

**Multiple Choice.**

\_\_\_\_\_ The base thymine is always paired with \_\_\_\_\_.

- A. Adenine
- B. Guanine
- C. Cytosine
- D. Thymine

\_\_\_\_\_ The sequence of one strand of DNA is 5' TCGATC 3'. The sequence of the complementary strand would be

- A. 5' AGCTAG 3'
- B. 5' TCGATC 3'
- C. 5' CTAGCT 3'
- D. 5' GCTAGC 3'
- E. 5' GATCGA 3

\_\_\_\_\_ DNA polymerase III is thought to add nucleotides

- A. to the 5' end of the RNA primer
- B. to the 3' end of the RNA primer
- C. in the place of the primer RNA after it is removed
- D. on single stranded templates without need for an RNA primer
- E. in the 3' to 5' direction

\_\_\_\_\_ The presence of a \_\_\_\_\_ with a free 3'-OH group is essential for DNA polymerase to synthesize DNA since no known DNA polymerase is able to initiate chains.

- A. origin of replication
- B. restriction endonuclease
- C. palindrome
- D. primer
- E. promoter

\_\_\_\_\_ The RNA polymerase that produces the primer necessary for DNA replication is called the \_\_\_\_\_.

- A. origin of replication
- B. convertase
- C. primase
- D. ligase
- E. topoisomerase

\_\_\_\_\_ is an enzyme that catalyzes the formation of a covalent bond between adjacent but separate fragments of DNA during replication.

- A. origin of replication
- B. convertase
- C. primase
- D. ligase
- E. topoisomerase

\_\_\_\_\_ The chemical bonds in DNA by which the sugar components of adjacent nucleotides are linked through the phosphate groups are called \_\_\_\_\_ bonds.

- A. phosphodiester
- B. hydrogen
- C. hydrophobic
- D. hydrophilic

\_\_\_\_\_ Which of the following is true regarding RNA processing?

- A. A 3' cap is added
- B. Involves removal of exons
- C. Involves removal of introns.
- D. All of the above

\_\_\_\_\_ The four ribonucleotide triphosphates incorporated into mRNA are

- A. Inosine, Guanine, Uracil, Thymine
- B. Adenine, Guanine, Cytosine, Thymine
- C. Cytosine, Uracil, Adenine, Guanine
- D. Thymine, Uracil, Guanine, Cytosine
- E. Inosine, Guanine, Adenine, Cytosine

\_\_\_\_\_ The process of producing a RNA polymer from a DNA template is called \_\_\_\_.

- A. replication
- B. transcription
- C. translation
- D. duplication

\_\_\_\_\_ The process of producing an amino acid polymer (polypeptide) from a RNA template is called \_\_\_\_.

- A. replication
- B. transcription
- C. translation
- D. duplication

\_\_\_\_\_ The promoting factor that binds first during transcription is called \_\_\_\_.

- A. TFIIA
- B. TFIIB
- C. TFIIC
- D. TFIID

\_\_\_\_\_ A "TATA box" is

- A. the translation termination sequence.
- B. an important base sequence in the promoters of bacteria.
- C. the site where the RNA polymerase II binding complex is assembled.
- D. an example of one of the translation stop codons.

\_\_\_\_\_ During transcription of a particular gene, the RNA polymerase will transcribe:

- A. both strands, but only one of RNA molecule will be used.
- B. only one of the DNA strands, moving in a 3' to 5' direction along the template.
- C. both strands, but moving 3' to 5' for one and 5' to 3' along the other.
- D. only the exons of the gene while skipping over the introns.

\_\_\_\_\_ During the process of translation:

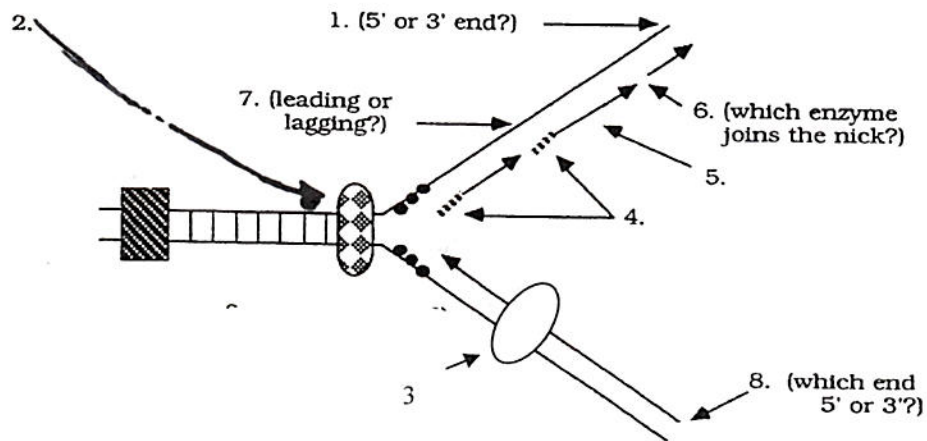
- A. the amino acid is 'passed' from the tRNA in the P-site to the tRNA in the A-site.
- B. incoming tRNAs must first bind to the E-site.
- C. initiation begins with the binding of the ribosomal SSU to the poly-A tail of the mRNA.
- D. the mRNA is translated by one ribosome at a time.

Match the following items to the correct descriptions/illustrations below.

a. DNA    b. mRNA    c. Protein    d. Replication    e. Transcription    f. Translation

15. \_\_\_\_\_ double helix
16. \_\_\_\_\_ process used to make new RNA
17. \_\_\_\_\_ molecule that is made of a chain of amino acids
18. \_\_\_\_\_ process used to make protein on the ribosome
19. \_\_\_\_\_ a process that occurs in the cytoplasm
20. \_\_\_\_\_ contains the bases, "A, C, G, and U"
21. \_\_\_\_\_ one of the two processes that occur in the nucleus
22. \_\_\_\_\_ the other process that occurs in the nucleus
23. \_\_\_\_\_ made of nucleotides with a deoxyribose sugar
24. \_\_\_\_\_ has 3 letter words called codons
25. \_\_\_\_\_ is made on a ribosome
26. \_\_\_\_\_ the process in which DNA makes a new copy of itself
27. \_\_\_\_\_ mRNA attaches to a ribosome and tells tRNA which amino acids to deliver
28. \_\_\_\_\_ the molecule in the nucleus that is a blueprint for making protein
29. \_\_\_\_\_ enzymes
30. \_\_\_\_\_ contains the sugar, ribose
31. \_\_\_\_\_ is a single strand made from building blocks of sugar-phosphate-base

The following questions refer to the numbers on this figure.



32. What end (5' or 3') of the molecule is indicated by arrow number 1(original strand)?
33. What end (5' or 3') of the molecule is indicated by arrow number 8 (original strand)?
34. What kind of nucleic acid is indicated by arrow number 4?
35. What do you call the short DNA fragments indicated by arrow number 5?
36. What enzyme functions to join the short fragments indicated by arrow number 6?
37. Which enzyme is indicated by arrow number 2?
38. Which enzyme is indicated by arrow number 3?
39. What strand is number 7?

40. Describe the entire process of protein synthesis starting with transcription and going through all the steps necessary to make a protein (18 points).

1. Draw a replication fork and label the 5' and 3' ends. Include the leading and lagging strands in your drawing. Beneath the drawing, indicate which direction the replication fork is moving. Why is the 3'OH group on the deoxyribose ring so important for DNA synthesis?
2. What is the function of the following enzymes or proteins in DNA replication: RNA primase, ligase, DNA polymerase I, DNA polymerase III, helicase, single stranded binding protein. Describe what would happen during DNA replication if a mutation occurred in the genes encoding each of these proteins (*i.e.*, how would a mutation in the DNA Polymerase gene affect DNA replication?)
3. Describe the entire process of protein synthesis starting with transcription and going through all the steps necessary to make a protein (15 pts).
4. Explain the findings of Erwin Chargaff, James Watson, and Francis Crick and their implications in deducing the structure of DNA.

