

## Biology Chapter 12 Test: Molecular Genetics

### True/False

Indicate whether the statement is true or false.

- \_\_\_ 1. RNA polymerase has to bind to DNA for an enzyme to be synthesized.
- \_\_\_ 2. The only function of RNA polymerase is to control mRNA synthesis in eukaryotes.
- \_\_\_ 3. One strand of a double-stranded DNA helix is oriented in the 5' (carbon of the deoxyribose molecule) to 3' direction, while the complementary strand it is bonded to is oriented in the 3' to 5' direction.
- \_\_\_ 4. The central dogma means that environmental factors have no influence on the transcription and translation of genes.
- \_\_\_ 5. The enzymes involved in DNA replication are named for the tasks they perform.
- \_\_\_ 6. DNA nucleotides are always added to an existing strand at the 3-prime end. This means that during replication a leading and lagging strand are created.
- \_\_\_ 7. DNA is a structurally simpler molecule than protein.

### Multiple Choice

Identify the choice that best completes the statement or answers the question.

- \_\_\_ 8. Which series is arranged in order from largest to smallest in size?
  - a. chromosome, nucleus, cell, DNA, nucleotide
  - b. cell, nucleus, chromosome, DNA, nucleotide
  - c. nucleotide, chromosome, cell, DNA, nucleus
  - d. cell, nucleotide, nucleus, DNA, chromosome

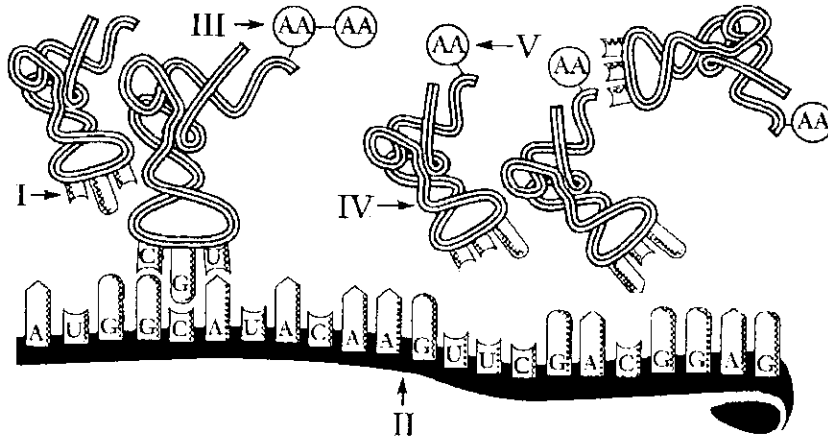


Figure 12-2

- \_\_\_\_\_ 9. In which part of the cell does this process shown in Figure 12-2 take place?
- |                     |                      |
|---------------------|----------------------|
| a. in the nucleus   | c. at the ribosomes  |
| b. in food vacuoles | d. on the chromosome |
- \_\_\_\_\_ 10. Structure III in Figure 12-2 represents a(n) \_\_\_\_\_.
- |               |                 |
|---------------|-----------------|
| a. gene       | c. codon        |
| b. amino acid | d. DNA molecule |
- \_\_\_\_\_ 11. The process illustrated in Figure 12-2 is called \_\_\_\_\_.
- |                |                  |
|----------------|------------------|
| a. translation | c. monoploidy    |
| b. replication | d. transcription |
- \_\_\_\_\_ 12. Which of the structures in Figure 12-2 are composed of RNA?
- |               |              |
|---------------|--------------|
| a. II and IV  | c. I and V   |
| b. III and IV | d. III and V |

Help Wanted
<b>Positions Available</b> in the genetics industry. Hundreds of entry-level openings for tireless workers. No previous experience necessary. Must be able to transcribe code in a nuclear environment.
<b>Accuracy and Speed</b> vital for this job in the field of translation. Applicants must demonstrate skills in transporting and positioning amino acids. Salary commensurate with experience.
<b>Executive Position</b> available. Must be able to maintain genetic continuity through replication and control cellular activity by regulation of enzyme production. Limited number of openings. All benefits.
<b>Supervisor</b> of production of proteins—all shifts. Must be able to follow exact directions from double-stranded template. Travel from nucleus to the cytoplasm is additional job benefit.

**Table 12-1**

- \_\_\_ 13. Applicants for the fourth job of the Help Wanted ad in Table 12-1, "Supervisor," could qualify if they were \_\_\_\_.
- a. DNA
  - b. mRNA
  - c. tRNA
  - d. rRNA
- \_\_\_ 14. Applicants for the third job of the Help Wanted ad in Table 12-1, "Executive Position," could qualify if they were \_\_\_\_.
- a. DNA
  - b. mRNA
  - c. tRNA
  - d. rRNA
- \_\_\_ 15. A DNA segment is changed from-AATTAG- to -AAATAG-. This is a \_\_\_\_.
- a. frameshift mutation
  - b. substitution
  - c. insertion
  - d. deletion

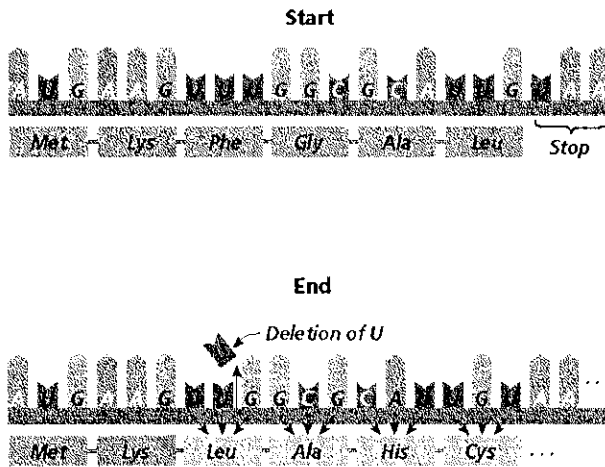


Figure 12-3

- \_\_\_\_ 16. What type of mutation has occurred in Figure 12-3?
- substitution
  - frameshift
  - lethal
  - insertion
- \_\_\_\_ 17. What will be the result of the mutation in Figure 12-3?
- it will have no effect on protein function
  - only one amino acid will change
  - nearly every amino acid in the protein will be changed
  - translation will not occur
- \_\_\_\_ 18. A DNA segment is changed from -AATTAGAAATAG- to -ATTAGAAATAG-. This is a \_\_\_\_.
- frameshift mutation
  - insertion
  - inversion
  - translation
- \_\_\_\_ 19. A particular sequence of parent DNA has four purine bases and two pyrimidine bases. According to base-pairing rules, which of the following sequences could be formed during replication?
- two cytosine, two adenine, two thymine
  - two cytosine, two adenine, two uracil
  - two adenine, two thymine, one guanine, one cytosine
  - two adenine, two guanine, two cytosine
- \_\_\_\_ 20. Which of the following sequences of processes correctly reflects the central dogma?
- protein synthesis, transcription, translation
  - protein synthesis, translation, transcription
  - transcription, translation, protein synthesis
  - translation, transcription, protein synthesis
- \_\_\_\_ 21. This is a template DNA sequence: 3'AATCGC5'. This is a partially-completed mRNA strand transcribed from the DNA template: 3'GCGA5'. What is the next nucleotide that RNA polymerase will attach?
- A
  - C
  - T
  - U

22. Using DNA sequencing, you discover that a bacterium has experienced a deletion mutation that removed three nucleotides. The bacterium appears completely unaffected in all its functions. Where is the most likely location for the mutation?
- an exon
  - an intron
  - a promoter
  - a repressor

	Adenine	Cytosine
Sample 1	34%	16%
Sample 2	16%	34%
Sample 3	33%	17%

Table 12-2

23. Three samples of DNA contain the percentages of nitrogenous bases listed in Table 12-2. According to Chargaff's law, which two samples probably belong to the same species?
- 1 and 2
  - 1 and 3
  - 2 and 3
  - cannot tell without data on guanine and thymine
24. The template strand of a piece of DNA being replicated reads: 5'-ATAGGCCGT-3'. A partially synthesized Okazaki fragment is 5'CCTA3'. If the next fragment is four bases long, what is its first base?
- A
  - C
  - G
  - T
25. DNA replication of a leading strand involves which enzymes?
- primase, polymerase
  - primase, polymerase, ligase
  - helicase, primase, ligase
  - helicase, primase, polymerase, ligase