

系所組別： 生理學研究所乙組

考試科目： 細胞及分子生物學

考試日期： 0220 · 節次： 2

※ 考生請注意：本試題 可 不可 使用計算機

1. Cytoskeleton plays an important role to maintain cell space and shape. (a) What are three major types of cytoskeletal filament in most animal cells? (b) Please provide one biological function for each cytoskeletal filament. (c) What are the differences among these cytoskeletal filaments? (d) Please provide one experimental method to distinguish each cytoskeletal filament. **(20%)**
2. Regulation of cell cycle is an important topic in cancer research. (a) What are four major phases of eukaryotic cell cycles? (b) What is interphase? (c) What is the ploidy at each phase? (d) Please provide one experiment to determine the cell phase of one cell population? **(20%)**
3. Gene regulation is affected by several different factors. (a) Please describe two "cis-elements" that affect the gene regulation at transcription level. (b) How to prove these cis-elements regulate gene expression? (c) Please provide two "trans-acting" factors that regulate gene expression at transcription level. (d) How to prove the regulatory functions of these trans-acting factors? **(20%)**
4. The selective degradation of many short-lived proteins in eukaryotic cells is carried out by the ubiquitination system. (a) Please describe three enzymes involved in ubiquitination of a polypeptide, and describe the function of each enzyme. (b) Please provide one cellular process where ubiquitination system involves. (c) Please provide one experiment to show the specific protein, TRASH, is ubiquitinated? **(20%)**
5. Please list three differences of mRNA between *E. Coli* and *Homo sapiens*. **(10%)**
6. In a single phrase, describe the function of each following protein during DNA replication: (a) DNA polymerase I (b) Topoisomerase (c) Helicase. **(10%)**