

※ 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。

一、簡答題與問答題 (100分)

1. Please give the information of the human genome. (8%; 2% each)
 - a). How many DNA base pairs are contained in the human genome ?
 - b). How many percentage of human genome sequence is encoded for protein?
 - c). Please name a database in which you can search the genome sequence of all species.
 - d). Please name a software you can use to compare the homology between two sequences.
2. Gene transcription is regulated by transcription factors. Please describe the technology often used to determine the DNA sequences bound by a transcription factor. (8%)
3. Please describe the functions of short interfering (siRNAs) and micro RNA (miRNAs) and compare the differences of the origin between these two. (8%)
4. What is epigenetics? Please give an example to illustrate how it affects cancer pathogenesis. (8%)
5. It was predicted that human genome may contain 30,000 genes. However, they may encode for 100,000 proteins. Please describe all possible mechanism. (8%)
6. Please describe in detail the transcriptional and translational controls about lactose operon involved in lactose metabolism in bacteria. (10%)
7. Please describe in detail the biological functions of RNA components ribonuclease P (RPPH1) and telomerase RNA (TERC) involved in tRNA maturation and telomere replication, respectively. (10%)
8. Please describe in detail the molecular mechanism about CRISPR/Cas type II system-mediated microbe adaptive immunity from first spacer acquisition, then crRNA biogenesis and processing to final target degradation. (10%)
9. Describe the translational regulation in prokaryotic cells. (10%)
10. Describe the basic machinery in transcribing mRNA in eucaryotic cells (10%)
11. What is apoptosis? What are the common experimental approaches for detecting apoptosis? (10%)