

Test Bank for Molecular Diagnostics
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Chapter 1: Nucleic Acids

Multiple Choice

1. DNA contains deoxyribonucleotide triphosphates joined together by what type of covalent bond?
 - A. Aldehyde
 - B. Ester
 - C. Phosphodiester
 - D. Peptide

ANS: C

OBJ: 1.3

2. Nucleotides in DNA consist of which of the following?
 - A. Nitrogen base, deoxyribose, and phosphate
 - B. Nitrogen base, ribose, and sulfur
 - C. Carbon base, ribose, and phosphate
 - D. Carbon base, glucose, and carboxyl

ANS: A

OBJ: 1.1

3. Which of the five ribose carbons of the deoxyribonucleotide are involved in the formation of the DNA chain?
 - A. 1' and 5'
 - B. 2' and 4'
 - C. 3' and 4'
 - D. 3' and 5'

ANS: D

OBJ: 1.2

4. In a DNA molecule, one end has a free hydroxyl group. What does the other end have?
 - A. A free phosphate group
 - B. A free hydroxyl group
 - C. A free amino group
 - D. A free carboxyl group.

ANS: A

OBJ: 1.2

5. What type of bonds spontaneously form between two complementary strands of DNA?
- A. Hydrogen bonds
 - B. Covalent bonds
 - C. Phosphodiester bonds
 - D. Hydrophobic bonds

ANS: A

OBJ: 1.2

6. In a double-stranded DNA molecule, base pairing between strands occurs between which of the following?
- A. A purine and a purine
 - B. A pyrimidine and a pyrimidine
 - C. A purine and a pyrimidine
 - D. All types of nucleotide bases

ANS: C

OBJ: 1.4

7. Which of the following is a purine?
- A. Tyrosine
 - B. Cytosine
 - C. Adenine
 - D. Alanine

ANS: C

OBJ: 1.1

8. Which DNA sequence is complementary to 5'GATTCTCAAAGGACT3'?
- A. 5'GATTCTCAAAGGACT3'
 - B. 3'GATTCTCAAAGGACT5'
 - C. 3'CTAAGAGTTTCCTGA5'
 - D. 5'CTAAGAGTTTCCTGA3'

ANS: C

OBJ: 1.5

9. Which term describes the arrangement of the individual strands in the double-stranded DNA molecule?
- A. Parallel
 - B. Antiparallel
 - C. Tangential
 - D. Divergent

ANS: B

OBJ: 1.5

10. What is the process of separating the two DNA strands of double-stranded DNA into two single strands called?
- A. Denaturation
 - B. Renaturation
 - C. Depolymerization
 - D. Hybridization

ANS: A

OBJ: 1.4

11. Which of the following describes DNA replication?
- A. Conservative
 - B. Semiconservative
 - C. Nonconservative
 - D. Dispersive

ANS: B

OBJ: 1.4

12. DNA replication requires the presence of which of the following?
- A. DNA template
 - B. Ribosomes
 - C. Amino acids
 - D. Messenger RNA

ANS: A

OBJ: 1.5

13. DNA replication of the lagging strand proceeds in what manner?
- A. Continuously
 - B. After completion of the leading strand
 - C. Discontinuously
 - D. Synthesis proceeds 3' to 5'

ANS: C

OBJ: 1.4

14. In DNA replication, the template is copied in which direction?
- A. Reading goes 5' to 3'.
 - B. Reading goes 3' to 5'.
 - C. Both strands are read bidirectionally.
 - D. Reading proceeds from the -OP to the -OH end.

ANS: B

OBJ: 1.4

15. What does synthesis of the lagging DNA strand produce?

- A. Kornberg fragments
- B. Southern fragments
- C. Okazaki fragments
- D. Klenow fragments

ANS: C

OBJ: 1.4

16. Which of the following provides a substrate for DNA polymerase?

- A. RNA primer hydroxyl group
- B. Dideoxynucleotide
- C. Uracil
- D. RNA primer phosphate group

ANS: A

OBJ: 1.3

17. Where does DNA replication begin and end?

- A. Origin of replication; end of the molecule
- B. Promoter; termination site
- C. Start codon; stop codon
- D. Start codon; termination site

ANS: A

OBJ: 1.4

18. Which of the following enzymes will untangle DNA?

- A. Polymerase
- B. Helicase
- C. Kinase
- D. Phosphatase

ANS: B

OBJ: 1.6

19. Restriction endonucleases are enzymes that do which of the following?

- A. Degrade viral proteins
- B. Digest DNA
- C. Have no laboratory applications
- D. Degrade lipids

ANS: B

OBJ: 1.6

20. Enzymes that recognize palindromic sequences of DNA, cut within the recognition sequence, do not have methylating activity and are used frequently in the laboratory are which type of restriction enzymes?
- A. Type I
 - B. Type II
 - C. Type III
 - D. Type IV

ANS: B

OBJ: 1.6

21. Which of the following is a palindromic enzyme recognition site?
- A. GAATTC
 - B. GAATTG
 - C. GAAAAG
 - D. GATCAG

ANS: A

OBJ: 1.6

22. An exonuclease will catalyze what type of reaction?
- A. Polymerization of nucleotides into long strands
 - B. Separation of complementary DNA strands
 - C. Dissociation of phosphodiester bonds at the ends of DNA molecules
 - D. Formation of circular DNA molecules from linear ones

ANS: C

OBJ: 1.6

23. What reactions are catalyzed by DNA methyltransferase?
- A. Addition of methyl groups to nitrogen bases
 - B. Addition of methyl groups to ribose sugars
 - C. Addition of methyl groups to proteins
 - D. Removal of methyl groups from DNA

ANS: A

OBJ: 1.6

24. What is the function of DNA ligase?
- A. To synthesize DNA
 - B. To cut DNA within the double helix
 - C. To chew DNA from the ends
 - D. To join two ends of DNA together

ANS: D

OBJ: 1.6

25. What is the fertility factor (F) observed by Hayes and Lederberg?
- A. A chemical that encourages bacterial mating
 - B. A virus
 - C. A plasmid
 - D. A polysaccharide on the cell surface

ANS: C

OBJ: 1.10

26. Recombination by transformation would be prevented by which treatment?
- A. Protease
 - B. Ribonuclease
 - C. Deoxyribonuclease
 - D. Phosphorylase

ANS: C

OBJ: 1.10

27. What is the movement of DNA from one bacterium to another through the activity of bacteriophages called?
- A. Conjugation
 - B. Transformation
 - C. Transduction
 - D. Crossing over

ANS: C

OBJ: 1.10

28. In sexual recombination, new combinations of genes are created by which of the following processes?
- A. Polymerization
 - B. Crossing over
 - C. Exonuclease digestion
 - D. Methylation

ANS: B

OBJ: 1.11

29. Which of the following promote bacterial resistance to common antibiotics?
- A. Helicases
 - B. R factors
 - C. Endonucleases
 - D. Methylases

ANS: B

OBJ: 1.10

30. Recombination between a plasmid and the bacterial chromosome will result in which of the following?
- A. Rapid degradation of the chromosome
 - B. Elimination of plasmid genes
 - C. Immediate cellular replication
 - D. Integration of plasmid genes

ANS: D

OBJ: 1.11

31. When an RNA molecule folds, what does adenine base pair with?
- A. Thymine
 - B. Cytosine
 - C. Uracil
 - D. Guanine

ANS: C

OBJ: 1.7

32. How are RNA and DNA structurally similar?
- A. They both have ribose as their sugar moiety.
 - B. They both mostly consist of a single strand that folds on itself.
 - C. They both consist of two complementary strands.
 - D. They both are polymers of nucleotide bases.

ANS: D

OBJ: 1.7

33. RNA is synthesized by RNA polymerase. What is it degraded by?
- A. Helicase
 - B. Polymerase
 - C. Ribonuclease
 - D. Methylase

ANS: C

OBJ: 1.7

34. The large ribosome subunit in prokaryotes consists of ribosomal proteins and which of the following?
- A. 16S rRNA
 - B. 18S rRNA
 - C. 23S rRNA and 5S rRNA
 - D. 28S rRNA, 5S rRNA, and 5.8S rRNA

ANS: C

OBJ: 1.8

35. Messenger RNA is different from other types of RNA because messenger RNA has which of the following?
- A. A 3' polyA tail
 - B. Introns and exons
 - C. A 3' methylated cap
 - D. A cruciform structure

ANS: A

OBJ: 1.8

36. What is synthesis of RNA guided by a DNA template called?
- A. Translation
 - B. DNA replication
 - C. Transcription
 - D. Reverse transcription

ANS: C

OBJ: 1.7

37. What is synthesis of DNA guided by an RNA template called?
- A. Translation
 - B. Replication
 - C. Transcription
 - D. Reverse transcription

ANS: D

OBJ: 1.7

38. In transcription, what is the starting material, what is the ending material, and what is the major enzyme that catalyzes the process?
- A. DNA; RNA; DNA polymerase
 - B. RNA; protein; RNA polymerase
 - C. RNA; DNA; reverse transcriptase
 - D. DNA; RNA; RNA polymerase

ANS: D

OBJ: 1.7

39. If the following oligonucleotide of double-stranded DNA was transcribed, what would be the sequence of the RNA?

5'TGCTAGCTA3'

3'ACGATCGAT5'

A. 5'UGCUAGCUA3'

B. 5'ACGAUCGAU3'

C. 3'ACGATCGAT5'

D. 3'ACGAUCGAU5'

ANS: A

OBJ: 1.7

40. Which of the following enzymes performs transcription in bacteria?

A. RNA-dependent DNA methylase

B. DNA-dependent RNA polymerase

C. DNA-dependent DNA polymerase

D. RNA-dependent RNA nuclease

ANS: B

OBJ: 1.7

41. The RNA polymerase holoenzyme consists of which of the following subunits?

A. α 3, β , β'

B. α 2, β , β' , ω , σ

C. α , α' , β , β'

D. α 2, β , β' , ρ , ω

ANS: B

OBJ: 1.7

42. Which component of RNA polymerase is responsible for initiating transcription at the correct site?

A. α

B. β

C. ρ

D. σ

ANS: D

OBJ: 1.7

43. Which of the following is involved with termination of transcription in bacteria?

- A. DNA polymerase
- B. Sigma
- C. Rho
- D. PolyA signal

ANS: C

OBJ: 1.7

44. Which of the following is associated with termination of mRNA transcription in eukaryotes?

- A. Ribonucleotide polymerase
- B. Sigma protein
- C. Attenuation by rho
- D. Polynucleotide adenylyltransferase

ANS: D

OBJ: 1.7

45. Which of the following types of RNA is directly involved in removing introns from RNA in eukaryotes?

- A. 18S ribosomal
- B. Transfer
- C. Small nuclear
- D. 16S ribosomal

ANS: C

OBJ: 1.9

46. What is the secondary structure of transfer RNA?

- A. Cruciform or inverted L
- B. Heteroduplex
- C. Triple helix or triplex
- D. Ring or inverted C

ANS: A

OBJ: 1.8

47. What is the loop of transfer RNA that interacts with the codon on mRNA in translation called?

- A. D loop
- B. T ψ C loop
- C. Variable loop
- D. Anticodon loop

ANS: D

OBJ: 1.8

48. One mechanism of intron removal results in which byproduct?

- A. Dinucleotides
- B. PolyA tails
- C. Lariats
- D. Okazaki fragments

ANS: C

OBJ: 1.9

49. Capping of RNA involves which type of connection?

- A. 3'RNA-5' cap
- B. 5'RNA-3' cap
- C. 5'RNA-5' cap
- D. 3'RNA-3' cap

ANS: C

OBJ: 1.9

50. Thalassemias arise from changes in what part of the beta globin gene?

- A. 3' untranslated region
- B. PolyA tail
- C. Splice-recognition site
- D. Ribosome-binding site

ANS: C

OBJ: 1.9