

國立中正大學

111 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。

一、選擇題：(30 題，每題 2 分，共計 60 分)

1. Which of the following is not a stop codon?
(A) UGG (B) UGA (C) UAG (D) UAA
2. In eukaryotes, DNA replication occurs during
(A) G1 phase (B) G2 phase (C) M phase (D) S phase
3. 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 activ
4. Which subunit of DNA polymerase III increases its processivity?
(A) α subunit (B) γ complex
(C) ϵ subunit (D) β subunit
5. Which of the following protein is not required for DNA replication in *E. coli*?
(A) DNA helicase (B) Primase (C) DNA ligase (D) DNA glycosylase.
6. 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
7. Which of following technique is used to detect mRNA level in the cells?
(A) Northern blotting (B) Southern blotting
(C) Western blotting (D) Far western blotting
8. Which transposable element does not use an RNA intermediate to insert into new sites in the genome of the host cell?
(A) DNA transposons (B) Viral-like retrotransposons
(C) Retroviruses (D) Poly-A retrotransposons
9. What is the name of the enzyme responsible for unwinding helical DNA for replication?
(A) Helicase (B) Polymerase (C) Ligase (D) Exonuclease

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本科目共 4 頁 第 2 頁

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10. Which of the following molecules is involved in DNA nucleotide excision repair (NER)?
(A) RecBCD (B) MutH (C) UvrC (D) Spo11
11. Which of the following components is not used during PCR?
(A) DNA Polymerase (B) Oligonucleotide Primers
(C) DNA Ligase (D) Template DNA
12. During Eukaryotic DNA replication, pre-replicative complex (pre-RC) is activated by:
(A) DnaA (B) Cdc6 (C) Cdk (D) Rad51
13. If a species contains 32% Adenine (A) in its DNA, what percentage of Guanine (G) would it also contain?
(A) 32% (B) 64% (C) 36% (D) 18%
14. Which of the following molecules is involved in non-homologous end-joining?
(A) RecBCD (B) Ku70 and Ku80 (C) MutS (D) Glycosylase
15. The unique enzyme that retrotransposons encode and does not exist in human cells is:
(A) DNA polymerase (B) Topoisomerase (C) Reverse Transcriptase (D) DNA ligase.
16. Which subunit of the RNA polymerase could bind to the TATA box in prokaryote?
(A) α (B) β (C) β' (D) σ
17. U6 snRNA is transcribed by:
(A) RNA polymerase I (B) RNA polymerase II
(C) RNA polymerase III (D) Reverse transcriptase
18. Following the previous question, the hnRNA(mRNA) is transcribed by?
(A) RNA polymerase I (B) RNA polymerase II
(C) RNA polymerase III (D) RNA dependent RNA polymerase
19. Which structure is NOT classified as the DNA binding domain?
(A) Zinc finger (B) Leucine zipper (C) Glutamine-rich (D) Homeodomains
20. Proteins that phosphorylate the CTD of RNA polymerase in transcriptional initiation and elongation steps, respectively are:
(A) both TAF1 (B) both TFIIF (C) TFIIF and TFIIS (D) TFIIF and pTEFb

21. For Kozak sequence, which positions and the corresponding bases are proved to be important for the translation efficiency if the underline of AUG as the +1?
- (A) -4 (C/U) and +4 (U) (B) -3 (G/A) and +4 (G)
(C) -10 (UAUA) and -25 (G) (D) -10 (UAUA) and -35 (U)
22. The shape of intron released by Group I self-splicing is?
- (A) linear (B) lariat (C) circular (D) Y-shape
23. In the structure of mature tRNA, the three bases in the most 3' end are:
- (A) 5'-AAC-3' (B) 5'-CCA-3' (C) 5'-ACC-3' (D) 5'-CAA-3'
24. In precursor mRNA splicing, U6 snRNA can pair with two snRNAs and the intron site. These two snRNAs and intron site are:
- (A) U1 and U2, 5' splicing site (B) U1 and U4, 3' splicing site
(C) U2 and U4, 5' splicing site (D) U2 and U5, 3' splicing site
25. In the infection of *E. coli* by λ phage, which description for the binding ability of cI 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 mRNA is named as?
- (A) Shine-Dalgarno sequence (B) Okazaki sequence
(C) Kozak sequence (D) Watson and Crick sequence
27. Pre-miRNA can be digested to mature miRNA by?
- (A) Argonaute (B) Slicer (C) DGCR8/ Pasha (D) Dicer
28. The antibiotic puromycin can terminate translation by mimicking the structure of?
- (A) 16S rRNA (B) 23S rRNA
(C) tyrosyl-tRNA (D) stem and loop structure of 3' UTR of mRNA
29. Which enzyme is NOT involved in RNA editing?
- (A) RNA ligase (B) terminal uridylyl transferase (TUTase)
(C) RNA triphosphatase (D) exo-nuclease
30. The protein-protein interaction can be detected by:
- (A) Far western blot (B) Western blot (C) Northern blot (D) Southern blot

二、簡答題：(10 題，每題 2 分，共計 20 分)

31. What enzyme removes excessive supercoiling ahead of the replication fork?
32. Name two molecules that are involved in the initiation of DNA replication in *E. coli*.
33. Name two types of histone modification.
34. Name two molecules that are involved in V(D)J recombination.
35. In *E. coli*, what molecule loads the β subunit of DNA polymerase III onto DNA?
36. The model for transcriptional termination in eukaryote.
37. The small RNAs that are required for precursor mRNA splicing.
38. Please write down the components of general transcriptional factor TFIID.
39. The enzyme that is responsible for the 5' end processing of tRNA.
40. The reason why the number of tRNA in a certain species is less than 64, but more than 20?

三、問答題：(4 題，每題 5 分，共計 20 分)

41. Please illustrate and describe the process of base excision repair (BER).
42. Please describe the molecular process (including all the molecules involved) of homologous recombination in *E. coli*.
43. Please describe the regulation for Tryptophan attenuation in prokaryote.
44. Please explain what is CRISPR and the application of CRISPR?