

106 學年度生物醫學所分子生物學試題 (全部 38 題, 總計 100 分)

一、選擇題：(30 題, 每題 2 分, 共 60 分)

1. Which amino acid is negatively charged under the biological condition?  
(A) Alanine (B) Cysteine (C) Aspartate (D) Lysine
2. Northern blotting is used for separation and detection of:  
(A) DNA (B) mRNA (C) protein (D) protein-DNA interaction
3. What are the short stretches of DNA formed on the lagging strand?  
(A) Okazaki fragments (B) Hiorshimi fragments  
(C) Klenow fragments (D) Sakura fragments
4. Which of the following enzymes is responsible for E. coli DNA replication?  
(A) DNA polymerase I (B) DNA polymerase II  
(C) DNA polymerase III (D) DNA polymerase V
5. Which of the following molecules increases the processivity of DNA polymerase holoenzyme?  
(A)  $\gamma$  complex (B)  $\beta$  clamp (C)  $\delta$  subunit (D)  $\epsilon$  subunit
6. Which of the following interactions requires the most energy to interrupt?  
(A) covalent bonds. (B) ionic bonds.  
(C) hydrogen bonds. (D) hydrophobic interaction.
7. What is the name of the enzyme responsible for unwinding helical DNA for replication?  
(A) Helicase (B) Polymerase (C) Ligase (D) Exonuclease
8. 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
9. Telomerase:  
(A) joins Okazaki fragments on the lagging strand  
(B) catalyzes DNA replication at the ends of chromosomes  
(C) initiates DNA replication at the origin  
(D) requires ATP

10. Which of the following molecules is not involved in the homologous recombination?  
(A) RecBCD (B) RecA (C) Ku70 (D) RuvC
11. Which of the following molecules is involved in DNA nucleotide excision repair?  
(A) RecBCD (B) MthH (C) UvrC (D) SpoII
12. 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.
13. The activities of RecBCD are controlled by specific DNA sequence elements known as  
(A) res sites (B) chi sites (C) ori sites (D) DSB sites
14. Which of the following molecules is involved in DNA non-homologous end-joining?  
(A) RecBCD (B) RuvA (C) SpoII (D) DNA-PK
15. Which description is wrong?  
(A) an A to G mutation is called a transition mutation.  
(B) DNA can be damaged from alkylation, oxidation, and radiation.  
(C) Human cells are used in the Ames test to determine the carcinogenic effects of chemical.  
(D) X-rays are hazardous because they cause double-strand breaks in the DNA, which are hard to repair.
16. Which structure is NOT classified as the transactivation domain?  
(A) Zinc finger (B) Acidic (C) Glutamine-rich (D) Proline-rich
17. What is the genus/species name for zebra fish?  
(A) *Danio rerio* (B) *Caenorhabditis elegans*  
(C) *Homo sapiens* (D) *Drosophila melanogaster*
18. Which structure in DNA does TBP (TATA box binding protein) bind to?  
(A) Minor groove (B) Major groove  
(C) Backbone (D) Random region except GC rich
19. Which rRNA can pair with the ribosome-binding site of mRNA (Shine-Dalgarno sequence) during translation?  
(A) 5S RNA (B) 5.8S RNA (C) 16S RNA (D) 23S RNA

20. For Kozak sequence, which positions and the corresponding bases are proved to be important for the translation efficiency if the underline of AUG is designed as the +1?
- (A) -4 (C/U) and +4 (U)  
(B) -3 (G/A) and +4 (G)  
(C) -10 (UAUA) and -25 (U)  
(D) -10 (UAUA) and -35 (G)
21. Which kind of small RNA is required for mRNA splicing?
- (A) lncRNA (B) miRNA (C) snRNA (D) snoRNA
22. The shape of intron released by Group I self-splicing is?
- (A) lariat (B) linear (C) Y-shape (D) circular
23. For following codon, which is NOT belonged to translational stop codon?
- (A) UAA (B) UGG (C) UAG (D) UGA
24. In the infection of *E. coli* by  $\lambda$  phage, which description for binding ability of cI (repressor) is correct?
- (A)  $O_{R1} > O_{R2} > O_{R3}$  (B)  $O_{L1} < O_{L2} < O_{L3}$   
(C)  $O_{R1} < O_{R2} < O_{R3}$  (D)  $O_{L1} = O_{L2} = O_{L3}$
25. In tRNA structure, the 5' end is processed by?
- (A) RNase P (B) 5' to 3' exonuclease (C) RNase III (D) all answers above are correct
26. The region that is bound by  $\sigma$  subunit of the RNA polymerase in prokaryote?
- (A) UP element (B) -35 region (C) -10 region (D) both -10 and -35 region
27. Preliminary miRNA (pre-miRNA) can be digested to miRNA by?
- (A) Dicer (B) Slicer (C) DGCR8/Pasha (D) Argonaute
28. The antibiotic puromycin can terminates translation by mimicking the structure of?
- (A) 16S rRNA (B) 23S rRNA (C) tyrosyl-tRNA (D) 5' UTR of mRNA
29. Which protein contains the helicase activity in translational complex eIF4F?
- (A) eIF4G (B) eIF4A (C) eIF4B (D) eIF4E
30. Which enzyme does NOT involved in RNA editing?
- (A) endo-nuclease (B) deaminase (C) RNase P (D) exo-nuclease

二. 問答題：(8 題, 共 40 分)

31. Please describe the initiation process of DNA replication in *E. coli*. (5 points)
32. What is “epigenetic regulation”? (5 points)
33. Please illustrate the base excision repair in details. (5 points)
34. Please describe the mechanisms that B cells use to generate millions of antibodies in details. (5 points)
35. Please explain the negative and positive control of lac operon. (6 points)
36. Please describe the mechanism of transcriptional termination in eukaryote. (6 points)
37. Please explain the context of Histone Code. (4 points)
38. Please describe the concept of Wobble theory in translation. (4 points)