

考生注意事項：所有考題務必在答案卷上作答。凡在問題卷上作答者無效。

I. 選擇題 (單選，每題二分)

1. Which one of the following statements about RNA polymerase is CORRECT ?
 - A. It requires a primer to initiate RNA synthesis.
 - B. Unlike DNA polymerase, it does not contain 3'-5' exonuclease activity.
 - C. It use deoxyribonucleotide as substrate.
 - D. It can be inhibited by streptomycin.
 - E. None of the above

2. DNA sequencing (the Sanger method) depends upon cleavage by termination of growing chains by
 - A. 2,3 dioxynucleoside monophosphate
 - B. 2,3 dioxynucleoside triphosphate
 - C. DNA polymerase I inhibitor
 - D. DNA polymerase III inhibitor
 - E. deoxynucleoside diphosphate

3. Group II introns
 - A. require ATP cofactor for splicing
 - B. are generally found in the primary transcripts of mitochondrial mRNAs
 - C. require a small nuclear RNA for splicing
 - D. require a GMP, GDP, or GTP cofactor for splicing
 - E. are generally found in the primary transcripts of nuclear mRNA

4. Which of the following statements concerning a Klenow fragment is CORRECT ?

Klenow fragment

 - A. possesses a 5'-3' proofreading exonuclease
 - B. cannot carry out nick translation
 - C. has only a highly specialized DNA repair function
 - D. incorporates many thousand nucleotide per binding event
 - E. acts to promote the pairing of homologous strands

5. Which one of the following enzymes is NOT involved in SOS repair?
- A. MutH
 - B. RecA
 - C. Uvr
 - D. UmuD
 - E. DNA polymerase II
6. TFIID protein is
- A. a transcription factor that is required for RNA polymerase binding
 - B. specifically recognizes the GC boxes in higher eukaryotes
 - C. an eukaryotic single-stranded DNA binding protein
 - D. a translational repressor that binds to the mRNA and blocks translation
 - E. an antiterminator for gene transcription of bacteriophage
7. For most promoters in *E. coli*, the consensus sequence for the -10 region is
- A. TTGACA
 - B. TATAAT
 - C. CCCCATTTA
 - D. GGGCGG
 - E. TATAAAA
8. The synthesis of the core oligosaccharide of glycoprotein can be inhibited by
- A. Tunicamycin
 - B. Puromycin
 - C. Streptomycin
 - D. Tetracyclines
 - E. Chloramphenicol
9. Which one of the following base pairing is allowed in anticodon-codon interactions?
- A. 5' codon A pair with 3' anticodin U
 - B. 5' codon G pair with 3' anticodon U
 - C. 3' codon A pair with 5' anticodon U
 - D. 3' codon G pair with 5' anticodon U
 - E. none of the above

10. In higher eukaryotes, satellite DNA can be localized to centromeres or to telomeres by using the method called
- A. in situ hybridization
 - B. cesium chloride gradient
 - C. tritium-labeled DNA probe
 - D. in vitro transcription
 - E. in vitro translation
11. In *E. coli*, binding of RNA polymerase to heat-shock promoters is mediated by
- A. σ^{32}
 - B. σ^{70}
 - C. RF1
 - D. rho protein
 - E. 7SL RNA
12. Which one of the following statements is **INCORRECT** ?
- A. RNase P is endonuclease that removes RNA at the 5' end of tRNAs
 - B. RNase D is exonuclease that removes RNA at the 3' end of tRNAs
 - C. RNase P is a ribozyme
 - D. RNase P is found only in higher eukaryotes
 - E. none of the above
13. Which one of the following statements about reverse transcriptases is **INCORRECT** ? Reverse transcriptases
- A. catalyze RNA-directed DNA synthesis
 - B. catalyze RNA degradation
 - C. catalyze DNA-directed DNA synthesis
 - D. do not have 3'-5' proofreading exonucleases
 - E. none of the above
14. Which one of the following statements concerning tRNAs is **INCORRECT** ?
- A. tRNAs usually have a pG residus at the 5' end
 - B. tRNAs usually have the trinucleotide sequence CCA(3') at the 3' end
 - C. The three-dimensional structure of a tRNA look like a twisted L
 - D. tRNAs usually contain modified residues
 - E. tRNAs usually contain 100-200 nucleotides and consist of a double strand of RNA

15. Which one of the following components is an inducer of the *lac* operon and often used experimentally
- A. isopropylthiogalactoside (IPTG)
 - B. arabinose
 - C. cAMP
 - D. lactose
 - E. glucose
16. Which one of the following is usually found in the transcriptional activation domain of transcription factors?
- A. acidic rich amino acids
 - B. leucine zipper
 - C. helix-turn-helix
 - D. zinc finger
 - E. basic rich amino acids
17. Bacteriophage that can establish lysogeny is called
- A. integrate phage
 - B. lytic phage
 - C. temperate phage
 - D. infective phage
 - E. virulent phage
18. Which one of the following codons is not used as termination codon in procaryotic translation?
- A. UAA
 - B. UGA
 - C. UAG
 - D. UGG
 - E. none of the above
19. Which one of the following components is involved in eukaryotic protein degradation?
- A. La protease
 - B. ubiquitin
 - C. DnaB protein
 - D. ubiquinone
 - E. Ras protein

20. 5' end of a DNA fragment can be radioactively labeled by a mixture containing

- A. γ - ^{32}P -ATP, alkaline phosphatase
- B. α - ^{32}P -dATP, polynucleotide kinase
- C. γ - ^{32}P -ATP, polynucleotide kinase
- D. α - ^{32}P -dATP, terminal transferase
- E. α - ^{32}P -dATP, reverse transcriptase

II. Problem 21-25, match the following enzyme with appropriate statement (1% each)

- A. DNA polymerase α
- B. PCNA (proliferating cell nuclear antigen)
- C. DNA polymerase δ
- D. DNA polymerase Γ
- E. RFA (replication factor A)

- 21. is a eukaryotic single-stranded DNA-binding protein
- 22. is a highly processing enzyme and is located to mitochondria
- 23. seem to be involved in eukaryotic lagging strand synthesis
- 24. seem to be involved in eukaryotic leading strand synthesis
- 25. have a function analogous to the β subunit of *E. coli* DNA polymerase III

III. Problem 26-30, match each statement with the correct lettered terms (1% each)

- A. Actinomycin D
- B. Rifampicin
- C. Tetracycline
- D. Cycloheximide
- E. Ricin

- 26. binds specifically to the β subunit of bacterial RNA polymerases
- 27. inhibit protein synthesis in bacteria
- 28. blocks the peptidyl transferase of 80S eukaryotic ribosomes
- 29. inactivates the 60S subunit of eukaryotic ribosomes.

30. inhibits RNA elongation in both bacteria and eukaryotes.

IV. Problem 31-35, describe the following terms:(2% each)

- 31. Ti plasmid
- 32. Homeobox
- 33. Nonsense suppressor
- 34. AP endonuclease
- 35. Retrotransposons

V. Short answer-question

- 36. What is the Ames test, and what is it used for? (4%)
- 37. What are the characteristics of cosmids? (4%)
- 38. (6%)
 - (A) Give possible explanations why a simply cloned eukaryotic gene will not usually yield functional mRNA in a bacterial host.
 - (B) Assuming the problem in (A) is solved, give possible reasons why a desired protein may not be made by a eukaryotic gene cloned in a bacterium.
- 39. Describe the processing of preribosomal RNA transcripts in bacteria (6%)
- 40. Describe briefly the regulation of the SOS response in *E. coli*. (6%)
- 41. Describe the model for methyl-directed mismatch repair. (6%)
- 42. Describe briefly the basic model for DNA replication (summarize the proposed events that occur in or near a replication fork in *E. coli*). (8%)