

※ 注意：請於試卷內之「非選擇題作答區」作答，並應註明作答之題號。

1. Please describe what are the major proteins in the basement membrane (BM)? (3%)
what are the biological functions of basement membrane? (2%)
2. Explain how the single-stranded DNA repaired for general recombination is generated. (5%)
3. Which of the following statements about DNA polymerase III holoenzyme from *E. coli* are correct? (2%)
(A) It elongates a growing DNA chain approximately 100 times faster than DNA polymerase I.
(B) It associates with the parental template, adds a few nucleotides to the growing chain, and then dissociates prior to initiating another synthesis cycle.
(C) It maintains a high fidelity of replication, in part by acting in conjunction with a subunit containing a 3'→5' exonuclease activity.
(D) When replicating DNA, it is a molecular assembly composed of at least 8 different kinds of subunits.
4. Place the following events in the order in which they would occur during general recombination between two DNA molecules. (2%)
(A) Strand exchange occurs between duplexes via branch migration at the crossover point.
(B) A pair of strands with similar sequences is cleaved in each duplex.
(C) Two duplexes align at a region of sequence similarity.
(D) Each invading strand becomes covalently joined to its corresponding strand in the other duplex.
(E) Strands of the recombinant intermediate are cleaved at or near the crossover point and are joined to their corresponding strands in each duplex.
(F) The end of each single strand invades the other duplex and forms base pairs with its complementary strand.
5. Please briefly explain what are oxidases and hydroperoxidases and oxygenases? (5%)
6. How glucagon and insulin individually regulate glycogen synthase and glycogen synthase kinase activities? (4.5%)
7. How intestinal microorganisms reduce bilirubin diglucuronides to urobilinogens and how urobilinogens will become dark in the feces? (4.5%)
8. Please describe how to determine protein phosphorylation and glycosylation. (8%)
9. What are affinity, size exclusion, ionic and reverse phase chromatographies? (4%)
10. Please explain the oxygen-binding curve of hemoglobin is sigmoidal. (4%)
11. For an enzyme-catalyzed reaction that follows Michaelis-Menton model, which one is the correct expression of initial velocity (V_0) at very low $[S]$? Why? (2%)
(A) $V_0 = k_{cat}[E_T]$

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(B) $V_o = k_2[E_T]/k_{-1}$

(C) $V_o = V_{max}[E_T][S]/K_m$

(D) $V_o = k_{cat}[E_T][S]/K_m$

12. Please describe the experimental procedure for obtaining Michaelis-Menton parameters (K_m and V_{max}) for an enzyme-catalyzed reaction. (3%)
13. Please describe how catalytic triad may facilitate peptide bond hydrolysis. (3%)
14. Metabolic pathways which serve both anabolic and catabolic functions are called "amphibolic pathways". Is TCA cycle (also called Krebs cycle or citric acid cycle) an amphibolic pathway? Why? (3%)
15. What is the functional significance of pyruvate dehydrogenase complex? How is the activity of pyruvate dehydrogenase complex regulated *in vivo*? (3%)
16. Please explain what 'reverse cholesterol transport' is. (5 %)
17. What raise 3 conditions that may lead to hypercholesterolemia? And explain the mechanism. (5%)
18. What are the functions of ApoE in lipoprotein metabolism? (4%)
19. An enzyme X consists of two distinct functional domains, which are the substrate binding and catalytic domains. What domain should be mutated so that one can generate a dominant negative mutant of enzyme X? Why? (14%)
20. Please describe the structure and functions of coenzyme Q in mammalian cells. (12%)
21. What is hydrophathy index? (2%)

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