

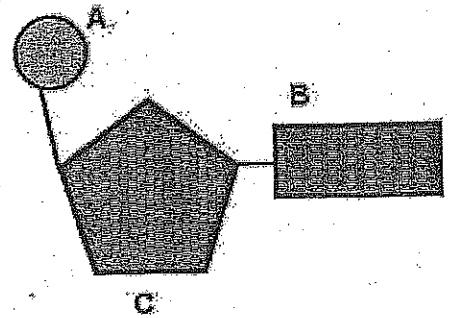
Name: Key

Period: \_\_\_\_\_

### DNA & Protein Synthesis Study Guide

1. List the three parts of a nucleotide and label the diagram to the right.

A = phosphate  
C = sugar (deoxyribose)  
B = base



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2. List the four nucleotide bases.

adenine  
thymine

cytosine  
guanine

3. How do the nucleotides pair up?

adenine (A) pairs with thymine (T)  
guanine (G) pairs with cytosine (C)

4. What is the shape of a DNA molecule?

double helix / twisted ladder

5. What is the base-pair rule?

A-T C-G

6. Based on the base-pair rule, if a DNA strand fragment is 15% adenine, what are the percentages of Thymine, Cytosine, and Guanine in the DNA strand fragment?

Thymine is 15 %

Cytosine is 35 %

Guanine is 35 %

7. If a DNA strand fragment is 38% adenine, what are the percentages of Thymine, Cytosine, and Guanine in the DNA strand fragment?

Thymine is 38 %

Cytosine is 12 %

Guanine is 12 %

For questions 8 through 10, complete the DNA strand fragments and the questions that follow.

8. Specimen A: Original Strand: ATACTCGACCATACCTAA  
Complimentary Strand: TATGAGCTCGTATCGATT

9. Specimen B: Original Strand: ATACTCGACCAGGATCAA  
Complimentary Strand: TATGAGCTGCTCTAGTT

10. Specimen C: Original Strand: ATACTCGACCAGGATAAA  
Complimentary Strand: TATGAGCTGGTCTATTT

11. What two specimens are the most genetically similar? What percentage are they genetically similar? Show your work?

B+C  $17/18 = .94 \times 100 = 94\%$

12. Which of the three specimens is the least genetically similar? What percentage is it genetically similar to the other two specimens? Show your work.

A+B / A+C  $13/18 = .72 \times 100 = 72\%$

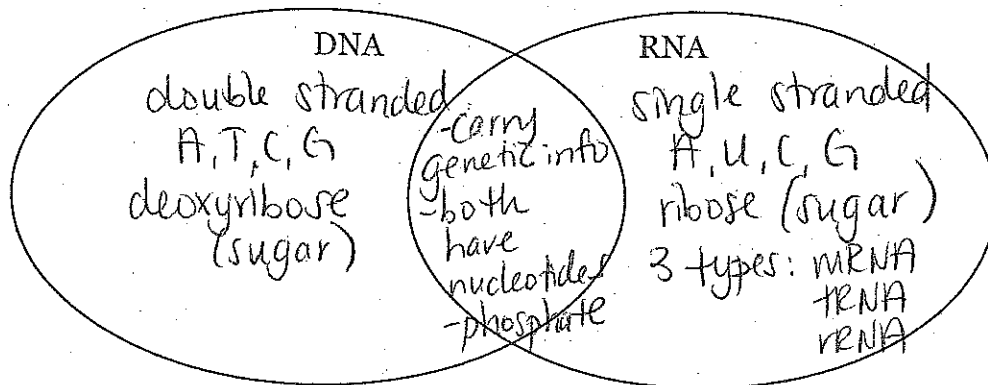
13. Humans are 50 percent genetically similar to bananas. What does this mean?

The sequence (order) of DNA bases is 50% similar between a human and banana.

14. The human genome is 3 billion (3,000,000,000) base pairs long. How many of these base pairs are in the same sequence as a banana's? Show your work.

$3,000,000,000 \times .5 = 1,500,000,000$

15. Compare (find similarities) and contrast (find differences) DNA and RNA.



16. List the three main types of RNA and their functions.

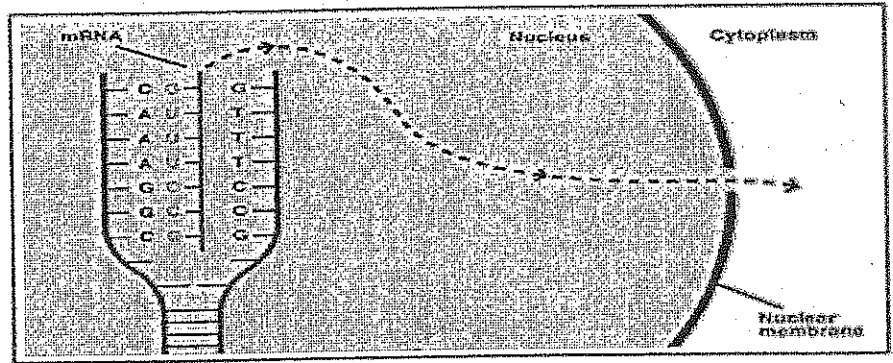
- a. mRNA - messenger RNA (copy of DNA), leaves nucleus
- b. tRNA - transfer RNA, transfers amino acids
- c. rRNA - ribosomal RNA, where translation takes place

17. A section of one DNA strand has the sequence ACCGAGGTT. What is the sequence of an mRNA transcribed from this section of DNA?

- a. ACCGAGGUU    b. ACCGAGGTT    c. TGGCTCCAA    **(d.) UGGCUCCAA**

18. What process is shown in the diagram to the right?

- a. replication  
**B (b.) transcription**  
 c. translation  
 d. protein synthesis



19. Describe the differences between transcription and translation.

transcription = copy of DNA is made - mRNA  
translation = amino acids join together to form a protein

Use the given chart showing the genetic code and its corresponding codons and amino acids to help answer the questions that follow:

20. The mRNA codon of CCG codes for what amino acid?

- a. Leucine  
**B (b.) Proline**  
 c. Arginine  
 d. Glycine

	U	C	A	G	
U	Phenylalanine Phenylalanine Leucine Leucine	Serine Serine Serine Serine	Tyrosine Tyrosine Stop Stop	Cysteine Cysteine Stop Tryptophan	U C A G
C	Leucine Leucine Leucine Leucine	Proline Proline Proline Proline	Histidine Histidine Glutamine Glutamine	Arginine Arginine Arginine Arginine	U C A G
A	Isoleucine Isoleucine Isoleucine Methionine	Threonine Threonine Threonine Threonine	Asparagine Asparagine Lysine Lysine	Serine Serine Arginine Arginine	U C A G
G	Valine Valine Valine Valine	Alanine Alanine Alanine Alanine	Aspartic acid Aspartic acid Glutamic acid Glutamic acid	Glycine Glycine Glycine Glycine	U C A G

21. Given the following DNA strand: **TACGTATGCCGTATGGGCATT**

a. What is the DNA corresponding to given strand?

**ATGCATACGGCATA CCGTAA**

b. What is the mRNA corresponding to the given strand?

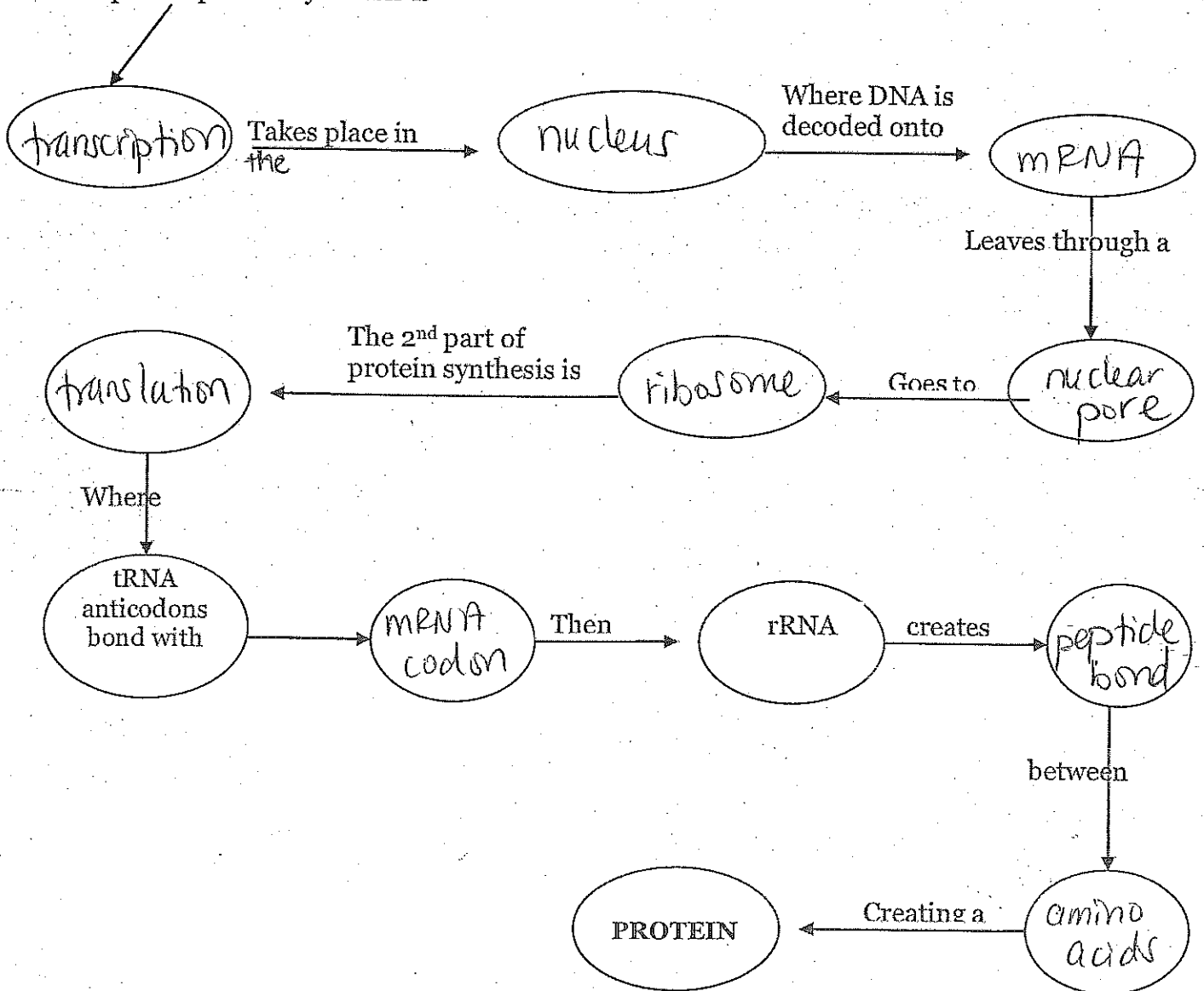
**UAGGUAUGCCGUAUGGGCAUU**

c. What is the correct amino acid sequence to the mRNA strand given in part b (use the table from the previous page)?

**tyrosine - valine - cysteine - arginine - methionine -  
glycine - isoleucine**

22. Fill in the flow chart below, using the following words: **Amino acids, mRNA, mRNA codon, nucleus, nuclear pore, peptide bonds, ribosome, transcription, translation**

The first part of protein synthesis is



23. What is a mutation, and what are the three types of mutations discussed in the lesson?

change in DNA sequence (order)

24. Which three genetic disorders are caused by mutations?

cystic fibrosis, PKU, Williams syndrome

25. Below is a string of nucleotides. With the string of nucleotides, you are going to create mutations to show how the sequence of DNA would be altered.

Nucleotide sequence: A G G C G T C C A T G A

Make 3 point mutations-insertion, deletion, substitution

Insertion: A G G T C G T C C A T G A

Deletion: A G C G T C C A T G A

Substitution: T G G C G T C C A T G A

