

國立成功大學

114學年度碩士班招生考試試題

編 號： 216

系 所： 分子醫學研究所

科 目： 分子生物學

日 期： 0210

節 次： 第 3 節

注 意： 1. 不可使用計算機
2. 請於答案卷(卡)作答，於
試題上作答，不予計分。

1. (a) Define the function of a promoter of a gene (3%)? (b) Please compare the typical compositions of a bacterial promoter to a typical eukaryotic promoter (e.g., actin gene) (6%). (c) Define an enhancer of a eukaryotic gene (3%).
2. Regarding eukaryotic gene expression, epigenetic regulation such as DNA methylation and modified chromatin structure play key roles on gene expression. (a) Define the characteristics of DNA methylation in the promoter of eukaryotic genes (4%)? (b) Define the role and the molecular mechanism of DNA methylation in regulating eukaryotic gene expression (6%). (c) What is the role of chromatin structure in affecting gene expression and what is the effect of histone modification such as acetylation on gene expression (4%)?
3. Regarding the initiation step of DNA replication in prokaryotic cells such as *E. coli* and in eukaryotic cells such as human cells, please compare the initial steps of DNA replication between prokaryotic cells and eukaryotic cells (6%). Please list two key enzymes and their functions commonly found in the initial steps of DNA replication in both prokaryotic cells and eukaryotic cells besides DNA polymerase (4%). Why during DNA replication, there exist both leading strand and lagging strand (4%)?
4. DNA can be damaged by many ways, such as chemicals, UV, x-rays, and gamma radiation. If DNA damages are left unpaired, it can lead to mutations. For example, UV can cause pyrimidine dimers of DNA and other subtle DNA damages such as base damages. Please compare the repair process for subtle base damages in *E. coli* and in human cells (10%).
5. Please compare eukaryotic cells' translation mechanism (e.g., ribosome, Cap, initiation, elongation, and release factors) to prokaryotic cells (15%).
6. Please describe how the cells communicate with each other (e.g., autocrine, paracrine, endocrine, cell contacts, or synaptic transmission) (10%).
7. Please describe the principle of polymerase chain reaction (10%) and its application (5%).
8. Please explain the mechanisms by which microRNA (miRNA) regulates gene expression (10%).