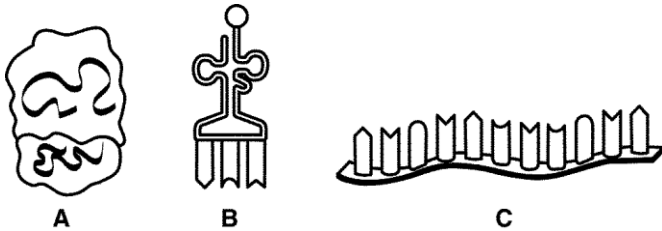


## "RNA and Protein Synthesis Problem Set"

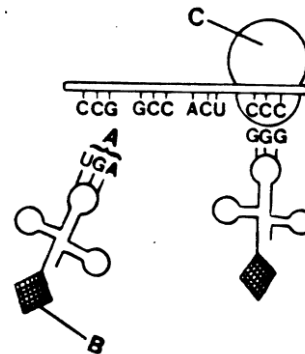
True or False. If the answer is False, change the underlined word(s) to make the statement true.

- F Ribose 1) The sugar found in RNA is called deoxyribose.  
T \_\_\_\_\_ 2) The DNA molecule is double stranded and the RNA molecule is single stranded.  
T \_\_\_\_\_ 3) The process of translation occurs at the ribosome.  
F tRNA 4) The job of mRNA is to pick up amino acids and transport them to the ribosomes.  
T \_\_\_\_\_ 5) Transcription must occur before translation may occur.  
 6) In the figure below, A, B, and C are three types of RNA.



Identify the labeled structures on the following diagram of translation.

- 7) Part A is the anticodon.  
 8) Part B is the amino acid.  
 9) Part C is the ribosome.



10) The sense strand of a DNA molecule is: C C C A C G T C T

The mRNA sequence from this DNA molecule is : GGG UGC AGA

Use the amino acid chart on the last page to identify the amino acids from the mRNA sequence in problem # 10.

- 11) First amino acid: Glycine (Gly)  
 12) Second amino acid: Cysteine (Cys)  
 13) Third amino acid: Arginine (Arg)

Multiple Choice

- 14) Which of the following is attached to the transfer RNA (tRNA)?  
 A. DNA B. ribosome C. amino acid D. nucleic acid
- 15) Which of the following is not part of protein synthesis?  
A. replication B. translation C. transcription
- 16) The codon is located on the  
A. mRNA. B. tRNA. C. rRNA. D. DNA.
- 17) In the RNA molecule, which nitrogen base is found in place of thymine?  
 A. guanine B. cytosine C. thymine D. uracil
- 18) During the process of transcription, which of the following is produced?  
 A. H<sub>2</sub>O B. ATP C. mRNA D. DNA

- 19) The actual site of protein synthesis is the  
 A. nucleus. B. mitochondrion. C. chloroplast. **D. ribosome.**
- 20) If the DNA template reads "ATA", then which of the following would be the corresponding sequence on the mRNA?  
**A. UAU** B. ATA C. TUT D. UCU
- 21) The genetic code is based upon the reading of how many bases at a time?  
 A. one B. two **C. three** D. four
- 22) Amino acids are held together by \_\_?\_\_ bonds.  
 A. hydrogen **B. peptide** C. ionic D. high energy
- 23) How many codons are needed to specify three amino acids?

- A. 3** C. 9  
 B. 6 D. 12

- 24) One similarity between DNA and messenger RNA molecules is that they both contain  
 a. the same sugar  
**b. genetic codes based on sequences of bases**  
 c. a nitrogenous base known as uracil  
 d. double-stranded polymers
- 25) Some events that take place during the synthesis of a specific protein are listed below.  
 a. Messenger RNA attaches to a ribosome.  
 b. DNA serves as a template for RNA production.  
 c. Transfer RNA bonds to a specific codon.  
 d. Amino acids are bonded together.  
 e. RNA moves from the nucleus to the cytoplasm.

The correct order of these events is

- a. B E A C D**  
 b. D A E C B  
 c. B C E D A  
 d. C B A E D
- 26) What is the complementary messenger-RNA sequence for the DNA sequence shown below?  
 a. G-T-T-C-C-A  
 b. C-A-A-G-G-U  
**c. G-U-U-C-C-A**  
 d. C-A-A-G-G-T

C A A G G T  
 └──┬──┬──┬──┬──┬──┘

**Use the diagram below for Questions 27-29**

27) Which processes occur in the nucleus?

- a. 1 and 2**  
 b. 2 and 3  
 c. 3 and 4  
 d. 4 and 5

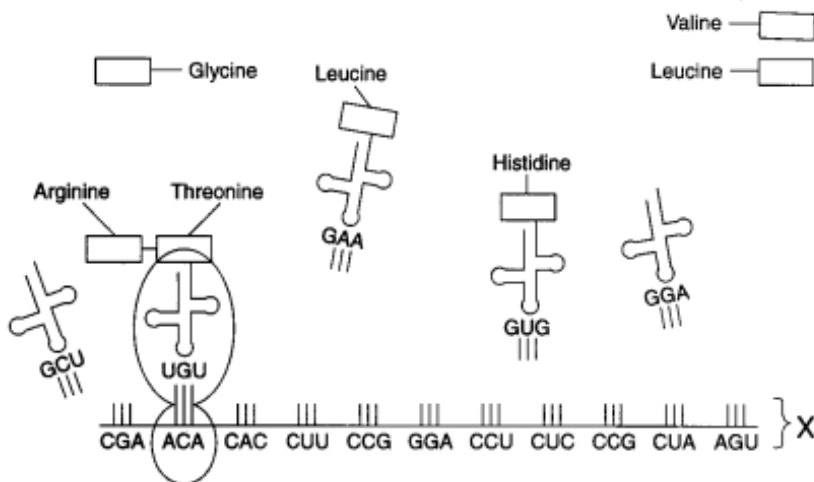
28) Process 2 is known as

- a. replication  
 b. mutation  
**c. transcription**  
 d. translation



- 29) What is the product of process 3?
- a strand of DNA
  - two complementary strands of DNA
  - a strand of RNA
  - a chain of amino acids

Use the diagram below for Questions 30-32



30) Structure X was made in the

- nucleus
- cytoplasm
- lysosome
- vacuole

31) The process represented in the diagram is most closely associated with the cell organelle known as the

- nucleolus
- ribosome
- chloroplast
- mitochondrion

32) Which amino acid would be transferred to the position of codon CAC?

- leucine
- glycine
- valine
- histidine

33) If a portion of a messenger RNA molecule contains the base sequence A-A-U, the corresponding transfer RNA base sequence is

- A-A-U
- G-G-T
- T-T-C
- U-U-A

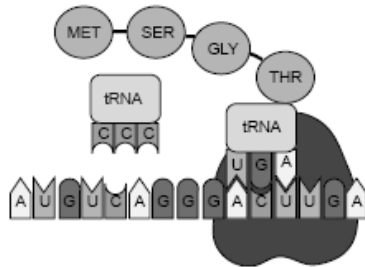
34) Which defines a codon?

- a protein that begins transcription by breaking apart H bonds
- a free-floating base that attaches to an open DNA strand
- the genetic code word of three bases on mRNA that specify one amino acid
- the strong bond between two complementary nitrogen bases

35) What is the role of tRNA during translation?

- a. bond to open the DNA strand to carry the code for protein synthesis out of the nucleus
- b. carry ribosomes to the site of protein synthesis
- c. break apart mRNA and send it back to the nucleus so that it can be reused
- d. Carry amino acids to the mRNA for correct placement into the protein chain

36) This diagram shows which cellular process?



- a. Replication
- b. Transcription
- c. Translation
- d. Mutation

37) Which of the following changes would be expected if a CAUUUG sequences of bases mutated to CACUUG?

- a. the amino acid sequence would be shorter than expected
- b. the identity of one amino acid would change
- c. the identity of more than one amino acid would change
- d. the amino acid sequence would remain unchanged

Condon Chart

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