生物

國立成功大學八十二學年度研究所招生考試(生物化學 試題) 共 2 頁 第 1 頁

Answer **all** the following questions as detail as possible:

(1) Most enzymes are oligomeric proteins particularly the intracellular enzymes. Explain why do cells not build a large protein with several functional (catalytic) sites instead of several monomeric proteins each with one site. (6%)

(2) Plasma membrane are important structure of cells.
   a) Define the basic structure, components and functions of plasma membrane. (4%)
   b) Describe the various types of active transports found in cell membranes. (3%)
   c) Recently, inositol 1,4,5-triphosphate (IP_3) has found to be important second messenger from membrane lipids. Describe the signal transduction pathways involving IP_3 turnover and functions. (4%)

(3) Plants, with some microorganisms have the glyoxylate cycle for the metabolism of acetyl-CoA. Explain why and how the cycle function in these cells. (6%)

(4) Degradation and synthesis pathways of fatty acids are similar but not the same.
   a) Describe both the metabolic pathways for even-numbered saturated fatty acids. (4%)
   b) State the different enzymatic reactions of the oxidation of odd-numbered fatty acids. (2%)
   c) Describe the control mechanism of fatty acid oxidation and synthesis. (4%)

(5) Proteins are subjected to a process called enzyme turnover.
   a) What is protein turnover and its biological importance in protein metabolism. (3%)
   b) Describe the mechanism of protein turnover. (3%)
   c) Describe the possible correlation between the rates of turnover and the structure and function of enzymes. (3%)

(6) There are two different biosynthetic routes for nucleotides, de novo and salvage pathways.
   a) Describe briefly about the two different pathways for the synthesis of purine nucleotides. (4%)
   b) Explain why and how the manipulation of salvage pathways could be used in the preparation of hybridoma for the production of monoclonal antibodies. (4%)
   c) Describe how the disease gout is related to the purine catabolism. (3%)

(7) Conversion of the product of glycolysis, pyruvate to acetyl-CoA is catalyzed by pyruvate dehydrogenase complex, which is a kind of multienzyme systems.
   a) Define multienzyme systems and state the advantages of these systems. (4%)
   b) There are several coenzymes involving in the pyruvate dehydrogenase complex. Describe what are these coenzymes and their functions in pyruvate oxidation. (4%)
   c) Control of pyruvate dehydrogenase complex involves in a reversible changes in covalent structure of this enzyme complex. Describe the control mechanism of this complex and the advantages by using this covalently modification control. (5%)

(8) To date, radioisotopes have been widely used in the investigation of biochemical research.
   a) Give some basic properties of isotopes generally used in biochemical research. (2%)
   b) Describe how β-emitting isotopes could be detected by liquid scintillation counter. (3%)
   c) Give some biochemical techniques used by radioisotopes as tracers. (4%)

(9) Both gluconeogenesis in animals and Calvin cycle in plants could synthesize 6-carbon sugars and finally become glycogen and amylose respectively.
   a) Describe the major different enzymatic reactions of these two pathways although some of the intermediates are the same. (4%)
   b) Give some reasons for using CO_2 as prime carbon source in plants. (3%)
   c) Will Calvin continue to proceed in dark ? Explain why. (3%)

(10) There are significant differences in the ways that messenger RNAs for protein-coding gene are produced and utilized in prokaryotic cells. Compare the differences in detail using diagrams. (15%)