問答題

1. J. Shine and L. Dalgarno made one important discovery of understanding the mechanism of initiation of translation in prokaryotes, and their findings came from studies of the synthesis of three gene products of *E. coli* phages. At earlier time, other scientists had found that *E. coli* ribosomes could translate all three genes of *E. coli* phages *in vitro*, but that ribosomes from bacterium *Bacillus stearothermophilus* could translate only one of the three genes. Please discuss the proposed mechanisms and experiments that helped to finding the Shine-Dalgarno sequence (15 points).

2. Describe how most eukaryotic and prokaryotic DNAs replicate bidirectionally and explain it with experimental evidence (10 points).

3. You are asked to study the regulation of gene expression of a eukaryotic gene X during transcription. Describe how you will find the promoter, transcription start sites and regulatory elements of this gene (10 points).

4. Describe briefly the regulatory mechanism of gene expression in eukaryotic cells (10 points)?

5. Please describe the structure/components of idealized gene (i.e. exon and intron, ……..) (10 points).

6. What are the features of nucleosome (10 points)?

7. Recently non-coding RNA (ncRNA) are found to play an important role in different cellular physiological processes, including growth, differentiation, apoptosis, and cancer. microRNA is one class of ncRNA, please describe the characteristics, biogenesis and functions of miRNA genes, including the features of miRNA gene, how they are transcribed, how they are processed, structural features, how do they function in gene regulation.(20 points)

8. Please describe and explain the basic principle of at least three different methods to detect mRNA levels besides the quantitative reverse transcription-polymerase chain reaction (qRT-PCR)(15 points).