

(全部 39 題, 總計 100 分)

一、 選擇題: (30 題, 每題 2 分, 共 60 分)

1. Which amino acid is positively charged under the biological condition?
(A) Alanine (B) Cysteine (C) Serine (D) Lysine (E) Valine
2. Northern blotting is used for separation and detection of:
(A) DNA (B) mRNA (C) protein (D) protein-DNA interaction (E) organelles
3. Which of the following is a "stop codon"?
(A) GAA (B) UAG (C) UGG (D) AGA (E) AUG
4. Which of the following statements is true?
(A) RNA is usually double-stranded, but DNA is usually single-stranded.
(B) RNA has the sugar deoxyribose, but DNA has the sugar ribose.
(C) RNA contains three different nucleotides, but DNA contains four different nucleotides.
(D) RNA lacks the base thymine (which is found in DNA) and has uracil instead.
(E) DNAs are generally synthesized using RNAs as templates
5. Which primer set would you use to amplify the following 40 nt long fragment?
5' -GTATTATGCTACGACGAGGCTAGCATGCTAGCTAGCGGTT-3'
3' -CATAATACGATGCTGCTCCGATCGTACGATCGATCGCCAA-5'

(A) 5' -TAGCGGTT-3' and 5' -CATAATAC-3'
(B) 5' -GTATTATG-3' and 5' -TAGCGGTT-3'
(C) 5' -GTATTATG-3' and 5' -AACCGCTA-3'
(D) 5' -TAGCGGTT-3' and 5' -AACCGCTA-3'
(E) 5' -TTGGCGAT-3' and 5' -CATAATAC-3'
6. The strand on which DNA replication is continuous is called the:
(A) Leading strand (B) Lagging strand (C) Template strand
(D) Major strand (E) Minor strand
7. What are the short stretches of DNA formed on the lagging strand?
(A) Okazaki fragments (B) Hiorshimi fragments (C) Klenow fragments
(D) Sakura fragments (E) None of the above

8. 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 (E) RNA polymerase I
9. Which subunit of DNA polymerase III load β clamp onto DNA?
(A) α subunit (B) γ complex (C) ϵ subunit
(D) ω subunit (E) ϕ subunit
10. Which activity of DNA polymerase I is also called "proof reading"?
(A) 5' to 3' polymerase activity (B) 3' to 5' polymerase activity
(C) 5' to 3' exonuclease activity (D) 3' to 5' exonuclease activity
(E) ligase activity
11. Which of the following molecules is involved in non-homologous end-joining?
(A) ORC (B) RecA (C) LexA (D) DnaA (E) DNA-PK
12. The activities of RecBCD are controlled by specific DNA sequence elements known as:
(A) chi sites (B) res sites (C) DSB sites (D) ori sites (E) hix sites
13. Which of the followings is induced by the SOS response?
(A) DNA polymerase I (B) DNA polymerase III
(C) Translesion DNA polymerase V (D) RNA polymerase III
(E) DNA ligase.X
14. Which of the following is not in the pre-replicative complexes (pre-RCs)?
(A) ORC (B) Cdc6 (C) Cdt1 (D) Rad51 (E) Mcm 2-7
15. What is the genus/species name for baker's yeast?
(A) *Danio rerio* (B) *Saccharomyces cerevisiae* (C) *Homo Sapien*
(D) *Drosophila melanogaster* (E) *Caenorhabditis elegans*
16. Which region(s) in DNA does TBP (TATA box binding protein) bind to?
(A) Minor groove (B) Major groove (C) Both major and minor groove
(D) Backbone (E) Random region except GC rich
17. In precursor mRNA splicing, which snRNPs must leave the spliceosome finally:
(A) U1 and U4 (B) U2 and U6 (C) U4 and U5
(D) U1 only (E) U6 only

18. Which enzyme does NOT participate in RNA polyadenylation?
(A) poly (A) polymerase (PAP) (B) terminal uridylyl transferase (TUTase)
(C) RNA polymerase II (D) poly-A binding protein (PAB)
(E) cleavage and polyadenylation specificity factor (CPSF)
19. Which molecule can play the role for translocation of ribosome?
(A) EF-G (B) EF-Ts (C) EF-Tu
(D) Release factor (RF) (E) ribosome recycling factor (RRF)
20. For Kozak sequence, which positions are proved to be important for the translation efficiency if the underline of AUG as the +1?
(A) -10 and -35 (B) -10 and -25 (C) -4 and -10 (D) -3 and +4 (E) -4 and +4
21. Which kind of small RNA is required for rRNA processing?
(A) siRNA (B) miRNA (C) snRNA (D) snoRNA (E) piRNA
22. The shape of intron released by Group II self-splicing is?
(A) linear (B) Y-shape (C) lariat (D) circular (E) triangle
23. 5S rRNA is transcribed by:
(A) RNA polymerase I (B) RNA polymerase II (C) RNA polymerase III
(D) RNA-dependent RNA polymerase (RdRp) (E) Reverse transcriptase
24. When *E. coli* is infected by phage λ , which viral protein is proved to be the factor for regulating anti-termination at DNA level during life cycle of phage?
(A) cI (B) cII (C) cro (D) N (E) Q
25. Ubiquitin is a conserved protein with 76 amino acids as a marker for proteasome degradation. To which amino acid (abbreviation in single-letter) of the target protein ubiquitin is bound?
(A) [A] (B) [K] (C) [R] (D) [S] (E) [T]
26. Which factor has been proved to have the proofreading activity during transcription?
(A) TFIIID (B) TFIIIF (C) TFIIIE (D) TFIIH (E) TFIIIS

27. In tRNA structure, the most 3' end is:
(A) D-loop (B) anticodon loop (C) variable loop
(D) acceptor stem (E) TΨC loop
28. The peptidyl transferase activity residue in
(A) 5S rRNA (B) 16S rRNA (C) 23S rRNA
(D) proteins in large subunit (E) proteins in small subunit
29. The dimerization domain of GAL4 was based on
(A) zinc finger (B) helix turn helix (C) helix loop helix
(D) coiled coil (E) leucine zipper
30. The three-amino acid region of RF1 (release factor 1) in translation is critical for release factor specificity and is named as peptide anticodon. The three amino acids are:
(A) GGQ (B) KDE (C) DEL (D) ENL (E) ELL

二. 問答題：(9 題, 共 40 分)

31. Please describe the initiation process of DNA replication in *E. coli*. (5 points)
32. Please illustrate and describe the homologous recombination process in *E. coli*. (4 points)
33. Please illustrate and describe the nucleotide excision repair pathway in *E. coli*. (4 points)
34. Please describe the process of base-excision repair. (4 points)
35. How do B cells generate more than millions of different antibodies with limited amounts of genes? (3 points)
36. Please explain the mechanism of Trp attenuation model in *E. coli*. (5 points)
37. Please explain the regulations of lac operon. (5 points)
38. Please describe the mechanisms of transcriptional termination in eukaryote. (5 points)
39. Please explain the concept of Wobble theory. (5 points)