DNA

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

___ 1. Which one of the following nucleotide pair bonds would be found in a DNA molecule?
   a. adenine-guanine  c. adenine-cytosine
   b. guanine-cytosine  d. cytosine-uracil

___ 2. The backbone of a DNA molecule is made of which two components?
   a. phosphate molecules and ribose sugars
   b. deoxyphosphate molecules and ribose sugars
   c. phosphate molecules and deoxyribose sugars
   d. deoxyphosphate molecules and deoxyribose sugars

___ 3. Ribosomes are made of _____.
   a. rRNA and protein  c. rRNA and mRNA
   b. tRNA and mRNA  d. protein and tRNA

___ 4. Watson and Crick were the first to suggest that DNA is _____.
   a. a short molecule  c. a protein molecule
   b. the shape of a double helix  d. the genetic material

___ 5. The chromosome abnormality that occurs when part of one chromosome breaks off and is added to a different chromosome is _____.
   a. deletion  c. translocation
   b. nondisjunction  d. inversion

___ 6. Which of the following would be least likely to happen as a result of a mutation in a person's skin cells?
   a. skin cancer
   b. reduced functioning of the skin cell
   c. no change in functioning of the skin cell
   d. the person's offspring have mutated skin

___ 7. The pairing of _____ in DNA is the key feature that allows DNA to be copied.
   a. nucleotides  c. chromosomes
   b. nitrogen bases  d. codons

___ 8. The process by which a DNA molecule is copied is called _____.
   a. binary fission  c. replication
   b. mitosis  d. translation

___ 9. A DNA nucleotide may be made up of a phosphate group, along with _____.
   a. deoxyribose sugar and uracil  c. deoxyribose sugar and thymine
   b. ribose sugar and adenine  d. ribose sugar and cytosine

___ 10. 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

___ 11. Messenger RNA is formed in the process of _____.
    a. transcription  c. replication
    b. translation  d. mutation
12. An RNA molecule is a polymer composed of subunits known as _____.
   a. polysaccharides   c. nucleotides
   b. ribose molecules   d. uracil molecules

13. X rays, ultraviolet light, and radioactive substances that can change the chemical nature of DNA are classified as _____.
   a. growth regulators   c. hydrolytic enzymes
   b. metamorphic molecules   d. mutagens

14. In which part of the cell does this process shown in Figure 11-1 take place?
   a. in the nucleus   c. at the ribosomes
   b. in food vacuoles   d. on the chromosome

15. Which of the structures in Figure 11-1 are composed of RNA?
   a. II and IV   c. I and V
   b. III and IV   d. III and V

16. Structure III in Figure 11-1 represents a(n) _____.
   a. gene   c. codon
   b. amino acid   d. DNA molecule

17. The process illustrated in Figure 11-1 is called _____.
   a. translation   c. monoploidy
   b. replication   d. transcription
Help Wanted

**Positions Available** 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. The ability to work in close association with ribosomes is
a must.

**Accuracy and Speed** vital for this job in the field of translation. Applicants must
demonstrate skills in transporting and positioning amino acids. Salary
commensurate with experience.

**Executive Position** 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.

**Supervisor** 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 11-1

<p>| | | |</p>
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<tbody>
<tr>
<td>18. Applicants for the fourth job of the Help Wanted ad in Table 11-1, &quot;Supervisor,&quot; could qualify if they were</td>
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<td>b. mRNA</td>
<td>d. rRNA</td>
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<td>19. Applicants for the third job of the Help Wanted ad in Table 11-1, &quot;Executive Position,&quot; could qualify if they were</td>
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<td>b. mRNA</td>
<td>d. rRNA</td>
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<td>20. Applicants for the second job of the Help Wanted ad in Table 11-1, &quot;Accuracy and Speed,&quot; could qualify if they were</td>
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<td>b. mRNA</td>
<td>d. rRNA</td>
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<td>21. A DNA segment is changed from-AATTAG- to -AAATAG-. This is a</td>
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<td>b. point mutation</td>
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<tr>
<td>22. A DNA segment is changed from -AATTAGAAATAG- to -ATTAGAAATAG-. This is a</td>
<td></td>
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<tr>
<td>b. point mutation</td>
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</table>
23. Which structure shown in Figure 11-3 is a pyrimidine?
   a. A  
   b. B  
   c. C  
   d. D

24. Which structure shown in Figure 11-3 does not contain a nitrogenous base?
   a. A  
   b. B  
   c. C  
   d. D

25. Which structure shown in Figure 11-3 would attract a free cytosine nucleotide?
   a. A  
   b. B  
   c. C  
   d. D
26. What type of mutation has occurred in Figure 11-4?
   a. point mutation  
   b. frame shift  
   c. lethal  
   d. protein

27. What will be the result of the mutation in Figure 11-4?
   a. it will have no affect on protein function  
   b. only one amino acid will change  
   c. nearly every amino acid in the protein will be changed  
   d. the organism will die

Completion

Complete each statement.

28. Watson and Crick called the three-dimensional shape of DNA a ________________.

29. When parts of chromosomes are broken off and lost during mitosis or meiosis, the result is a(n) ________________.

30. The process of converting RNA code into an amino acid sequence is called ________________.

31. If a nucleotide is added or removed from a DNA molecule and mRNA is created, the codons after the mutation will not be read correctly. This is a ________________.

32. A change in a single base pair of the DNA molecule that affects the synthesis of an entire protein is called a(n) ________________.

33. The molecule ________________ brings amino acids to the ribosomes for the assembly of proteins.

34. Each set of three nitrogen bases representing an amino acid is referred to as a(n) ________________.

35. The process by which DNA makes a copy of itself is called ________________.

36. Thymine, adenine, guanine, and cytosine are classified as ________________.

37. Watson and Crick, with the help of Rosalind Franklin, developed the ________________ model of DNA.

38. A(n) ________________ involves the addition or deletion of a single base in a DNA molecule.
39. During the process of transcription, DNA serves as the template for making ________________, which leaves the nucleus and travels to the ribosomes.

40. Translation is to protein as transcription is to ________________.

41. DNA is to RNA as double stranded is to ________________.

42. Adenine is to thymine as guanine is to ________________.

Short Answer

43. Describe the process of replication.

44. Provide a mathematical reason for why codons cannot be two nucleotides in length.

45. Identify the following types of chromosome changes.
   a. abcdef → abcedf
   b. abcdef → abcefd
   c. abcdef → abcd56

46. What is the difference between a codon and an anticodon?

47. Why is tRNA important in translation?

Problem

48. In Figure 11-2, use the letter P to label all of the phosphate groups. Use an S to label all the sugar molecules. For labeling the nitrogen bases, use a T for thymine and a C for cytosine. Guanine and adenine have been filled in for you. Circle and label a codon. Circle and label a nucleotide.

![Figure 11-2](image)