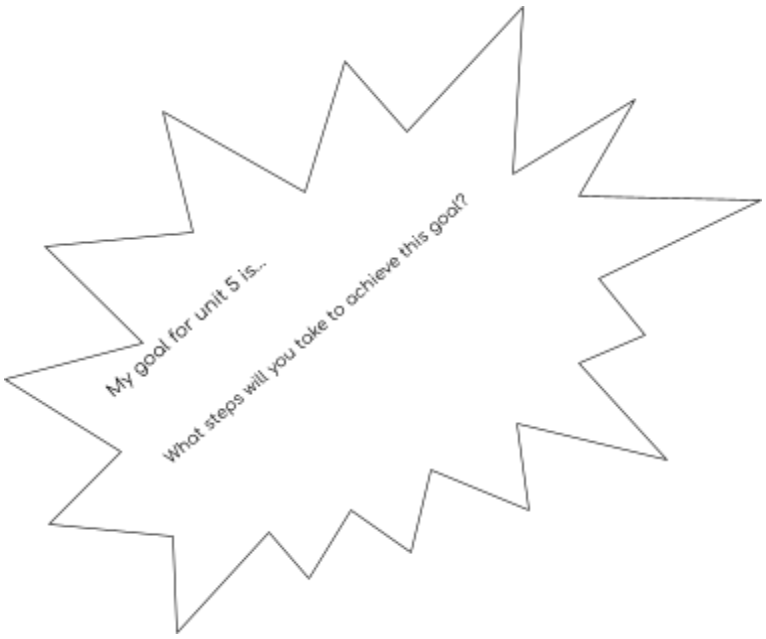


Biology

Unit 5

DNA

Name _____

Class Period _____

The UNIT 05 TEST is on

_____

Unit 5 Vocabulary: DNA

This page is not required, but it is *highly recommended* that you fill it out as we go through the unit. All of the following vocabulary words are relevant to the unit and are found on the Unit 5 Quizlet: shorturl.at/dmEPQ

DNA Structure and Replication

Watson and Crick -

DNA -

Rosalind Franklin -

Nitrogenous Bases -

Adenine -

Thymine -

Cytosine -Guanine -

Deoxyribose -

Phosphate -

DNA Helicase -

DNA Polymerase -

Semiconservative Replication -

S Phase -

Interphase -

Genes -

Complementary Base Pair Rule -

Nucleotides -

Centromere -

Sister Chromatids -

Mutation -

Double Helix -

Antiparallel -

Unit 5 Vocabulary: DNA (continued)

Transcription and Translation

The Central Dogma of Biology -

RNA Polymerase -

Uracil -

Transcription -

Transcript -

RNA -

mRNA -

rRNA -

tRNA -

Translation -

Protein -

Amino Acids -

Codon -

Anticodon -

Stop Codon -

Ribosome -

Peptide -

Polypeptide -

Peptide bond -

Unit 5 Preview: DNA Name _____

Biology Date _____ Hour _____

Using your textbook and what you already know, answer the following questions to help you preview what we are learning about in this unit.

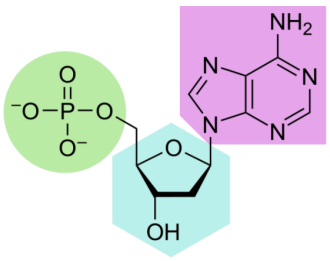
1. What is **DNA**?* (use the internet to search for this answer)

2. **Where** is DNA found?* (use the internet to search for this answer)

3. **Label** the diagram of DNA using the following terms: Adenine (A), Guanine (G), Thymine (T), Cytosine (C), Nitrogenous base, Base pair, Sugar Phosphate backbone. * (use the internet to search for this answer)

4. What is a **nucleotide**? (pg 329)

   a. **Label** the generic nucleotide below. (pg 329)



5. How do the **nucleotides pair up**? (Which ones go together?) (pg 330)

6. DNA is found as **what type of shape**? (pg 330)

7. Who officially discovered the **shape/structure of DNA**? (pg 330)

   Fun Fact: a Nobel Prize was awarded to both scientists for this discovery.

8. Who else helped discover DNA by taking the famous **photograph 51**? (p.330)

   Not So Fun Fact: this scientist wasn't given a Nobel Prize or really any credit for their contribution to the discovery of the structure of DNA.

9. How many **hydrogen bonds** do adenine (A) and thymine (T) share? (pg 330)

10. How many **hydrogen bonds** do cytosine (C) and guanine (G) share? (pg 330)

11. The nucleotide bases have **complementary base pairing.** What does that mean? (pg 330)

12. What is **semiconservative replication** and what are the three main stages of this process? (pg 333)

13. When does **DNA replication** occur? (pg 333)

14. Write out the **central dogma of biology**. (pg 336) (answer questions 16-19 first!)

15. How is RNA different from DNA? List **3 differences**. (pg 336)

16. Explain **transcription**. Be as detailed as possible. (pg 337)

17. Define "**codon**". When are these used and where can they be found?(pg 338)

18. Explain **translation**. Be as detailed as possible. (pg 338)

Introduction to DNA Structure & Replication Name _____

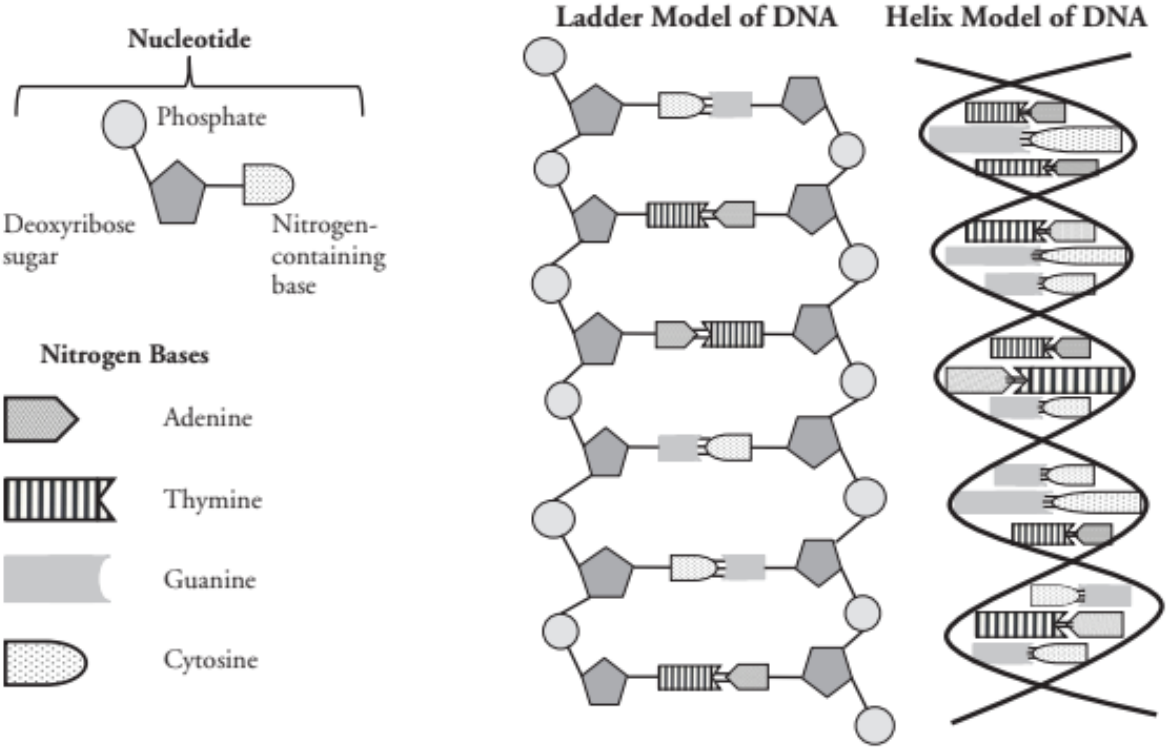
How is genetic information stored and copied?

Biology Date _____ Hour _____

Why? *Read & annotate the paragraph below.*

Deoxyribonucleic acid or **DNA** is the molecule of heredity. It contains the genetic blueprint for life. For organisms to grow and repair damaged cells, each cell must be capable of accurately copying itself. So how does the structure of DNA allow it to copy itself so accurately?

Model 1 - The Structure of DNA



1. Refer to the diagram in **Model 1**.
   a. What are the three parts of a nucleotide?

   b. What kind of sugar is found in a nucleotide?

   c. Which nucleotide component contains nitrogen?

   d. Name the four nitrogen bases shown in Model 1.

2. DNA is often drawn in a "ladder model." Locate this drawing in Model 1.
   a. Circle a single nucleotide on each side of the ladder model of DNA.
   b. What part(s) of the nucleotides make up the rungs of the "ladder"?

c. What parts of the nucleotides make up the sides (backbone) of the "ladder"?

d. Look at the bottom and top of the "ladder" in Model 1. Are the rungs parallel (the ends of the strands match) or antiparallel (the ends of the strands are opposites)?

3. On the ladder model of DNA in **Model 1** label each of the bases with the letter A, T, C or G. Use a different color.

Key Concept!

4. Refer to **Model 1**. When one nucleotide contains adenine, what is the name of the other base that adenine is attached to on the opposite nucleotide strand?

5. The two strands of DNA are held together with hydrogen bonds between the nitrogen bases. These are weak bonds between polar molecules. How many hydrogen bonds connect the two bases from Question 4?

Key Concept!

6. Refer to **Model 1**. When one nucleotide contains cytosine, what type of base is the cytosine attached to on the opposite nucleotide strand?

7. How many hydrogen bonds connect the two bases from Question 6?

8. Use a complete sentence to write a rule for how the bases are arranged in the ladder model of DNA.

Read This! *Read & annotate the paragraph below.*

Erwin Chargaff (1905–2002), an Austrian-American biochemist, investigated the ratio of nucleotide bases found in the DNA from a variety of organisms. From his research, as well as research by Rosalind Franklin and Maurice Wilkins, Watson and Crick developed the **complementary base-pair** rule during their race to discover the structure of DNA. The complementary base-pair rule states that adenine and thymine form pairs across two strands, and guanine and cytosine form pairs across two strands.

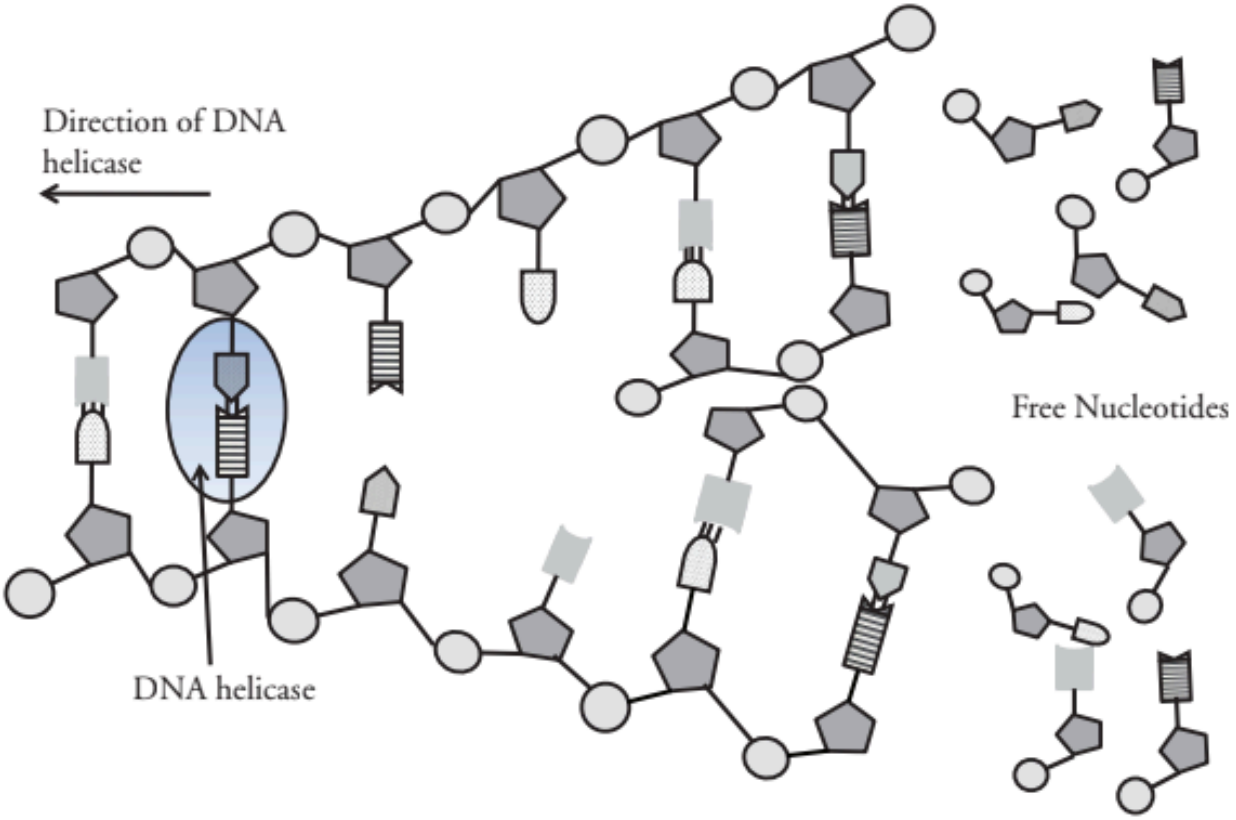
9. Fill in the complementary bases on the strand below according to the base-pair rule.

Parent Strand: A T C C A G

Complementary Strand:

10. The ladder model of DNA is a simplified representation of the actual structure and shape of a DNA molecule. In reality, the strands of DNA form a double helix. Refer to the double helix diagram in Model 1 and describe its shape using a complete sentence.

Model 2 - DNA Replication



11. Examine **Model 2**. Number the steps below in order to describe the replication of DNA in a cell. Use the picture to help you infer the order of the steps.

    _____ Hydrogen bonds between nucleotides form.

    _____ Hydrogen bonds between nucleotides break.

    _____ Strands of DNA separate.

    _____ Free nucleotides are attracted to exposed bases on the loose strands of DNA.

12. Locate the DNA helicase on **Model 2**.
    a. What type of biological molecule is DNA helicase?

       *We haven't learned about this yet. Anything that has the suffix "-ase" is called an **enzyme** which is a type of protein that serves a specific function.*

    b. What is the role of DNA helicase in the replication of DNA?

13. What rule is used to join the free nucleotides to the exposed bases of the DNA? *Hint: look back at the "Read This" section.*

Key Concept!

14. This type of replication is called **semi-conservative replication.** Considering the meaning of these words (semi—half; conserve—to keep), explain why DNA replication is called semi-conservative.

15. DNA molecules can be tens of thousands of base pairs in length. Mistakes in DNA replication lead to mutations, which may or may not be harmful to an organism. How does semi-conservative replication help prevent mutations during DNA replication?

16. The proportions of the bases are consistent within a species; however they do vary between species. Using the base-pair rules, complete the following table to show the percentage of each type of base in the five different organisms. *Hint: look back at the "Read This" section.*

Organism	**Percentage of each type of base**			
	Adenine (A)	**Guanine (G)**	**Cytosine (C)**	**Thymine (T)**
Human	31		19	
Cow	28	22		
Salmon			21	29
Wheat	27			
Yeast	31	19		

DNA: Discovery, Structure, & Replication

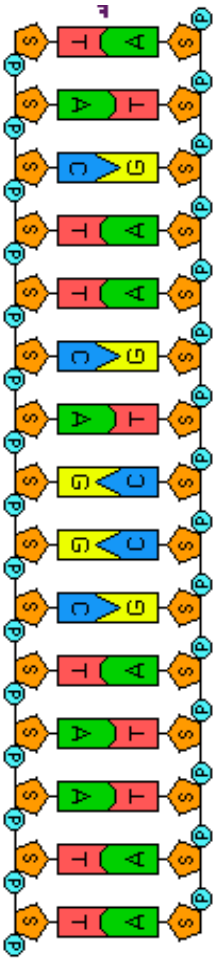
Name _____

Biology

Date _____ Hour _____

DNA Discovery and Structure

- The Discovery of DNA's Structure
  - _____ & _____ discovered the structure of DNA using _____ image of DNA. (she used x-ray crystallography)
  - They confirmed that DNA strands are….
    - _____ - each strand of DNA contains a set of base pairs that are complementary (_____) to the other strand. The complement to adenine (A) is _____ and the complement to cytosine (C) is _____.
    - _____ - each strand of DNA is oriented _____ (opposite) of the other strand.
    - shaped like a _____ _____- the two strands of DNA are _____ together forming a helix with two strands. It looks like a _____.

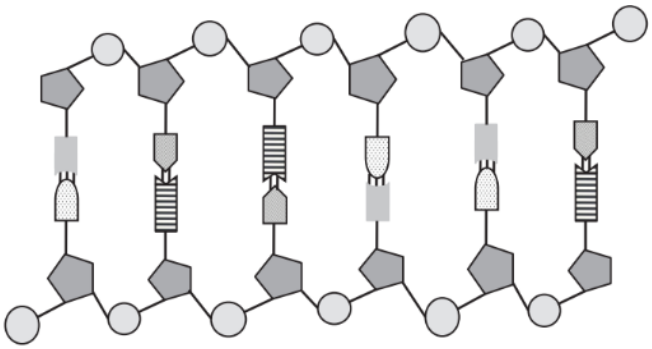


- DNA Structure
  - DNA stands for _____
  - A molecule that stores the _____ _____ in organisms for making all proteins. It's like a _____ or set of instructions for the cell to follow.
  - DNA is made up of _____
    - These are the _____ _____ of DNA
    - Nucleotides have 3 parts:
      - _____ group
      - Sugar called _____
      - Nitrogen-containing _____. There are 4 possible bases for DNA:

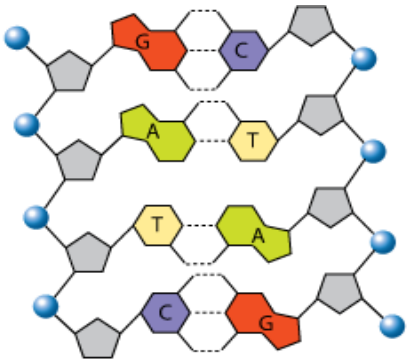
        A = _____ G = _____

        C = _____ T = _____
  - DNA has a structure similar to a twisted ladder.
    - The sides of the ladder are called the "_____" of DNA and is made of _____and _____ sugar
    - The "_____" of the ladder is made of the nitrogenous _____ (A, T, C, and G)

* Label the image of DNA below with the following terms: backbone, rungs, phosphate, nitrogenous base, and sugar



- Complementary Base Pair Rule
  - Each nitrogenous base on one strand of DNA is _____ _____ with its complementary base pair on the other strand of DNA.
  - _____ binds to Thymine with _____ hydrogen bonds
    - AT2 (Apple in the Tree)
  - Cytosine binds to _____ with _____ hydrogen bonds
    - CG3 (Car in the Garage with 3 hydrogen bonds



- Chargaff's theory
  - Chargaff found that the number of adenine bases was _____ to the number of thymine. The same for cytosine and guanine. His work supported the _____.
  - Write the two formulas that help you remember Chargaff's theory:

DNA Replication

- Replication - Process during _____ _____ when DNA is _____
- There are 3 steps to DNA replication…
  - Step 1: Unzip
    - Helicase (enzyme) _____ the double helix
  - Step 2: Place Bases
    - DNA _____ places complementary base pairs. (according to base pairing rules: _____ & _____)

- Step 3: 2 Strands Created
  - 2 _____,

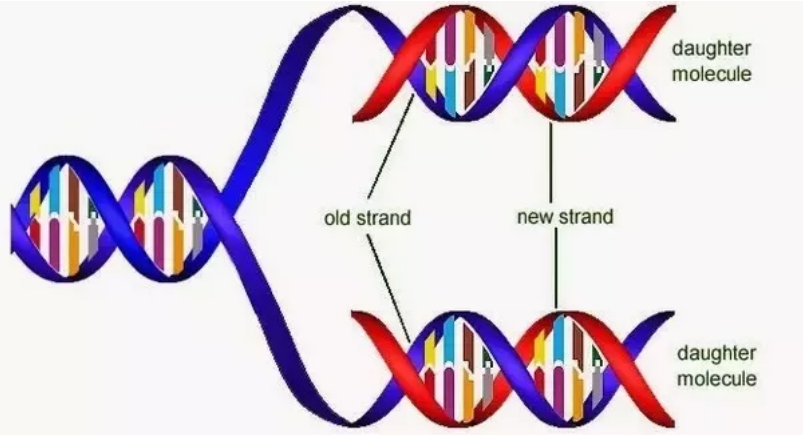
    _____

    DNA molecules are made.
  - *semiconservative = 1 _____ strand is conserved (saved) and 1 _____ strand is made.*
  - These two strands are the sister

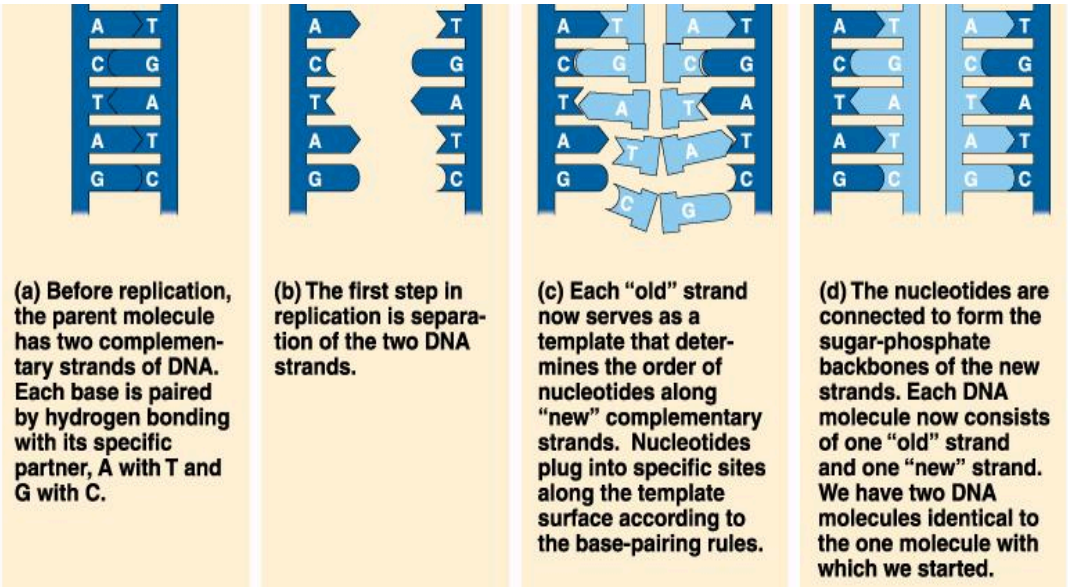
    _____ (held

    together by a_____)

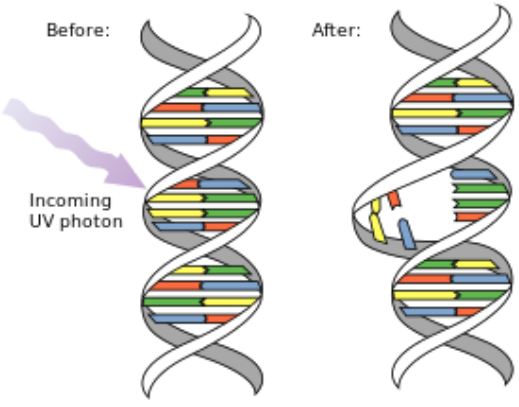
    that separate in anaphase of mitosis.



- DNA Replication Summary
  - Step 1: Helicase unzips DNA
  - Step 2: Polymerase places bases on DNA
  - Step 3: Process repeats until all of the DNA molecule is replicated



- Mutations - ACCIDENTS HAPPEN!
  - Mutation: A _____in organisms' DNA
    - Happens during _____ if it affects a single gene
    - If a mutation is not fixed, if may _____ change an organism's DNA
  - Effects of mutated DNA
    - Genetic diseases, Cancer, New genetic traits, or even _____



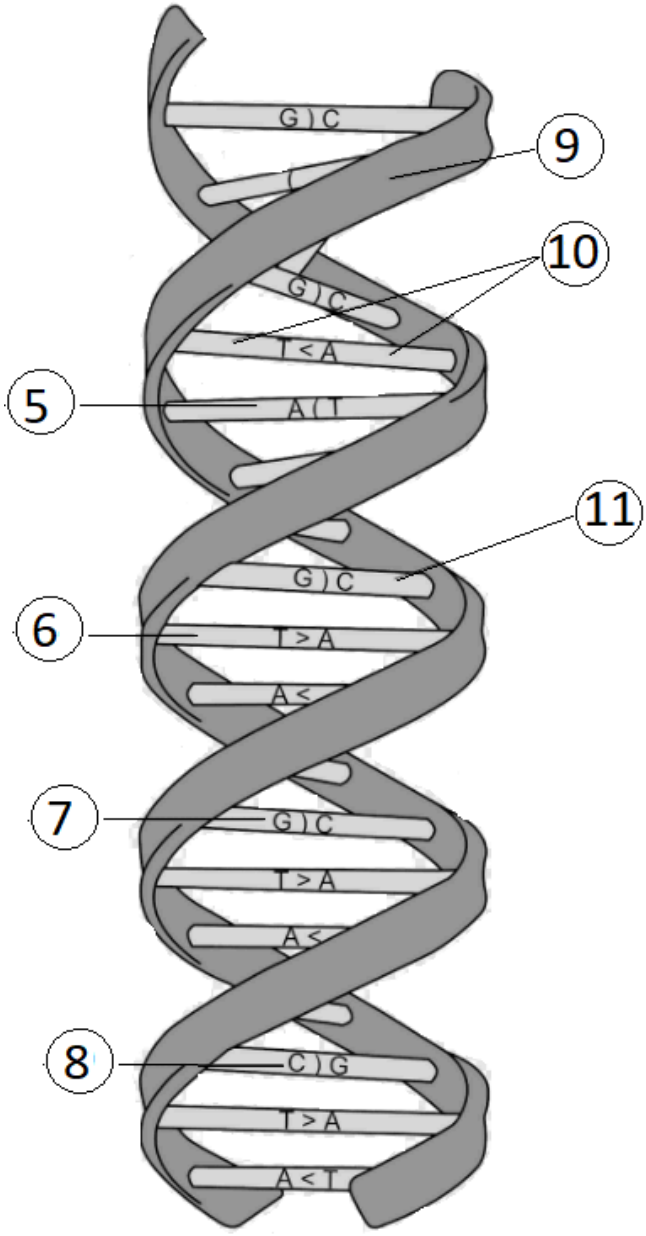
DNA Structure & Replication Practice Name _____

Biology Date _____ Hour _____

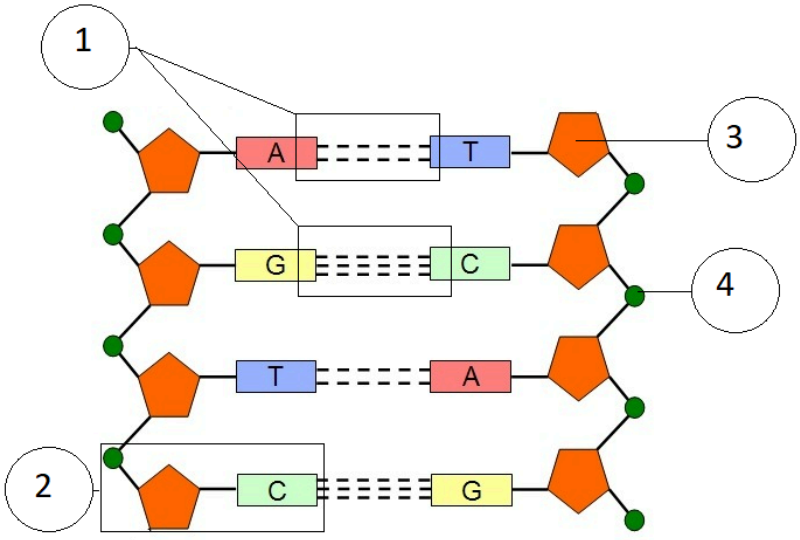
1. Write the term that best identifies each part of the DNA model to the right. Use the following word bank:

phosphate	cytosine	nitrogenous base	sugar/phosphate backbone
thymine	nucleotide	hydrogen bonds	deoxyribose sugar
guanine	adenine	base pair	

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____



Use the image below to describe what it means to have two strands of DNA that are ***antiparallel.***



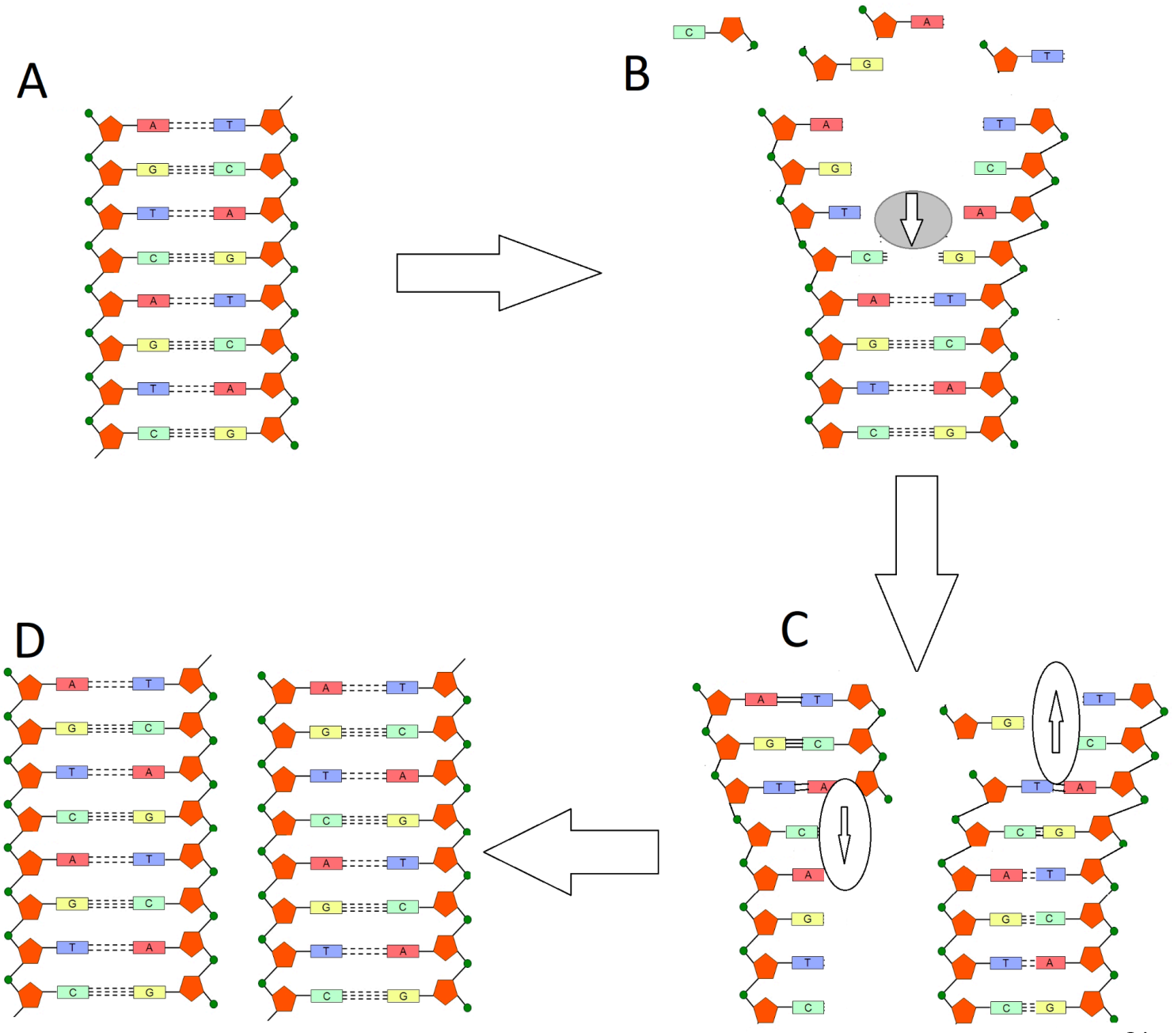
2. When does DNA replication occur? Be specific.

3. Where do the nucleotides in step B come from?

4. What is the name of the enzyme in step B called? What is its role?

5. What is the name of the enzyme in step C caller? What is its role?

6. For each image below (A-D), write one sentence describing what is happening.

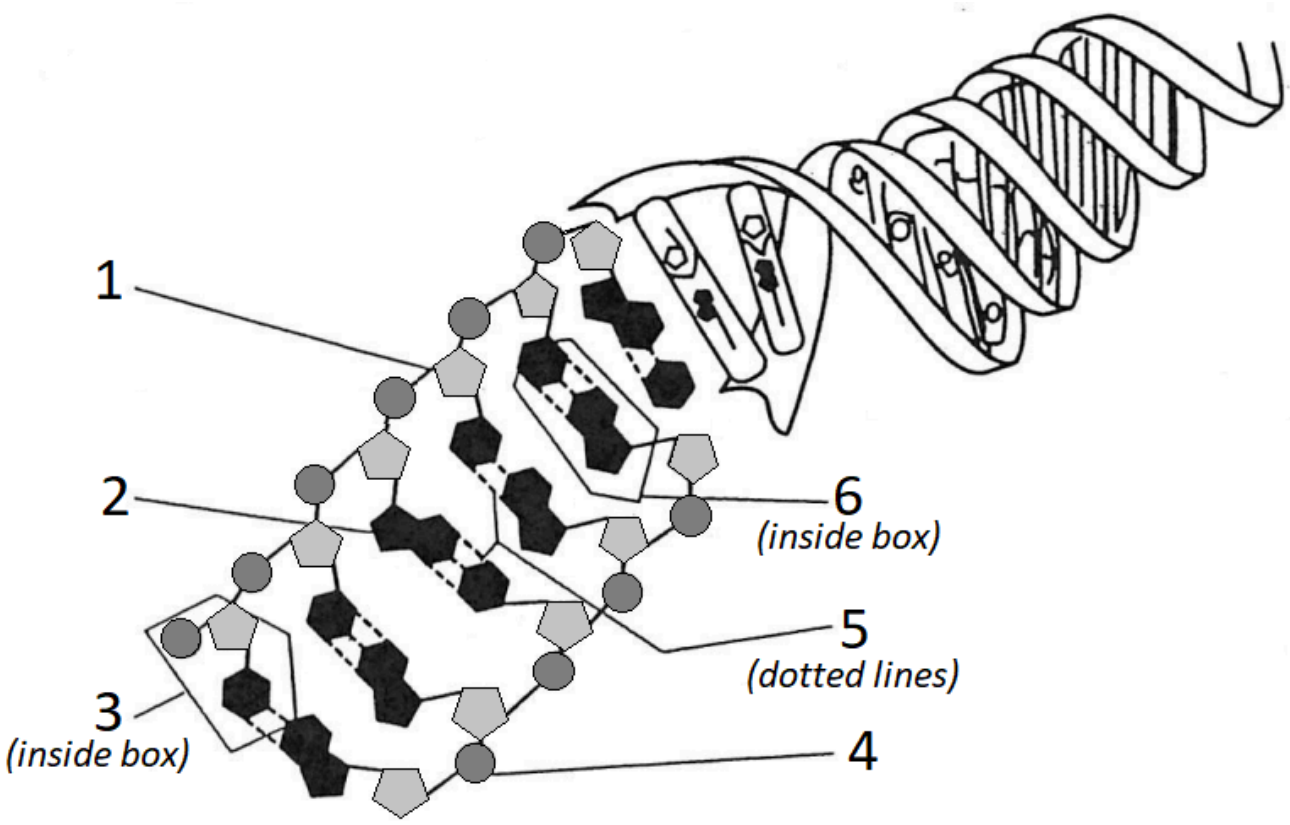


DNA & Genes Reinforcement Name _____

Biology Date _____ Hour _____

Label the diagram below. Use the following choices:

nucleotide deoxyribose phosphate group nitrogenous base hydrogen bonds base pair



Complete each statement below. There is no word bank provided.

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. The process of _____ produces a new copy of an organism's genetic information, which is passed on to a new cell.
11. The double-coiled shape of DNA is called a _____.
12. Write the complementary DNA strand for the following parent DNA code: A T T G C T A C

Sequence Organizer: DNA Replication

Name:_____

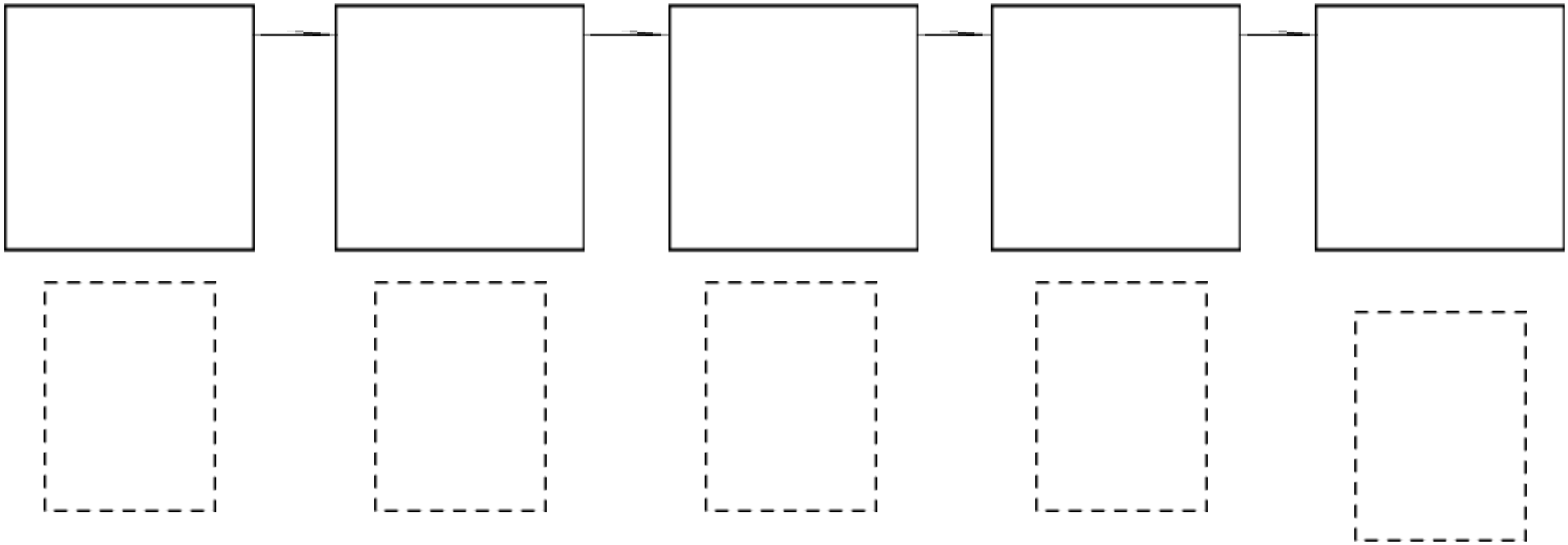
Biology

Date: _____Hour_____

Cut each action box out (or rewrite them in the appropriate boxes), put them in the correct order of DNA replication, and paste it to the appropriate box above. Then, draw the step of DNA replication described in the action box. Finally, select the term that best matches the action taking place.

DNA Replication occurs during _____ stage of the cell cycle.

Draw it!



Term: _____ _____ _____ _____ _____

ACTION BOXES:

The DNA strands are held open.	The DNA is has been copied.	The DNA is unzipped by an enzyme.	An enzyme adds bases to the unzipped strands of DNA.	Half of the new strands are old DNA half are new.

TERMS:

DNA Helicase
DNA Polymerase
DNA Replication
Semi-Conservative
SSB Protein

The Central Dogma of Biology

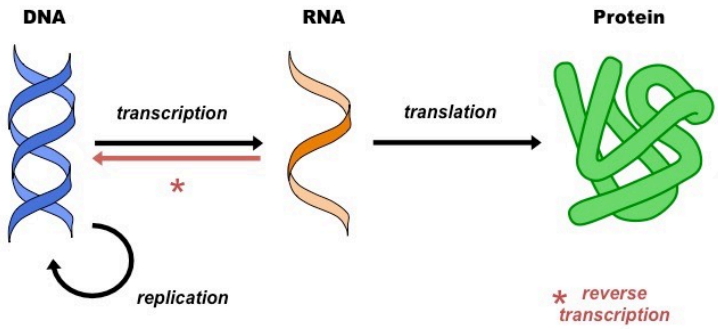
Name _____

Biology

Date _____ Hour ____

The Central Dogma of Biology

- Explains the flow of _____ from _____ to _____ to a functioning _____
- You could compare it to computer technology.
  - DNA is the storage - it stores instructions for proteins in the nucleus.
  - RNA is the software - a temporary set of instructions for cells to make a protein.
  - Proteins are the applications - they form the basis of life by performing basic cell functions.

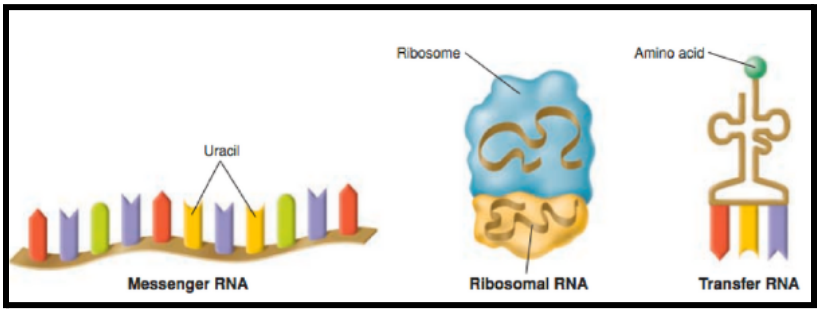


RNA Structure

- _____ = RNA
  - _____ stranded (not a double helix like DNA)
  - Contains _____ instead of _____
  - RNA is a _____ of DNA used to make _____
- Nucleotides
  - Nucleotides have three parts:
    - A _____ group
    - A simple sugar called _____ (not deoxyribose, like DNA)
    - A nitrogen-containing base.
      - G = _____ C = _____
      - A = _____ U = _____(uracil binds to adenine)

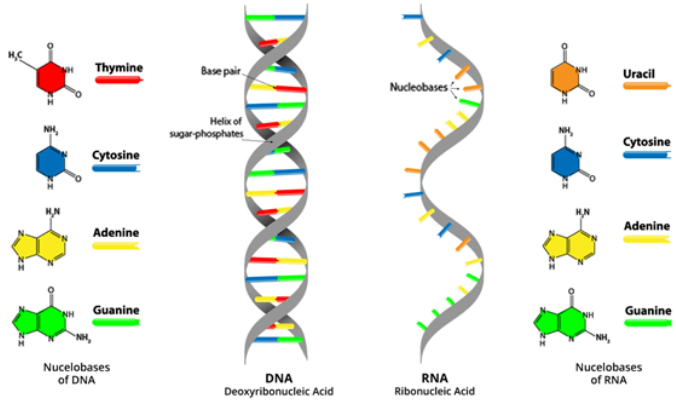
3 Types of RNA

- mRNA (_____ RNA)
  - Carries a _____ (_____) of the DNA's instructions (code) out of the _____ and into the _____for the creation of proteins.
- rRNA (_____ RNA)
  - Makes up _____ (structures where proteins are assembled).
- tRNA (_____ RNA)
  - _____ the mRNA transcript (made of nitrogenous bases) into _____ _____ inside the ribosome to create a protein.



DNA vs RNA

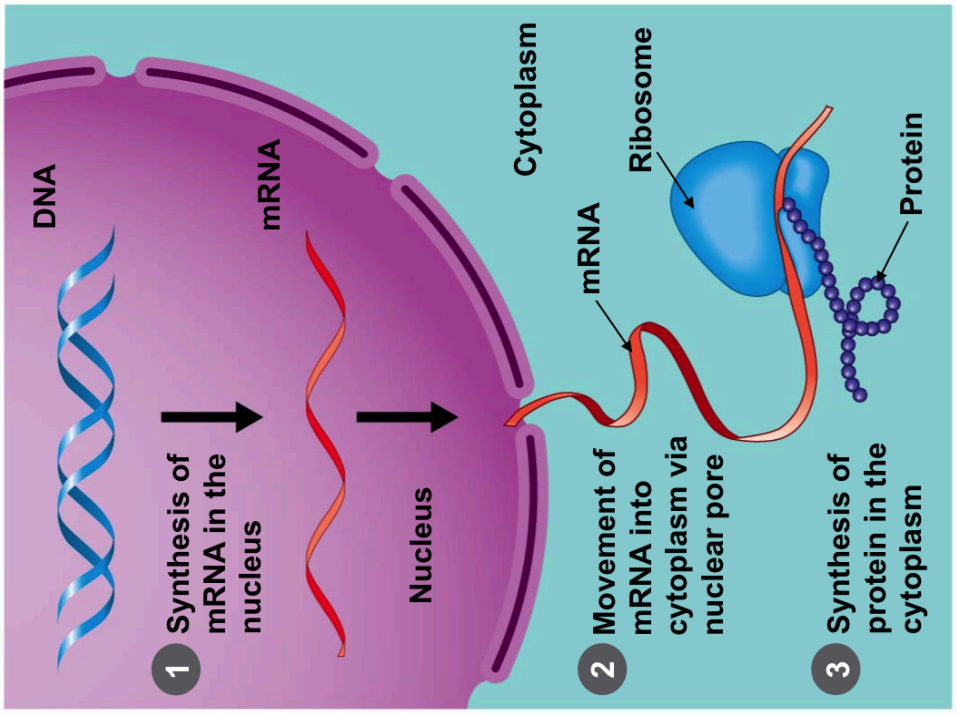
DNA	RNA



Transcription: _____ → _____

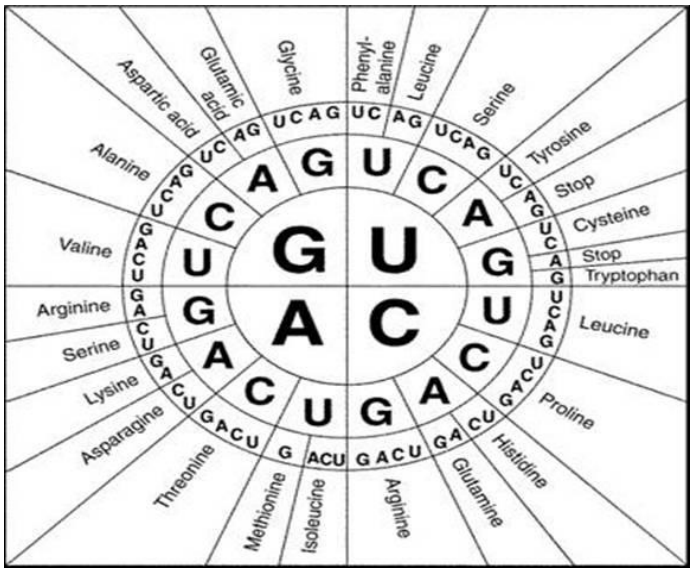
- Similar to DNA replication but makes an mRNA transcript (copy in a different medium).
- Happens in the _____.
  - Think of it this way: the nucleus needs to send a message to the ribosomes to make protein in the cytoplasm.
- Steps to Transcription
  1. A small section of _____is _____
     - Only the part of the DNA that codes for the gene we need is opened up.
  2. _____ places RNA nucleotides according to the DNA code to create a single strand of _____.

     DNA strand = A T T C G C A G C C
     RNA strand = U A A G C G U C G G
  3. The _____ is sent out of the _____ and into the _____.
     - This is the message for the ribosome to start making the specific protein.
  4. The _____ zips back up.
     - It goes back to the way it started: a double helix.



Translation: _____ → _____

- _____ an mRNA message into a protein chain, called a _____ (protein).
  - To translate means to _____ from _____.
  - In this case, the ribosome is translating from _____ into _____ (a fancy word for proteins).
    - Nucleic acids - The building blocks of _____ and _____. Also known as nucleotides.
      - *4 types of DNA nucleotides: Adenine, Thymine, Cytosine, & Guanine*
      - *4 types of RNA nucleotides: Adenine, Uracil, Cytosine, & Guanin*e
    - Amino Acids - The building blocks of _____. They are held together by _____ bonds.
      - There are only 20 different amino acids.
  - Codon - A _____ sequence on _____ that codes for an amino acid
  - Anticodon - A _____ sequence on _____ that is complementary to a mRNA codon.
    - For example: codon GGG pairs with anticodon CCC
- Step 1 - _____
  - Ribosome searches for the _____ (_____) on the _____ transcript. This is where translation begins.
- Step 2 - _____
  - The _____ on the _____ molecules bind to each _____ on the _____. Each tRNA carries one kind of amino acid.
- STEP 3: _____
  - The amino acids form _____ bonds between them to form a "_____" (a protein).
- STEP 4: _____ and _____
- The ribosome will _____ when a "_____" is reached. The newly formed _____ (protein) is then released.



DNA vs RNA: Concept Map

Name _____

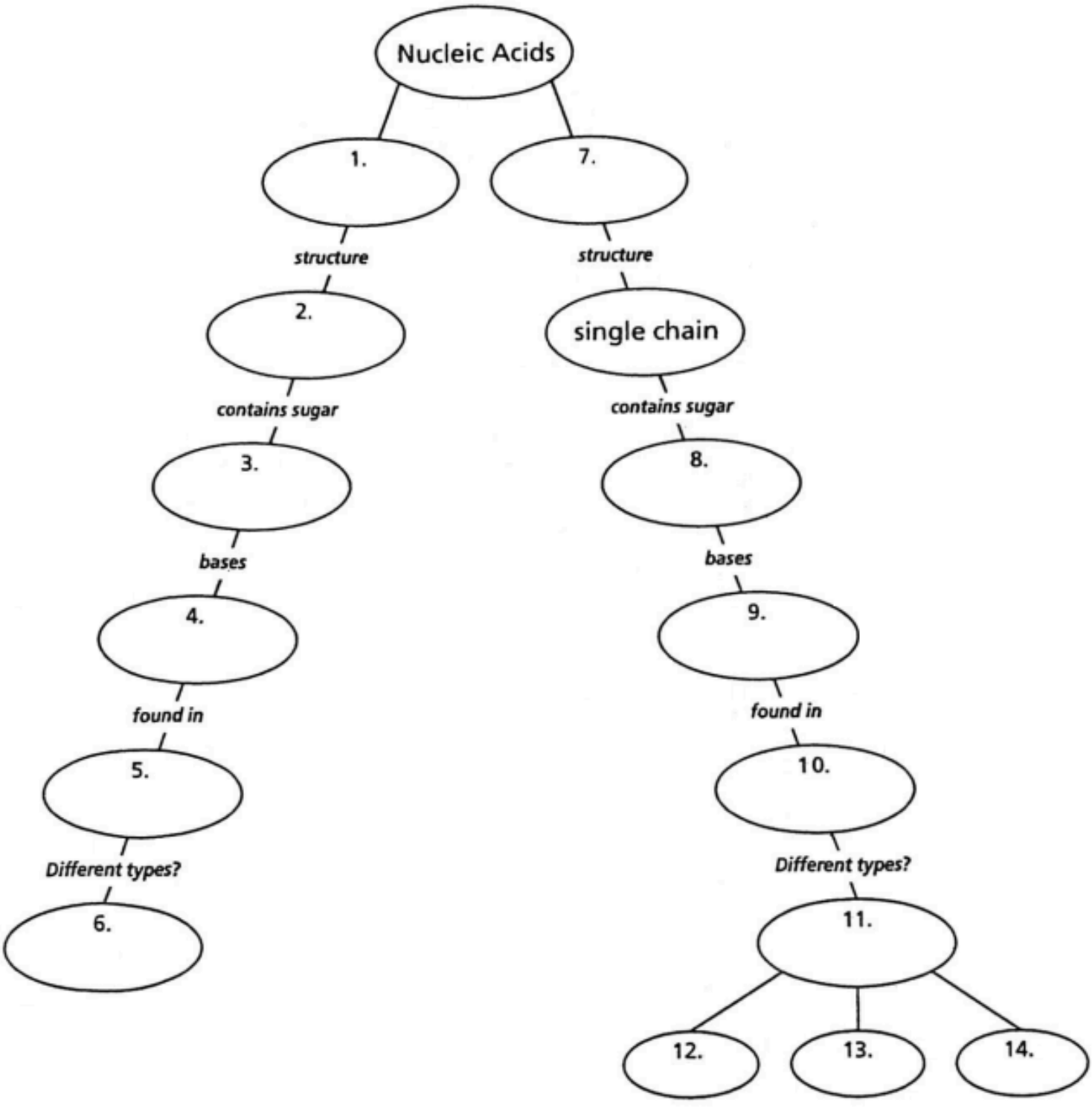
Biology

Date _____ Hour _____

DNA & RNA

Complete the concept map below to show how DNA and RNA are alike and how they are different. Use these words or phrases:

ACGT	ACGU	DNA	mRNA	ribose	deoxyribose	yes	no
nucleus	RNA	rRna	tRNA	double chain	nucleus and cytoplasm		



Transcription & Translation Practice Name _____

Biology Date _____ Hour _____

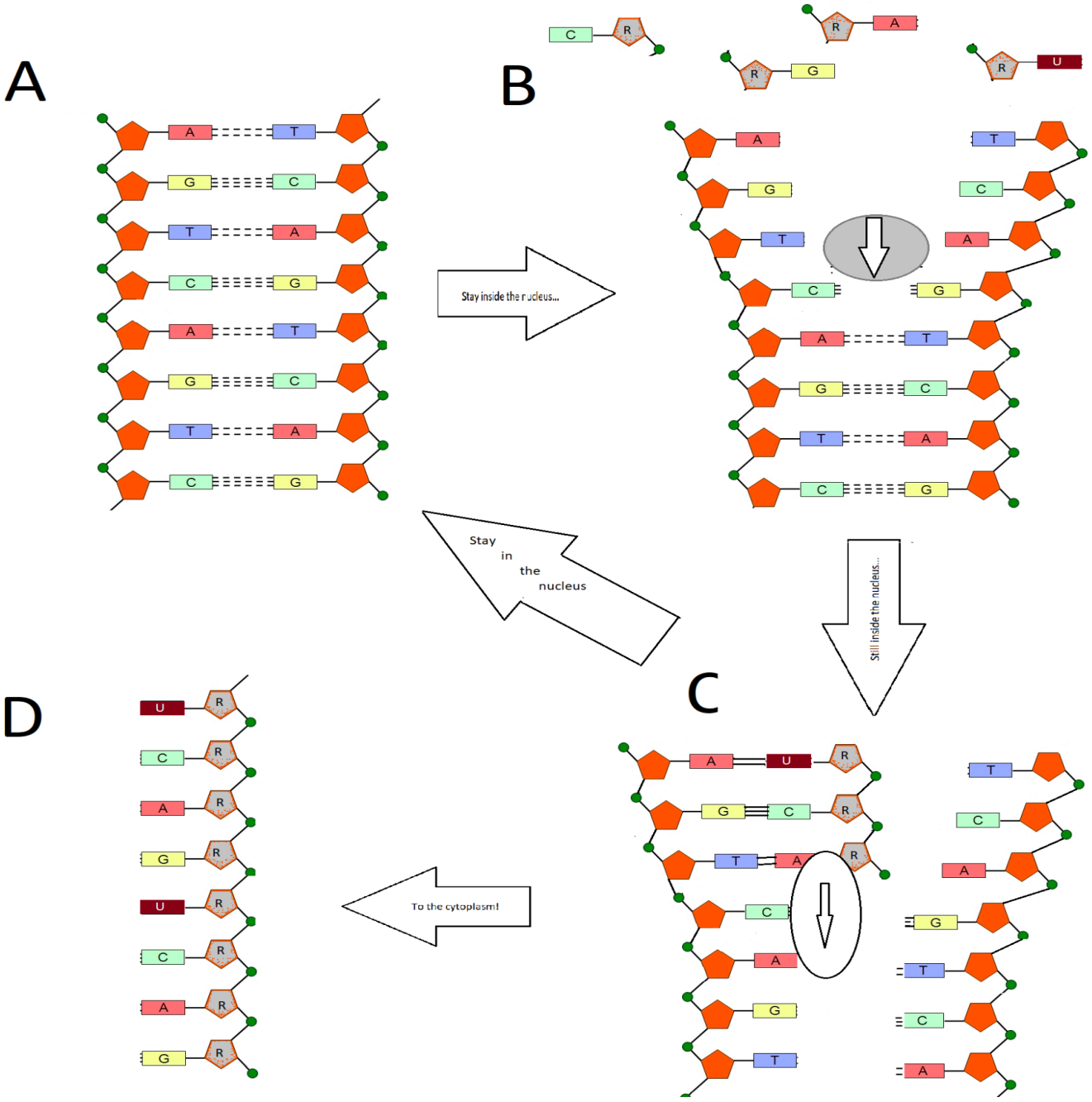
1. What is the name of the enzyme in step B and what is its function?

2. Why are the nucleotides labeled with the letter "R"?

3. What is the name of the enzyme in step C and what is its function?

4. What is the name of the molecule that is produced in step D? Why does it go out to the cytoplasm?

5. For each image below (A-D), write one sentence describing what is happening.

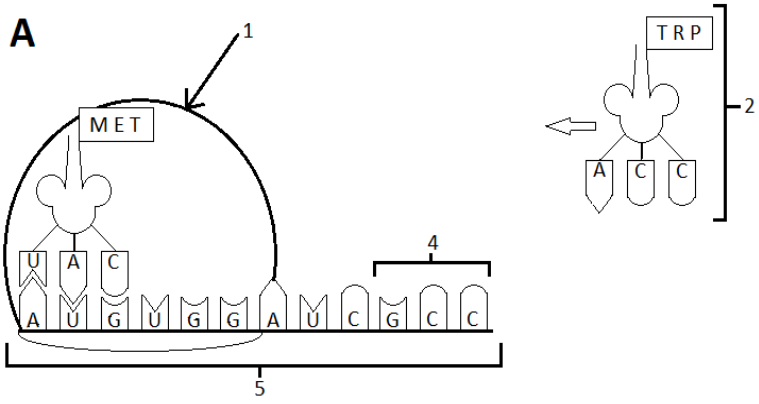


6. Label each of the numbered structures that have been labeled below. Use the following word bank:

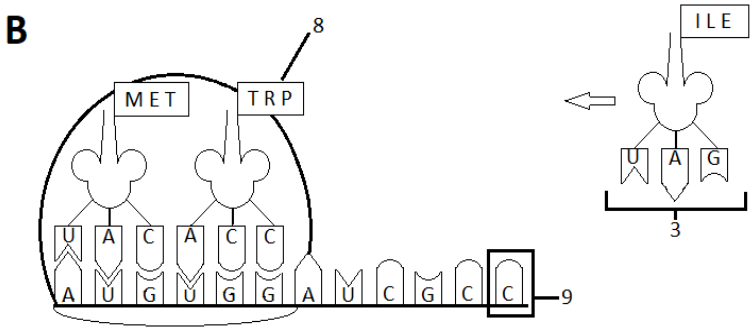
Protein (polypeptide)	ribosome	nitrogenous base	codon	mRNA
amino acid	anticodon	peptide bond	tRNA	

For each image below (A-D), write one sentence describing what is happening.

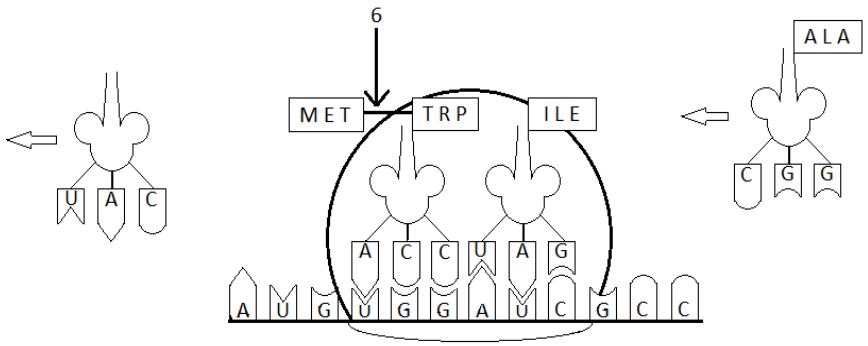
A



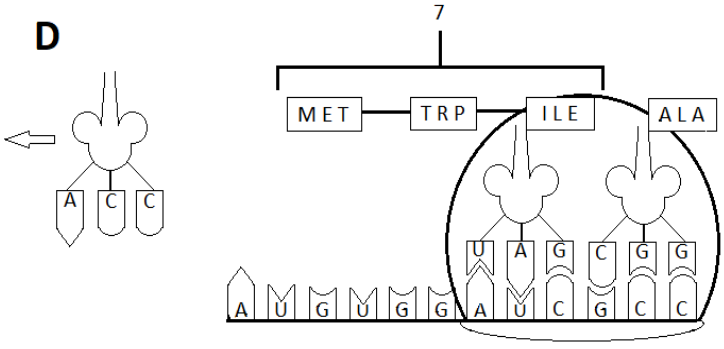
B



C



D



Sequence Organizer: Protein Synthesis

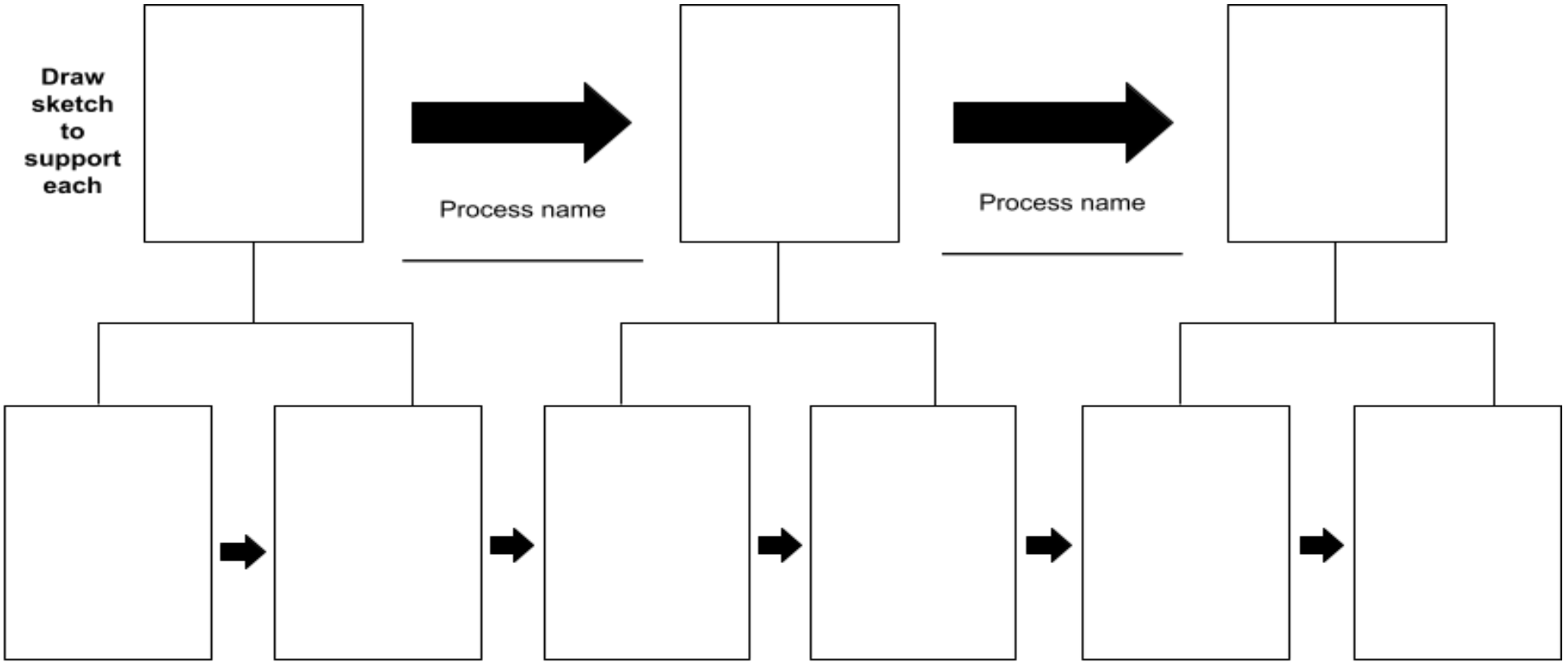
Name:_____

Biology

Date: _____Hour_____

Cut each action box out (or rewrite them in the appropriate boxes), put them in the correct order of DNA replication, and paste it to the appropriate box above. Then, draw the step of DNA replication described in the action box. Finally, select the term that best matches the action taking place.

What is the purpose of this process (Central Dogma of Biology)? _____



STOP codon is reached and the **protein is released** to be used by the cell

RNA polymerase adds new bases: A-U, G-C, T-A **Creates mRNA**

rRNA connects w/ **mRNA in cytoplasm**

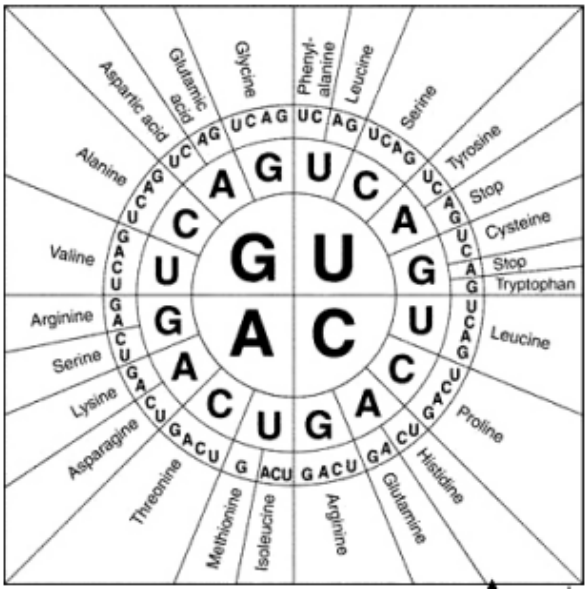
Double Stranded DNA code read by **RNA Polymerase in the nucleus**

tRNA anticodons pair with **mRNA codons** and carry **amino acids**

Amino acids form **peptide bonds** - create a chain called **proteins**

Coding Exercise Name _____

Biology Date _____ Hour _____



For the following DNA strands, give the base order for the <u>complementary</u> strand of DNA.

1. DNA: A T T | C G A | G C C | T C T | G A T | G A C
   DNA: __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __

2. DNA: T G C | C A C | T G T | C A G | A A G | C T A
   DNA: __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __

For the following DNA strands, give the <u>mRNA bases</u> that would be <u>transcribed</u> from it.

3. DNA: C C G | A T A | G T C | A G T | T A G | C T A | C G C | T A C
   mRNA: __

Write the complementary <u>tRNA bases</u> that would be translated from the mRNA strand.

4. mRNA: U A G | C G A | U U G | A A C | G G U | A A U | G U C | A C U
   tRNA: __

Now put it all together and show how a protein is made. Combine what you know about complementary base pairing, and the use of the chart at the top of the page to determine the amino acid coded for by mRNA.

DNA: T A C | C C A | A A T | C G T | A A C | T G C | G T G | A G G | A T C

5. Transcribed to mRNA: __
6. Translated by tRNA: __
7. Amino acid carried by tRNA:

Mutations *occur when there is a spelling error in the DNA code. Show what would happen step by step if the 8th letter in the DNA strand from above was changed from an "A" to a "G". Use the chart at the top of the page to determine the amino acid coded for by mRNA*

DNA: T A C | C C A | A ***G*** T | C G T | A A C | T G C | G T G | A G G | A T C

8. Transcribed to mRNA: __
9. Translated by tRNA: __
10. Amino acid carried by tRNA:

11. What happened as a result of this mutation? Be specific.

DNA Mutation Exercise

Name _____

Biology

Date _____ Hour _____

DNA Coding Strand:	**T A C**	**A C G**	**T C A**	**C C G**	**T G C**
mRNA	_____	_____	_____	_____	_____
tRNA	_____	_____	_____	_____	_____
Amino acid	_____	_____	_____	_____	_____

Mutation #1: Harmless Point Mutation **Circle where the mutation occurred in the DNA sequence below.*

DNA Coding Strand:	**T A C**	**A C A**	**T C A**	**C C G**	**T G C**
mRNA	_____	_____	_____	_____	_____
tRNA	_____	_____	_____	_____	_____
Amino acid	_____	_____	_____	_____	_____

Why do you think this was considered "harmless"? Point to specific examples from your work above.

Mutation #2: Harmful Point Mutation **Circle where the mutation occurred in the DNA sequence below.*

DNA Coding Strand:	**T A C**	**A C T**	**T C A**	**C C G**	**T G C**
mRNA	_____	_____	_____	_____	_____
tRNA	_____	_____	_____	_____	_____
Amino acid	_____	_____	_____	_____	_____

How is this point mutation more "dangerous" than mutation #1? Compare and contrast the two mutations to support your answer.

Mutation #3: Deletion **Circle where the mutation occurred in the DNA sequence below.*

DNA Coding Strand:	**T A C**	**A C A**	**C A C**	**C G T**	**G C**
mRNA	_____	_____	_____	_____	_____
tRNA	_____	_____	_____	_____	_____
Amino acid	_____	_____	_____	_____	_____

Mutation #3 is also known as a frameshift mutation. Using your work above as evidence, explain why this name is appropriate.

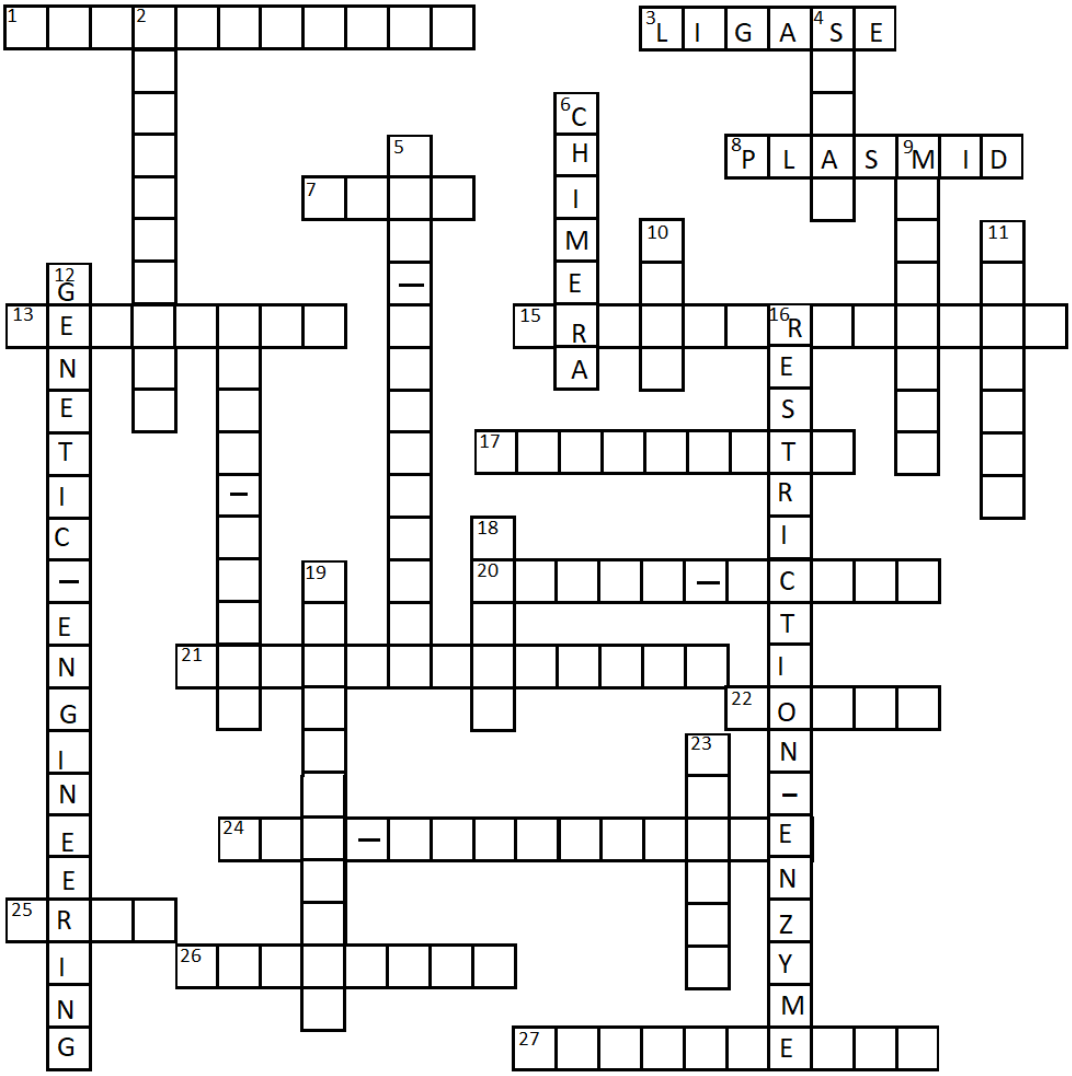
Of the three mutations, which do you think is the most problematic and why? Point to specific examples from your work above to support your answer.

Crossword Review

Name _____

Biology

Date _____ Hour _____



ACROSS

1. Linking amino acids together to make a protein
3. The chemical glue that holds two pieces of DNA together
7. this compound delivers an amino acid to the ribosome
8. an extra piece of DNA in bacteria that can be modified
13. an enzyme that splits the double helix apart
15. the message in DNA is converted to mRNA
17. this connects one sugar to another (a rubber on model)
20. 20 of these are specified by 64 codons
21. describes how 1 base pairs only with one other base
22. three letter sequence of mRNA
24. an enzyme that builds a strand of DNA
25. this compound carries a message from the nucleus to the cytoplasm
26. this organelle is the platform where proteins are built
27. this shape describes the structure of DNA

DOWN

2. unit of DNA made of sugar, phosphate, and a base
4. bonded to a phosphate on one end and a base at the other
5. an enzyme that builds a strand of mRNA
6. an organism having DNA from two or more species
9. spelling errors in the DNA message
10. length of DNA that spells out specific products
11. the sequence of amino acids determines what kind of ____ you have
12. the deliberate tweaking of DNA
14. three letter sequence of tRNA
16. chemical scissors that cut DNA in specific places
18. adenine, thymine, cytosine, guanine
19. process that ensures each cell has a full set of DNA
23. this compound is found in RNA but not DNA

Unit 5: Review Guide

Name _____

Biology

Date _____ Hour _____

Study Advice:

- Use a **separate sheet of lined paper** to write down as much information as your can for each topic presented below. Try to do this without using your notes.
- Go back through the topics a second time. Use your notes to augment (add to) correct the answers in a different color.
- Become comfortable with the vocabulary. Study the vocabulary a little bit each night using flashcards (quizlet!).
- Reflect on your studying:
  - ★ Star 5 topics you feel really comfortable with.
  - ○ Circle 5 topics you struggle with the most.

Intro to DNA

1. What is the building block of DNA?
2. What is the shape/structure of the DNA molecule?
3. The 3 dimensional structure of the DNA molecule was discovered by _____ in 1953.
4. The pairing of _____ in DNA is the key feature that allows DNA to be copied.
5. What components of the nucleotide make up the "backbone" of DNA? The rungs of the ladder?
6. Label the parts of figure 11-2 provided.
7. Arrange the following structures from smallest to largest in size: nucleus, nucleotide, cell, chromosomes, DNA, nitrogenous base
8. If a DNA sample is found to contain 21% cytosine, what % of the sample should be adenine?

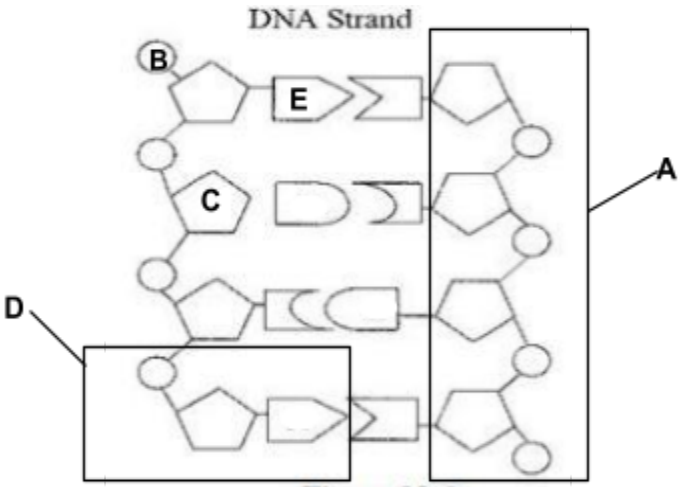


Figure 11-2

DNA Replication

9. The process by which a DNA molecule is **copied** is called _____.
10. When does replication occur during the cell cycle?
11. What are the steps of DNA replication?
12. Describe the role of DNA polymerase and DNA Helicase.
13. What do you think would happen if there was a mutation in the gene that codes for the DNA polymerase. How could that mutation impact how DNA polymerase functions?
14. What is the DNA daughter strand if the parent strands reads -ATGCTAGGTTAG- ?

DNA vs RNA

15. Compare and contrast DNA and RNA.
16. Unlike DNA, RNA contains _____ as a nitrogenous base instead of _____.
17. An RNA molecule is a molecule composed of _____.

Transcription and Translation

18. What is the correct sequence of the transfer of genetic information to protein (Central Dogma of Biology) in most organisms?
19. Messenger RNA (mRNA) is formed in the process of _____.
20. Which type of RNA takes the message from DNA in the nucleus to the ribosome?
21. How many **nucleotides (bases)** are needed to make up a codon?
22. What macromolecule do DNA molecules code for? (protein, fatty acids, nucleic acids, carbohydrates?)
23. In DNA replication, transcription, and translation, products (DNA, mRNA, or Protein) are being built. In animals, what is the source of raw materials (free-floating nucleotides) for building the new molecules that result?
24. What are **similarities** and differences between the processes of DNA replication and transcription?
25. What happens during **translation**?
26. Which of the structures in Figure 11-1 is the **match to a codon**?
27. Which of the structures in Figure 11-1 is **messenger RNA (mRNA**)?
28. The process illustrated in Figure 11-1 is called _____.
29. What major structure is missing from figure 11-1?
30. A DNA segment is changed from -CATTAG- TO -CAATAG-. Would this mutation cause a significant change in the resulting protein?

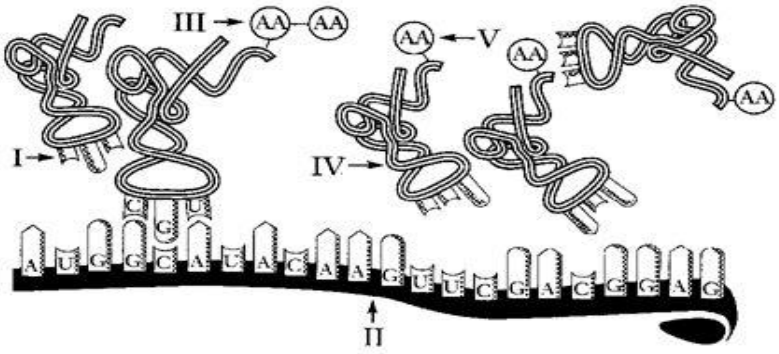


Figure 11-1

31. A DNA parent strand code has been provided: **T A C G T G C T T G C C C G T**
    a. Write the DNA daughter complement.
    b. Write an mRNA transcript of the parent strand.
    c. How many codons are on this mRNA transcript?
    d. Write the anticodon complement.
    e. Write the amino acid sequence.