

國立中正大學

113 學年度碩士班招生考試

試題

[第 1 節]

科目名稱	分子生物學
系所組別	生物醫學科學系分子生物

—作答注意事項—

※作答前請先核對「試題」、「試卷」與「准考證」之系所組別、科目名稱是否相符。

1. 預備鈴響時即可入場，但至考試開始鈴響前，不得翻閱試題，並不得書寫、畫記、作答。
2. 考試開始鈴響時，即可開始作答；考試結束鈴響畢，應即停止作答。
3. 入場後於考試開始 40 分鐘內不得離場。
4. 全部答題均須在試卷（答案卷）作答區內完成。
5. 試卷作答限用藍色或黑色筆（含鉛筆）書寫。
6. 試題須隨試卷繳還。

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一、選擇題：(30 題，每題 2 分，共 60 分)

1. On a polypeptide, which amino acid cannot be phosphorylated?
(A) serine (B) valine (C) threonine (D) tyrosine
2. Amino acids are the building blocks of:
(A) DNAs (B) RNAs (C) Proteins (D) Polysaccharides
3. Which of the following proteins can recognize the Ori sequence in *E. coli*?
(A) DnaA (B) DnaB (C) DnaC (D) DnaG
4. Which of the following is a true statement regarding DNA polymerase?
(A) It is a processive enzyme
(B) It contains proofreading activity
(C) It requires a short primer or oligonucleotide to start synthesizing new DNA strands
(D) All of the above
5. Which activity of DNA polymerase I is also called "proofreading" activity?
(A) 5' to 3' polymerase activity (B) 3' to 5' polymerase activity
(C) 5' to 3' exonuclease activity (D) 3' to 5' exonuclease activity
6. Which of the following is not a "stop codon" ?
(A) UAA (B) UGG (C) UGA (D) UAG
7. Which statement is correct?
(A) Histone proteins are mainly positively charged.
(B) The core histones include H1, H2A, H2B, H3, and H4.
(C) Histone proteins interact mainly with the bases of the DNA.
(D) None of the above.
8. In eukaryotes, DNA replication occurs during:
(A) G1 phase (B) G2 phase (C) M phase (D) S phase
9. Which of the following molecules is involved in DNA mismatch repair?
(A) RecBCD (B) MutH (C) UvrC (D) Spo11
10. Which of the following molecules is involved in DNA nucleotide excision repair?
(A) RecBCD (B) MutH (C) UvrC (D) Spo11

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11. Which description is false?
- (A) X-rays are hazardous because they cause DNA double-strand breaks, which are hard to repair.
 - (B) an A to G mutation is called a point mutation.
 - (C) Human cells are used in the Ames test to determine the carcinogenic effects of chemicals.
 - (D) Non-homologous end joining usually results in DNA mutations.
12. Which transposable element does not use an RNA intermediate to insert into new sites in the host cell genome?
- (A) DNA transposons
 - (B) Viral-like retrotransposons
 - (C) Retroviruses
 - (D) Poly-A retrotransposons
13. If a species contains 20% adenine (A) in its DNA, what percentage of guanine (G) would it also have?
- (A) 20%
 - (B) 30%
 - (C) 15%
 - (D) 40%
14. The aromatic rings of the bases found in DNA and RNA absorb ultraviolet light with an absorption maximum at:
- (A) 240 nm
 - (B) 260 nm
 - (C) 280 nm
 - (D) 300 nm
15. DnaG is a :
- (A) Helicase
 - (B) Topoisomerase
 - (C) Primase
 - (D) DNA ligase.
16. What subunits that are common in all three kinds of the RNA polymerase in eukaryote?
- (A) Rpb1/Rpb2
 - (B) Rpb3/Rpb9
 - (C) Rpb4/Rpb7
 - (D) Rpb5/Rpb6/Rpb8
17. The sensitivity to α -amanitin for three kinds of RNA polymerase (Pol I, Pol II and Pol III) is:
- (A) Pol I > Pol II > Pol III
 - (B) Pol I > Pol III > Pol II
 - (C) Pol II > Pol III > Pol I
 - (D) Pol III > Pol II > Pol I
18. microRNA(miRNA) is transcribed by:
- (A) RNA polymerase I
 - (B) RNA polymerase II
 - (C) RNA polymerase III
 - (D) Reverse transcriptase
19. Following the previous question, the 5S rRNA(ribosomal RNA) is transcribed by?
- (A) RNA polymerase I
 - (B) RNA polymerase II
 - (C) RNA polymerase III
 - (D) RNA dependent RNA polymerase

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20. Which one is NOT classified as the transactivation domain of a transcriptional factor?
(A) Zinc finger domain (B) Acidic domain
(C) Glutamine-rich domain (D) Proline-rich domain
21. Which proteins contains the activity of proofreading during the elongation step in eukaryote transcription?
(A) TFIID (B) TFIIIE (C) TFIIF (D) TFIIIS
22. The triphosphate linkage in the cap structure of a mRNA from 5' to 3' direction is:
(A) $\alpha \beta \gamma$ (B) $\gamma \beta \alpha$ (C) $\alpha \beta \alpha$ (D) $\gamma \beta \gamma$
23. The shape of the intron released after *trans*-splicing is?
(A) linear (B) lariat (C) circular (D) Y-shape
24. In precursor mRNA splicing, which two snRNAs can pair with U6 snRNA?
(A) U1 and U2 (B) U2 and U4 (C) U2 and U5 (D) U4 and U5
25. In the infection of *E. coli* by λ phage, which description for the binding ability of cro is correct?
(A) $O_{R1} > O_{R2} > O_{R3}$ (B) $O_{L1} < O_{L2} < O_{L3}$
(C) $O_{R1} > O_{R2} = O_{R3}$ (D) $O_{L1} < O_{L2} = O_{L3}$
26. The ribosome-binding site in a mRNA is named as?
(A) Shine-Dalgarno sequence (B) Kozak sequence
(C) Okazaki sequence (D) Upstream Activating Sequence (UAS)
27. Primary miRNA can be digested to precursor miRNA by?
(A) Argonaute (B) Slicer (C) DGCR8/Pasha (D) Dicer
28. The first amino acid that incorporated into the P site of ribosome during the protein synthesis in prokaryote is:
(A) N-formyl Methionine (B) Methionine
(C) either N-formyl Methionine or Methionine (D) Serine or Threonine
29. The property of peptidyl transferase is confirmed as?
(A) RNA (B) both RNA and protein (C) protein (D) not identified yet
30. Which method is NOT used for detecting protein-protein interaction directly or indirectly:
(A) Yeast two-hybrid assay (B) Western blot
(C) Co-immunoprecipitation (D) Pull-down assay

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二、簡答題：(10 題，每題 2 分，共計 20 分)

31. Name the two most common secondary structures of proteins.
32. What enzyme can use RNA as a template to synthesize DNA?
33. What enzyme removes excessive supercoiling ahead of the replication fork?
34. Which subunit increases the processivity of DNA polymerase III?
35. Name two kinds of histone modifications.
36. The ways for transcriptional termination in prokaryote.
37. The small RNAs that are required for mRNA splicing and rRNA processing, respectively.
38. The RNA component that is responsible for the 5' end processing of tRNA.
39. Explain the Kozak's rule for translation and its biological function.
40. List at least two functions for the cap structure of the mRNA.

三、問答題：(5 題，每題 4 分，共計 20 分)

41. Please illustrate and describe the "base excision repair" mechanism in *E. coli*.
42. Please describe the molecular process (including all the molecules involved) of homologous recombination in *E. coli*.
43. Please explain the Wobble concept.
44. Please describe the positive and negative regulation of lac operon.
45. Please at least list two enzymes that are involved in RNA editing.