeptide chain?
4. What structure (think back to the cell unit) helps create proteins?
5. What happens to this structure after the stop codon appears?

Youtube Transcription:

<http://www.youtube.com/watch?v=vJSmZ3DsntU>

1. What is transcription?
2. What is the first step to transcription?
3. What would be the sequence of codons for a DNA strand of "TAA"?
4. The _____ is the product of transcription and it _____ the nucleus.

Youtube Translation:

<http://www.youtube.com/watch?v=B6O6uRb1D38&feature=related>

1. What is translation?
2. What is located on the top of the tRNA molecule?
3. What is an anti-codon? What do they do during translation?
4. What does the codon AUG do?
5. What type of bond connects amino acids?

The whole process together...

<http://www.youtube.com/watch?v=983lhh20rGY>

What is the overall product of transcription & translation?

How Genes Make Proteins

Given below are some tRNA anticodons/amino acid relationships and a stretch of imaginary DNA. Fill in the missing boxes in the chart below by writing the correct mRNA codons, tRNA anticodons and amino acids.

Use the following tRNA/amino acid relationships:

Codon	GGC	UUA	CAG	CUC	GAU	AGG	CCG
Protein	Pro	Asn	Val	Glu	Leu	Ser	Gly

DNA	TAC	AGG	GGC	CTC	TTA	CAG	CTC	GAT	AGG	CCG	GAT	ATC
mRNA												
tRNA												
Amino Acid												

What are the similarities between the DNA sequence and the tRNA sequence?

A new and exciting branch of biotechnology is called protein engineering. To engineer proteins, molecular biologists work backward through the protein synthesis process. They first determine the exact sequence of the polypeptides they want, and then create a DNA sequence to produce it. Use the rules of transcription and translation to “engineer” the peptide sequence below. Fill in the rows for tRNA anticodons, mRNA codons and DNA. Use the tRNA/amino acid relationships chart above

DNA												
mRNA												
tRNA												
Amino Acid	Met start	Leu	Val	Pro	Gly	Asn	Ser	Glu	Glu	Pro	Val	stop

DNA Practice Quiz:

Directions:

Record your answers on the following two pages. **Do not use your notes. This is a practice quiz for you to test what you know.**

DNA Practice Quiz Continued:

Protein Sentences:

INTRODUCTION:

Every cell in your body is made up of proteins. Special proteins, called enzymes, regulate nearly all the chemical activities of the body. **How are these proteins produced?** In this activity, you **WILL WORK IN PAIRS** to apply what you have learned about transcription and translation in the process of protein synthesis. You will construct a “protein” (in the form of a sentence) from a DNA template. Review the following terms before beginning this activity: DNA, tRNA, mRNA, nucleotide, triplet, codon, anti-codon, amino acid, transcription, and translation. When DNA nucleotides pair with RNA nucleotides, they do so in the following manner:

ADENINE (in DNA) pairs with URACIL (A-U) in the RNA molecule.
THYMINE (in DNA) pairs with ADENINE (T- A) in the RNA molecule.
CYTOSINE (in DNA) pairs with GUANINE (C-G) in the RNA molecule.
GUANINE (in DNA) pairs with CYTOSINE (G-C) in the RNA molecule.



Also, recall that tRNA pairs with mRNA to translate the message. **Therefore, you will NOT be making any base pairs with THYMINE.**

MATERIALS:

DNA TEMPLATES
64 ANTI-CODONS
DATA SHEETS.

PROCEDURE:

1. You will be given a **DNA** template. Write the template sequence in the space provided on the **DATA SHEET**.
2. **Transcribe the DNA template into mRNA.** Record the mRNA sequence of codons in the space provided on the **DATA SHEET**.
3. **Record the tRNA** sequence of anti-codons in the space provided on the **DATA SHEET**.
4. Once you have determined the **tRNA** sequence of anti-codons, use the **ANTI-CODON WORD LIST** to find the proper match of anti-codons and words.
5. **Record the message** in the space provided on the **DATA SHEET**.
6. If your “protein” has been properly constructed, you will end up with a coherent message. If not, you will end up with a nonsense message.
7. Tear out your data sheet and turn in at the end of the period.

Protein Sentences Data Sheet:

DNA Template Number: _____

DNA: _____

mRNA: _____

tRNA: _____

Message: _____

DNA Template Number: _____

DNA: _____

mRNA: _____

tRNA: _____

Message: _____

DNA Template Number: _____

DNA: _____

mRNA: _____

tRNA: _____

Message: _____

DNA Template Number: _____

DNA: _____

mRNA: _____

tRNA: _____

Message: _____

Mutations (*Draw pictures/diagrams*):

What is a mutation?

Substitution:

Example:

Outcomes:

1. _____
2. _____
3. _____

Insertion:

Example:

Outcomes:

Deletion:

Example:

Outcomes:

Frameshift:

Example:

Outcomes:

1. _____
2. _____
3. _____

SECTION

5.1

THE CELL CYCLE

Study Guide

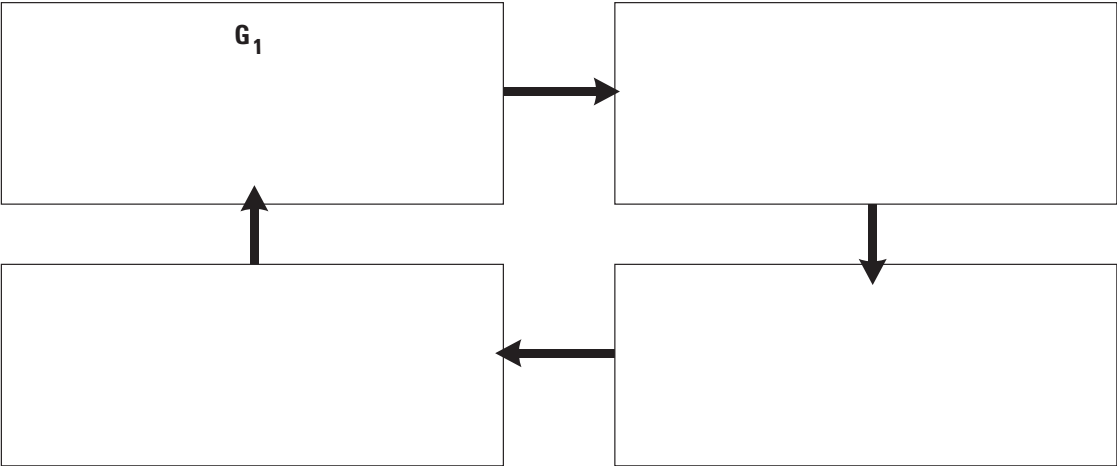
KEY CONCEPT

Cells have distinct phases of growth, reproduction, and normal functions.

VOCABULARY	
cell cycle	cytokinesis
mitosis	

MAIN IDEA: The cell cycle has four main stages.

Summarize what happens during each stage of the cell cycle in the boxes below.



- How did the G₁ and G₂ stages get their names?
- Cells must pass through a critical checkpoint during which two stages of the cell cycle?
- Where does DNA synthesis happen in eukaryotic cells?
- What two processes make up the M stage?

Name _____

Period _____

Date _____

STUDY GUIDE, CONTINUED

MAIN IDEA: Cells divide at different rates.

5. Among different types of cells, which stage of the cell cycle varies most in length?

6. Why does a skin cell divide more often than a liver cell?

7. What is G_0 ?

MAIN IDEA: Cell size is limited.

8. Write an analogy to explain why cell size is limited.

9. Which typically increases faster as a cell grows, surface area or volume?

10. For cells to stay the same size from generation to generation, what two things must be coordinated?

Vocabulary Check

11. Think of an example of a cycle. What does this cycle have in common with the cell cycle?

12. What process divides a cell's cytoplasm? How do the two word parts of your answer help you remember it?

13. What process divides the cell nucleus and its contents?

SECTION

8.2

STRUCTURE OF DNA

Power Notes

Parts of a DNA molecule

Nitrogen-containing bases

Pyrimidines

Purines

Backbone

1.

2.

Overall shape:

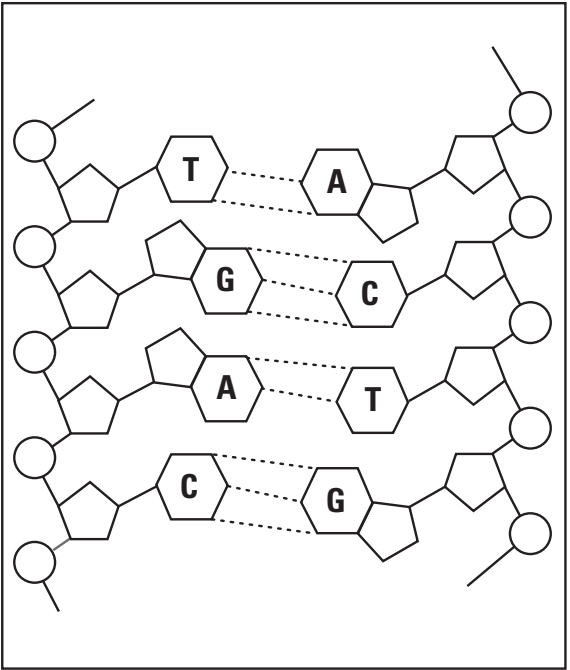
Base pairing rules:

Bonding

1.

2.

Chargaff's rules:





Name _____

Period _____

Date _____

SECTION
8.3

DNA REPLICATION
Study Guide

KEY CONCEPT

DNA replication copies the genetic information of a cell.

VOCABULARY

replication

DNA polymerase

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?

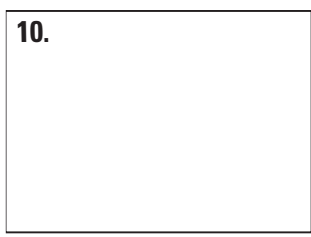
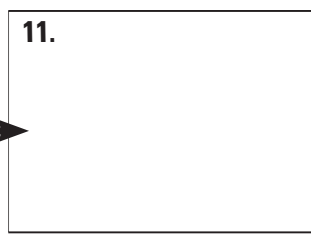
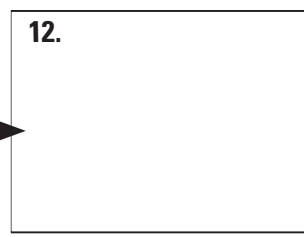
Name _____

Period _____

Date _____

STUDY GUIDE, CONTINUED

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

10.	11.	12.
		
_____	_____	_____
_____	_____	_____
_____	_____	_____

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.

SECTION

8.4

TRANSCRIPTION

Power Notes

Central Dogma

1. DNA

2.

3.

4.

5.

DNA:

RNA:

Transcription

Label the parts on the lines below. Summarize the steps of transcription in the boxes.

1.

2.

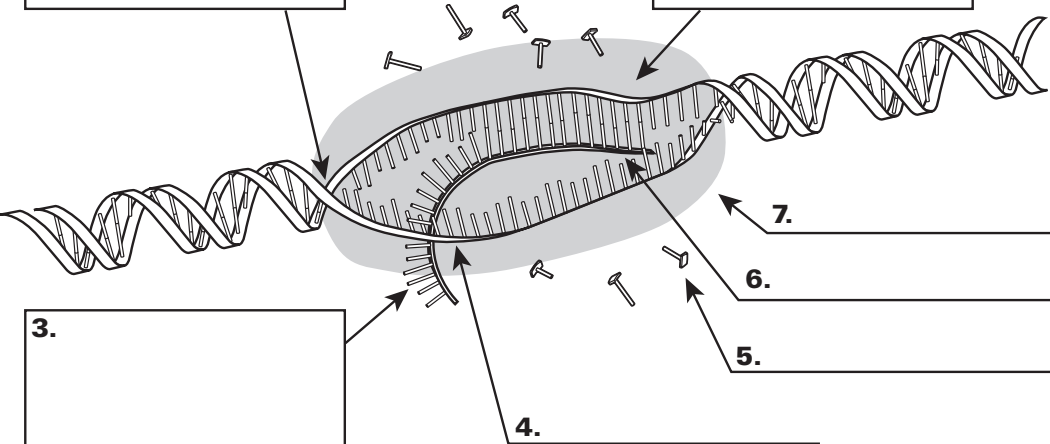
3.

4.

5.

6.

7.



RNA Type	Function
1. Messenger RNA (mRNA)	
2.	
3.	

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Name _____

Period _____

Date _____

SECTION
8.5

TRANSLATION
Study Guide

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 8.13 be found in a strand of DNA or RNA?

4. What is a reading frame?

Refer to Figure 8.13 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.

Name _____

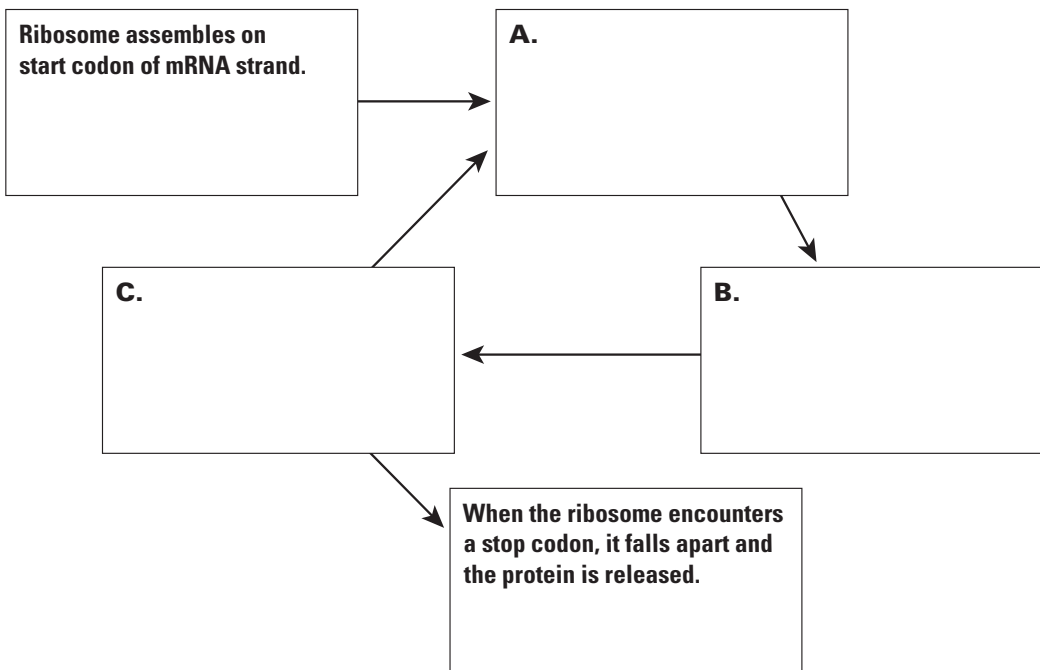
Period _____

Date _____

STUDY GUIDE, CONTINUED

- 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?

Name: _____

DNA Word Find and Study Guide

Directions: Read the clues and fill in the blanks for the statements below. Next, try to find the words you wrote in the word find. Have fun!!

1. The double stranded nucleic acid is called _____.
2. The process whereby DNA copies itself is called _____.
3. The number of bonds joining cytosine to guanine is _____.
4. Of the sugar and phosphate comprising the backbone, the nitrogenous base attaches to the _____.
5. The bonds joining nitrogenous bases to each other are called _____.
6. The part of the cell that stores DNA is called the _____.
7. Based on structure, adenine and guanine are a type of base called _____.
8. The spiral structure of DNA is called a _____.
9. Thymine, a pyrimidine, can only bond to a purine called _____.
10. The last names of the two men famed in 1953 for discovering the structure of DNA are _____.
11. Together, a phosphate group, a sugar molecule, and a nitrogenous base form a _____.
12. The sugar of DNA is called _____.

W	Y	T	H	R	E	E	G	P	O	H	D
A	D	E	N	E	H	Y	G	E	N	Y	E
T	D	B	L	P	U	R	I	M	D	D	O
S	O	G	A	L	I	C	A	T	I	R	X
O	U	H	W	I	T	S	O	N	A	O	Y
N	B	L	I	C	S	N	U	C	L	G	R
A	L	T	S	A	D	E	N	I	N	E	I
N	E	L	U	T	S	B	O	D	M	N	B
D	H	T	E	I	E	D	E	O	X	B	O
C	E	H	L	O	N	N	T	A	M	O	S
R	L	R	C	N	I	E	R	H	M	N	E
I	I	A	U	O	R	K	G	M	B	D	Y
C	X	I	N	S	U	R	A	G	U	S	J
K	D	W	A	D	P	T	N	A	P	L	O
L	F	N	U	C	L	E	O	T	I	D	E

Name _____

Date _____

GENES AND CHROMOSOMES

Reviewing Vocabulary

From the words provided in the list, write the one that best completes each of the following statements. Use these choices:

mRNA

nitrogen bases

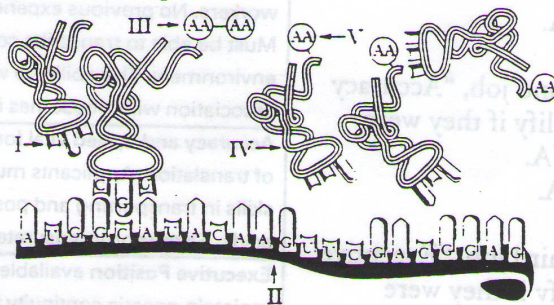
tRNA

translation

codon

- During the process of transcription, DNA serves as the template for making _____, which leaves the nucleus and travels to the ribosomes.
- The process of converting RNA code into an amino acid sequence is called _____.
- Each set of three nitrogen bases representing an amino acid is referred to as a _____.
- Thymine, adenine, guanine, and cytosine are classified as _____.
- _____ brings amino acids to the ribosomes for the assembly of proteins.

Refer to the diagram below to answer questions 2–5.



- The process illustrated is
 - translation.
 - replication.
 - monoploidy.
 - transcription.
- Structure III represents a(n)
 - gene.
 - amino acid.
 - codon.
 - DNA molecule.
- Which of the above structures are composed of RNA?
 - II and IV
 - III and IV
 - I and V
 - III and V
- Where in the cell does this process occur?
 - in the nucleus
 - in food vacuoles
 - at the ribosomes
 - within the plasma membrane

Name _____

Date _____

Class _____

Concept Mapping

CHAPTER 13 GENES AND CHROMOSOMES

DNA AND RNA

Complete the concept map to show how DNA and RNA are alike and how they differ. Use these words or phrases: *ACGT, ACGU, DNA, deoxyribose, double chain, mRNA, no, nucleus, nucleus and cytoplasm, ribose, RNA, rRNA, tRNA, yes.*

