

國立成功大學
111學年度碩士班招生考試試題

編 號：265

系 所：生理學研究所

科 目：生命科學

日 期：0220

節 次：第 1 節

備 註：不可使用計算機

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. One of the major breakthroughs in regenerative medicine is the establishment of inducible pluripotent stem cells (iPSC) by four factors discovered by Shinya Yamanaka. Please define the characteristics and functions of iPSC and how to obtain iPSC for regenerative medicine. (10%)
2. Extracellular vesicles (EVs) play important roles in growth, differentiation and migration of normal and cancer cells. Exosome is a kind of extracellular vesicles with the size of 40-100 nm. Micro-vesicles are defined as the size of 200-1000 nm. Please describe what methods can be used in isolation of exosome as well as micro-vesicles. Please also describe the contents of EVs. (10%)
3. To develop highly efficient urine concentration system, a countercurrent multiplier system is formed in mammalian kidney. Please describe the structure and function of urine concentration system and how concentrated the urine can be reached in a desert kangaroo rat. (10%)
4. Amphibians, such as frogs, may have gas exchange through the skin. Please describe how frogs organize their respiratory and circulatory system for gas exchange. (10%)
5. Two scientists shared Nobel prize of 2021 due to their discovery of Piezo-1 and TRPV for touch and spicy sensation, respectively. Please describe the function of Piezo-1 and TRPV. (10%)
6. A 58 years old woman went to hospital to have health examination and found that the bone density is low. Doctor told her to drink milk, exercise, and expose to sun more frequently. What are these actions for? Which mineral is involved in the loss of bone density? How is this mineral's homeostasis regulated? (20%)
7. What is epigenetics? Can it be inherited from cell to cell like genetic information? Give two examples of epigenetic regulation of gene expression. (20%)
8. Life is very complicated and the study of it is even tougher. There are many different research areas in studying life. Which area of research do you like to learn in the graduate school? Explain your reason(s). (10%)