

國立嘉義大學九十四學年度  
生物科技研究所碩士班招生考試試題

科目：生物化學

1. The oxygen binding activity of hemoglobin is shown as a sigmoid binding curve. Why hemoglobin need various binding ability in different tissues? Explain the alteration of oxygen binding based on the structural view. (25%)
2.  $\beta$ -carotene is the source of retinol (vitamin A<sub>1</sub>), which is converted to retinal in human body. Light will induce the *cis-trans* isomerization of retinal in rhodopsin. Why or how the isomerization of retinal could be related to the neuronal signal in eye? (25%)
3. Aerobic respiration and photosynthesis are two important metabolic pathways in living organisms. Please indicate (1) the major components (or complexes) of electron transfer in mitochondria inner membrane (ETC) and thylakoid membrane of chloroplast. (2) For aerobic respiration, how many electrons (pass through ETC), H<sup>+</sup> (pumping from mitochondria matrix to intermembrane space), ATP production in the matrix, and O<sub>2</sub> consumed for the oxidization of each NADH? (3) In the light reaction of photosynthesis, for each O<sub>2</sub> production, how many photon, electrons, H<sup>+</sup>, ATP, and NADPH would be required or produced? (25%)
4. There are 3 major enzymatic antioxidant systems in higher organisms to prevent damage caused by reactive oxygen species ( ROS ) (1) Give the names of the enzymes. (2) Which enzymatic system may require the supplement of NADPH as reducing power? And, give one source (just give the name of reaction or pathway) from that NADPH may be provided. (3) The reactions involved in the NADPH-dependent antioxidation of the system. (4) Vitamins C and E have been reported to be effective antioxidants, **briefly** describe their functions in this regard. (25%)