Protein Synthesis Pre-Test

Name:

1. Which type of molecule contains genetic information that is passed from parents to offspring?
    a. Fat molecules
    b. DNA molecules
    c. Protein molecules
    d. Carbohydrate molecules

2. What are the subunits that make up DNA molecules?
    a. Amino acids
    b. Nucleotides
    c. Fatty acids
    d. Proteins

3. Which of the following is TRUE about genes?
    a. Genes are traits
    b. Genes are proteins
    c. Genes are sequences of nucleotides
    d. Genes are sequences of amino acids

4. In sexually reproducing organisms, such as humans, which of the following statements is TRUE about the DNA that is passed from parents to children?
    a. All of the DNA comes from one of the parents
    b. Half of the DNA comes from each of the parents
    c. Some of the DNA comes from each of the parents, but the amount that comes from each parent cannot be predicted
    d. Sons receive most of their DNA from their fathers and daughters receive most of their DNA from their mothers

5. How many different types of amino acids are used to make proteins?
    a. One
    b. Three
    c. Four
    d. Twenty

6. Mutations in the DNA sequence are
    a. Detrimental
    b. Beneficial
    c. Neutral
    d. All of the above

7. Mutations in the DNA sequence can cause changes in which molecule(s)?
    a. mRNA
    b. Protein
    c. Amino acids
    d. Both A and B
    e. All of the above

8. True or False? Explain your choice: All DNA codes for proteins that conduct the essential functions of the body.

9. Construct a model that explains how the structure of DNA determines the structure of proteins.

10. Write or draw a sequence of steps (algorithm) explaining the cause of early onset Alzheimer's in humans.

11. Do you have any experience with Alzheimer's? What do you know about Alzheimer's?

Mutations Worksheet **Name** _____

There are several types of mutation:

DELETION (a base is lost)

INSERTION (an extra base is inserted)

Deletion and insertion may cause what's called a **FRAMESHIFT**, meaning the reading "frame" changes, changing the amino acid sequence.

SUBSTITUTION (one base is substituted for another)

If a substitution ***changes*** the amino acid, it's called a **MISSENSE** mutation.

If a substitution ***does not change*** the amino acid, it's called a **SILENT** mutation.

If a substitution ***changes the amino acid to a "stop,"*** it's called a **NONSENSE** mutation.

Complete the boxes below. Classify each as either Deletion, Insertion, or Substitution **AND** as either frameshift, missense, silent or nonsense (hint: deletion or insertion will always be frameshift).

Original DNA Sequence: **T A C A C C T T G G C G A C G A C T**

mRNA Sequence: _____

Amino Acid Sequence: _____

Amino Acid Properties: _____

Mutated DNA Sequence #1: **T A C A T C T T G G C G A C G A C T**

What's the mRNA sequence?_____(Circle the change)

What will be the amino acid sequence? _____

Will there likely be effects in protein folding? Why or why not?_____

_____

What kind of mutation is this? _____

Mutated DNA Sequence #2: **T A C G A C C T T G G C G A C G A C T**

What's the mRNA sequence? _____(Circle the change)

What will be the amino acid sequence?_____

Will there likely be effects in protein folding? Why or why not?_____

_____

What kind of mutation is this? _____

Mutated DNA Sequence #3: **T A C A C C T T A G C G A C G A C T**

What's the mRNA sequence? _____(Circle the change)

What will be the amino acid sequence?_____

Will there likely be effects in protein folding? Why or why not?_____

_____

What kind of mutation is this? _____

Mutated DNA Sequence #4: **T A C A C C T T G G C G A C T A C T**

What's the mRNA sequence?_____(Circle the change)

What will be the amino acid sequence?_____

Will there likely be effects in protein folding? Why or why not?_____

_____

What kind of mutation is this? _____

Mutated DNA Sequence #5: **T A C A C C T T G G G A C G A C T**

What's the mRNA sequence? _____(Circle the change)

What will be the amino acid sequence?_____

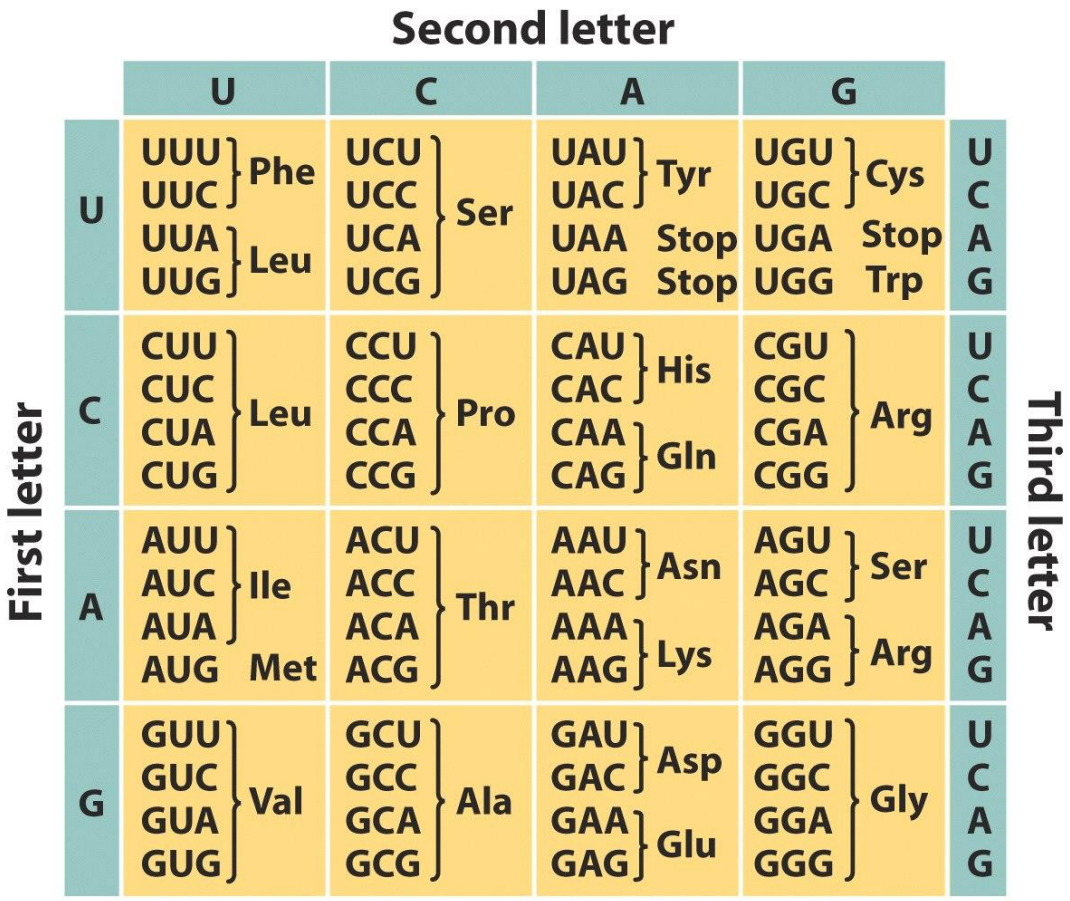
Will there likely be effects in protein folding? Why or why not?_____

_____

_____

What kind of mutation is this? _____

Adjusted from: http://staff.fcps.net/einman/biology/MutationsWS.doc



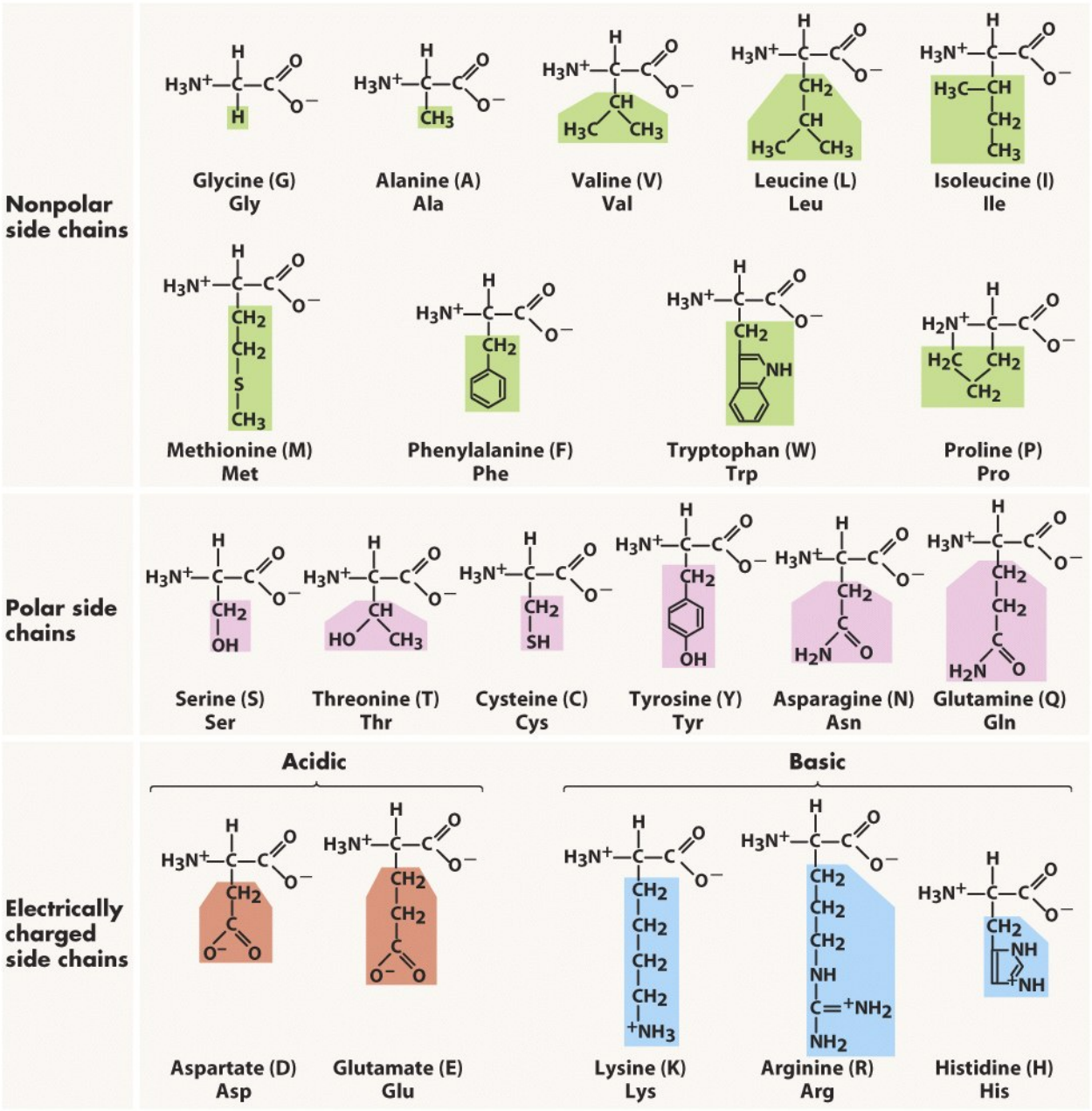


Figure 3-5 Biological Science, 2/e

Protein Synthesis Summative Test

Name:

1. What molecule contains genetic information that is passed from parents to offspring?

2. What are the subunits that make up DNA molecules?

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    a. Genes are traits
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    c. Genes are sequences of nucleotides
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5. How many different types of amino acids are used to make proteins?

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    a. Detrimental
    b. Beneficial
    c. Neutral
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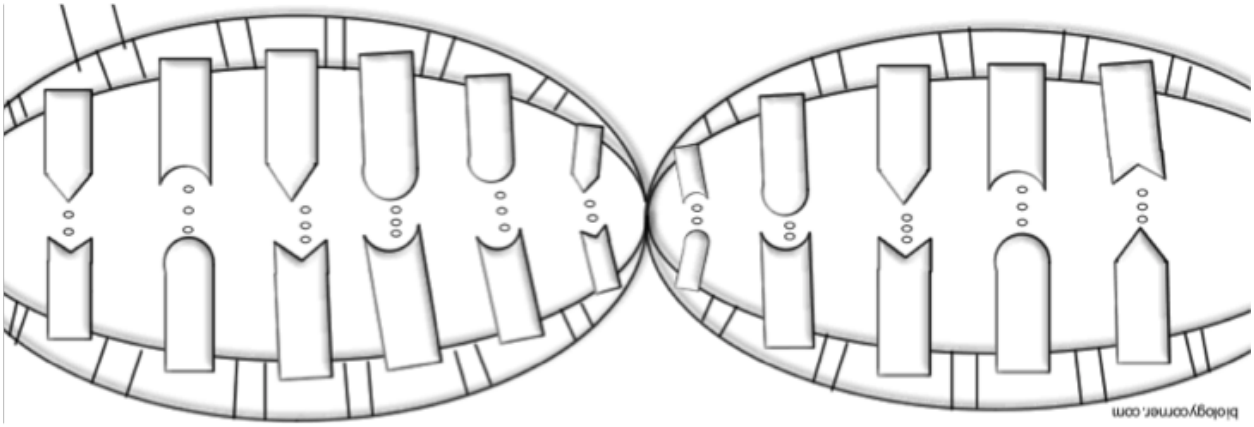
7. Mutations in the DNA sequence can cause changes in which molecule(s)?

8. True or False? Explain your choice: All DNA codes for proteins that conduct the essential functions of the body.



Use the diagram of DNA molecule below to answer question 9.

9. Appropriately label all of the nitrogen bases.

Use the picture below to answer the following questions 10-15.

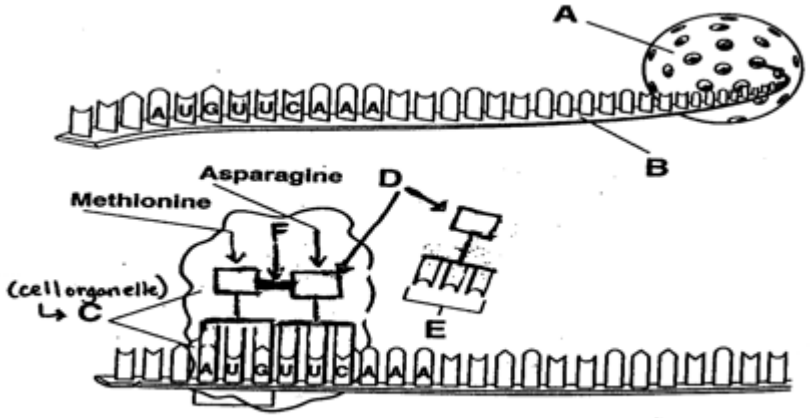


Figure 12-4

10. Label letters A-F above with the appropriate term.

11. In the space below, draw the half strand of DNA that was copied to make the portion of **B** that is shown.

12. Name the process that already occurred inside of **A**.

13. Label all of the bases on the tRNA molecules that correspond with the mRNA molecules.

14. Use the attached codon chart to determine the first three amino acids in this protein chain.

15. What would happen to the protein if the last codon was changed to AAG? What kind of mutation caused this change in the codon?

Use the following information for questions 16 and 17.

Hemoglobin is a protein your red blood cells make to help them carry oxygen and carbon dioxide. It is a small protein with 100 amino acids hooked together.

16. How many bases of DNA must be transcribed to make hemoglobin?

17. How many tRNA molecules would be needed to bring amino acids to the transcribed mRNA?

18. Indicate whether the following descriptors are true of DNA, RNA, BOTH, or NEITHER.

_____a. double helix
_____b. can be found in the nucleus
_____c. contains uracil
_____d. made of nucleotides
_____e. contains ribose sugar
_____f. can be found in the cytoplasm
_____g. made of amino acids
_____h. different types found within cells

19. The function of a protein is determined by:
    a. the shape of the protein.

b. the number of amino acids.
c. the sequence of amino acids.
d. All of the above are correct.

20. Proteins are important in living cells because:
a. they contain genetic information for all living organisms.
b. they are a main source of energy for an organism's metabolism.
c. they are involved in providing structure and controlling chemical reactions.
d. they transport oxygen and carbon dioxide across cell membranes.

21. Which of the following is an example of a frame-shift mutation?
a. AGGCTT → AGGTT
b. TTAGCG → TTCGCG
c. ATTATT → ATTATT
d. GAGCCA → GAGCCATTG

22. Briefly evaluate the validity of the following statement: *Your genes are completely responsible for determining your traits.*

23. What are the different characteristics amino acids have that contribute to a protein's shape?

24. What causes mutations in the DNA sequence?

Construct a model that explains how the structure of DNA determines the structure of proteins.

Write or draw a sequence of steps (algorithm) explaining the cause of early onset Alzheimer's in humans.