

Part One Assay Questions (75%)

1. (25%) In a pharmacological experiment of some drug, you are asked by your professor to fast the animals before the experiments. You therefore well feed the rats then fast them for 24 hours.
 - (A) Describe briefly in the well fed animals the transports and fates of (1) carbohydrate, (2) amino acid, and (3) lipid and their metabolites. Show especially how the fuels (the food components) and their metabolites are transported among small intestine, liver, muscle, kidney, and/or adipose tissues (hint: for example, show how carbohydrate is transported and then metabolized into glucose);
 - (B) Roughly depicts by graphs during the 24-hour fasting period the relative changes in levels of metabolic parameters such as (1) plasma insulin, (2) plasma glucagon, (3) plasma epinephrine, (4) plasma free fatty acids, (5) blood glucose, (6) blood ketone bodies, (7) liver glycogen.
 - (C) What will happen after the starvation if the fasted animals happen to be (1) pregnant females, (2) lactating females, (3) diabetic males.
2. (10%) Biologic systems conform to the general laws of thermodynamics. Please describe the two laws of thermodynamics in terms of entropy, enthalpy and exergonic and endergonic reactions, and the coupling of an exergonic to an endogonic reaction.
3. (10%) As compared to hemoglobin, myoglobin is unsuitable as an oxygen transport protein but effective for oxygen storage. Please discuss their difference of oxygen-binding capacity in terms of allosteric property of the molecules.
4. (20%) The Henderson-Hasselbalch equation **relates** the ratio of protonated to unprotonated weak acid or weak base to the molecule's pK_a and the pH of the medium. (a) Write the equation to show the relationship; (b) give definitions of a weak acid or a weak base in terms of cation, anion and proton; (c) Given that the pH of the blood is 7.4 and that of the urine is 6.0, and given that the pK_a of aspirin is 3.5 and that of the pyrimethamine, an antimalarial drug, is 7.0, how will the drugs be excreted by the kidney? Which one will be reabsorbed more from the glomerulus and in what form?
5. (10%) Please describe as best as you can the fluid-mosaic model for the plasma membrane structure.

(背面仍有題目,請繼續作答)

Part Two Blank Filling (25%)

1. Disposal of excess nitrogen via _____ cycle is done in the _____ organ.
2. _____ serves as the key gluconeogenic amino acid, in liver the rate of glucose synthesis from this amino is far higher than from all other amino acids.
3. Fatty acid oxidation, also termed _____, takes place in the _____ organelle; each step involves acyl-CoA derivatives catalyzed by separate enzymes. In contrast, fatty acid biosynthesis, also termed _____, takes place in the _____ of the cell, involves acyl derivatives continuously attached to a multienzyme complex.
4. The pentose phosphate pathway is an alternative route for the metabolism of glucose. It does not generate ATP but has two major functions: (1) the generation of _____ for reductive synthesis such as fatty acid and steroid biosynthesis, and (2) the provision of _____ residues for nucleotide and nucleic acid biosynthesis.
5. The strand of DNA that is transcribed into an RNA molecule is referred to as the _____ strand of the DNA. The other DNA strand is frequently referred to as the _____ strand of that gene.
6. RNA molecules are often processed before they become functional. During the process, the coding portions that are retained are called _____, and the noncoding portions that are excised are called _____. The whole process is termed RNA _____.
7. The RNA molecule that can act as a catalyst is termed _____.
8. The purine analog 4-hydroxypyrazolopyrimidine (allopurinol), used in treatment of hyperuricemia and gout, inhibits de novo _____ biosynthesis and _____ activity.

9. The calcium-dependent regulatory protein is referred to as _____, which has four calcium binding sites.
10. Certain hormone receptor interactions results in the activation of phospholipase C, which in turn results in the generation of _____, which liberates stored intracellular calcium, and _____, which activates protein kinase C.
11. A collection of different recombinant DNA clones is called a library. A _____ library is prepared from the total DNA of a cell line or tissue. A _____ library represents the population of mRNAs in a tissue.
12. Blotting and hybridization techniques allow visualization of specific nucleic acid fragments or protein. _____ blotting is used to identified DNA fragments, _____ blotting is for RNA fragments, and _____ blotting is for protein molecules.