“RNA and Protein Synthesis Problem Set”

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

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

Identify the labeled structures on the following diagram of translation.

7) Part A is the ____________________.
8) Part B is the ____________________.
9) Part C is the ____________________.

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: ____________________
    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: ____________________
    12) Second amino acid: ____________________
    13) Third amino acid: ____________________

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. H₂O  B. ATP  C. mRNA  D. DNA
19) The actual site of protein synthesis is the

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
   c. G-U-U-C-C-A

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. a strand of DNA
   b. two complementary strands of DNA
   c. a strand of RNA
   d. a chain of amino acids

Use the diagram below for Questions 30-32

30) Structure X was made in the
   a. nucleus
   b. cytoplasm
   c. lysosome
   d. vacuole

31) The process represented in the diagram is most closely associated with the cell organelle known as the
   a. nucleolus
   b. ribosome
   c. chloroplast
   d. mitochondrion

32) Which amino acid would be transferred to the position of codon CAC?
   a. leucine
   b. glycine
   c. valine
   d. 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-A-U
   b. G-G-T
   c. T-T-C
   d. U-U-A

34) Which defines a codon?
   a. a protein that begins transcription by breaking apart H bonds
   b. a free-floating base that attaches to an open DNA strand
   c. the genetic code word of three bases on mRNA that specify one amino acid
   d. 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