

考試科目：生物化學

系所名稱：水產養殖學系碩士班生命科學組

1. 答案以橫式由左至右書寫。2. 請依題號順序作答。

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1. What characteristic features define enzymes? (5 %)
2. Enzyme A follows simple Michaelis-Menten kinetics. The  $K_m$  of enzyme A for its substrate S is  $K_m^S = 10$  mM. Enzyme A also acts on substrate P and its  $K_m^P = 100$  mM. Is S or P the preferred substrate for enzyme A? Why? (5 %)
3. Why is the pyruvate reduced to lactate in working skeletal muscle under anaerobic condition? (5 %)
4. Why can some bacteria and plants use acetate as the only source of carbon for all the carbon compounds they produce? (5 %)
5. How are the electrons of cytosolic NADH fed into electron transport? (5 %)
6. Describe the four reactions are unique to gluconeogenesis (not in glycolysis). (5 %)
7. Describe the reactions of fatty acid oxidation ( $\beta$ -oxidation). (5 %)
8. What is the precursor of fatty acid and how to transport from mitochondrial into the cytosol. (5 %)
9. Describe the reactions of the urea cycle. (5%)
10. The major pathways of purine catabolism in animals lead to uric acid formation. The most common symptom of gout is arthritic pain in the joints as a result of uric acid deposition in cartilaginous tissue. However, a common treatment is allopurinol. Can you describe the mechanism of allopurinol. (5 %)
11. Assuming DNA replication proceeds at a rate of 100 base pairs per second in human cells and origins of replication occur every 300 kbp, how long would it take to replicate the entire diploid human genome? How many molecules of DNA polymerase does each cell need to carry out this task? (5%)  
\*Human genome is about  $3.4 \times 10^9$  base pairs long
12. Transposons are mutagenic agents. Why? (5%)

13. What might be the advantages of capping, methylation, and polyadenylation of eukaryotic mRNAs? (5%)
14. What ideas can you suggest to explain why ribosomes invariably exist as two-subunit structures, instead of a larger, single-subunit entity? (5%)
15. Many multidomain proteins apparently do not require chaperones to attain the fully folded conformations. Suggest a rational scenario for chaperone-independent folding of such proteins. (5%)
16. 試說明以下之名詞在大腸桿菌染色體 DNA 複製過程中之角色或功能：DNA gyrase、helicase、DNA polymerase、Okazaki fragments、lagging strand。(每個名詞 3%，共 15%)
17. 請問真核生物有幾種 RNA polymerase (不包含植物)，有何功能？(共 10%)