

Part I : 50%

1. What is the cellular location of the enzymes of the citric acid cycle? (single choice, 2%)
 - A) Nucleus
 - B) Cytoplasm
 - C) Mitochondria
 - D) Ribosomes
 - E) Lysosomes

2. Which of the following are characteristics of bacterial plasmids? (multiple choice) (3%)
 - A) They have all of the bacteria's genetic
 - B) DNA molecules that are linear
 - C) Self-replicating, extrachromosomal DNA molecules
 - D) Closed circular in structure
 - E) Useful cloning vectors

3. In each of pair of amino acids listed below, determine the one that has the more nonpolar side chain. (1% each, total 5%)
 - A) Gly:Ala
 - B) Ala:Ser
 - C) Val:Asp
 - D) Phe:Tyr
 - E) Pro:Lys

4. Identify each of the lipoproteins described below. Choose from chylomicrons, VLDL, IDL, LDL, and HDL. (2% for each question; total 10%)
 - A) Which lipoprotein has the lowest density? Why?
 - B) Which lipoprotein carries the highest percentage of cholesterol and cholesteryl esters?
 - C) Which lipoprotein has the highest percentage of protein?
 - D) Which lipoproteins has the highest percentage of triacylglycerol?
 - E) Which lipoproteins has the highest density? Why?

5. Describe the forces that stabilize protein quaternary structure. (10%)

(背面仍有題目,請繼續作答)

6. Protein is often regulated by covalent modification, for example, phosphorylation. Please describe how phosphorylation may affect glycogen metabolism and why it does! (10%)

7. Assume that a mRNA has the following sequence: (10%)

5' AUGCUCACUUCAGGGAGAAAG 3'

- A) According to the following table, what polypeptide sequence would be translated from the mRNA?
- B) If the fifth nucleotide (U) is deleted, what polypeptide sequence would now be translated from this mRNA?

The genetic code

First position (5' end)	Second position				Third position (3' end)
	U	C	A	G	
U	Phe	Ser	Tyr	Cys	U C A G
	Phe	Ser	Tyr	Cys	
	Leu	Ser	Stop	Stop	
	Leu	Ser	Stop	Trp	
C	Leu	Pro	His	Arg	U C A G
	Leu	Pro	His	Arg	
	Leu	Pro	Gln	Arg	
	Leu	Pro	Gln	Arg	
A	Ile	Thr	Asn	Ser	U C A G
	Ile	Thr	Asn	Ser	
	Ile	Thr	Lys	Arg	
	Met	Thr	Lys	Arg	
G	Val	Ala	Asp	Gly	U C A G
	Val	Ala	Asp	Gly	
	Val	Ala	Glu	Gly	
	Val	Ala	Glu	Gly	

Note: Given the position of the bases in a codon, it is possible to find the corresponding amino acid. For example, the codon 5'AUG 3' on mRNA specifies methionine, whereas CAU specifies histidine. UAA, UAG, and UGA are termination signals. AUG is part of the initiation signal, in addition to coding for internal methionines.

Part II : 50%

1. What physical properties are conferred on biological membranes by phospholipids? What role might divalent metal ions play in the interaction of peripheral membrane proteins with phospholipids? (10%)
2. Explain why mutations of *ras* often result in a dominant oncogene (one that has transforming activity even when a wild-type copy of the gene is present), while oncogenic mutations in p53 are usually recessive. (10%)
3. Skeletal muscle, eukaryotic cilia, and bacterial flagella use different molecular strategies for the conversion of free energy into coherent motion. Compare and contrast these motility systems with respect to (a) the free-energy source, and (b) the cellular localization. (10%)
4. Describe a mechanism by which a steroid hormone might act to increase intracellular levels of cyclic AMP. (5%)
5. Receptor tyrosine kinases are potential drug targets in cancer therapy. How might the effect of an oncogenic mutation be reversed by a small molecule? Propose a strategy for such a drug. (5%)
6. The error rate of the mitochondrial DNA polymerase is much higher than that of the nuclear DNA polymerase. Why can lower fidelity be tolerated in the mitochondrial enzyme? (5%)
7. Discuss the possible ways of modifying antisense RNA so as to promote its entrance into cells. (5%)