

國立成功大學

112學年度碩士班招生考試試題

編 號：304

系 所：細胞生物與解剖學研究所

科 目：生物化學

日 期：0207

節 次：第 1 節

備 註：不可使用計算機

※ 考生請注意：請於答案卷依序寫上題號並以中文或英文作答，於本試題紙上作答者，不予計分。本試題不可使用計算機或任何電子裝置應考。

※ Write down the question numbers in series on the answer sheet, followed by your answers to each question in either Chinese or English. The use of calculators or electronic devices in this exam is strictly prohibited.

一、名詞解釋 (40 分，每題 4 分。)

以生物化學觀點解釋以下名詞。任選 10 題作答，超過 10 題不計分。

PART ONE: Definition of terminology (40%)

*Directions: Explain the following terms from the aspect of Biochemistry. Among the total of 12 terms below, you are allowed to **select 10 and ONLY 10** terms to answer. Any additional selections of terms will not be scored. Each term counts 4 points (4%).*

- Acetyl-CoA (acetyl coenzyme A)
- Gluconeogenesis
- Chaperone protein
- Glycosaminoglycan
- DNA methylation
- Beer's law
- Urea cycle
- Chemiosmotic theory
- Isoelectric focusing
- Proteomics
- cAMP (cyclic adenosine monophosphate)
- Ubiquitination

二、問答題 (60 分，每題 15 分。)

詳讀並回答以下問題。若有需要可繪圖或製表輔助闡述論點。

PART TWO: Essay (60%, 15% for each question)

Directions: Read and answer the following questions in a well-organized way. Draw pictures or tables to illustrate your points, if necessary.

1. During oxidative phosphorylation, highly reactive free radicals may be produced in mitochondria. These superoxide free radicals, also known as reactive oxygen species (ROS), can damage membrane lipids and nucleic acids and are harmful to cells. What exactly are ROS? Your answers must include the factors that cause the formation of ROS in mitochondria. In addition, how antioxidant superoxide dismutase (SOD) and glutathione peroxidase work in mitochondria to prevent oxidative damage must be discussed. (15%)
2. Gene expression may be silenced by post-transcriptional RNA interference (RNAi). Practically, RNAi has been a valuable research tool to study therapeutics to treat cancer and other diseases. What exactly is RNAi? Your answers must include the principle of RNAi and the roles of microRNA (miRNA) and small interfering RNA (siRNA) in the RNAi pathway. Moreover, give examples on how RNAi can be applied to biomedical research. (15%)
3. Living cells react to environmental stimulations through signal transduction. This process is mediated by various membrane proteins such as receptor tyrosine kinases (RTKs). What is the mechanism of RTKs in cell signaling? Your answers must include the structural characteristics of RTKs and the subsequent phosphorylation cascade. Use insulin receptor or, if preferred, other growth factor receptors that signal through tyrosine kinase activity as an example in your answers. (15%)
4. Hemoglobin and myoglobin are heme proteins that are essential for oxygen supply and metabolism. (1) What are the major structural differences between hemoglobin and myoglobin? (2) What are the features of their oxygen-binding curves? (3) How is the Bohr effect associated with the function of these two heme proteins? (4) What is the biochemical basis of sickle cell anemia? (15%)