Total 100 pt

1. Explain the following terms (30 pt, 2 pt each):
   (A) frameshift mutation　　　　　　　(B) enhancer
   (C) T-DNA　　　　　　　　　　　　　(D) photo reactivation
   (E) chromatography　　　　　　　　　(F) histone
   (G) gene silencing　　　　　　　　　　(H) Southern blot
   (I) restriction endonuclease　　　　　　(J) transcriptome
   (K) pyrosequencing　　　　　　　　　(L) signal transduction
   (M) metagenomics　　　　　　　　　　(N) Klenow fragment
   (O) cosmid

2. In order to develop **molecular methods** to identify specific living organisms, **two major molecules** can be used as the targets, what are these two macromolecules? What are the methods commonly used? Please describe **one method for each target molecule**. (20 pt)

3. There is a suppressor tRNA that can suppress both a nonsense mutation (5'-UGA-3') and a missense mutation (5'-UGG-3'). What sequence would the anticodon of this tRNA need to have ? (make sure you label the 5' and 3' ends of the anticodon sequence) (5 pt)

4. Please **describe and contrast** the **regulation of gene expression in bacteria and eukaryotes** in terms of **gene organization** and the **processes from DNA to proteins**. In addition, take *lac* operon as an example, explain the **regulatory mechanism of catabolite repression**. (15 pt)

5. Compare the locations of fatty acid synthesis in the non-photosynthetic eukaryotic cells and photosynthetic cells? In addition, compare the locations for synthesizing long-chain and shot-chain fatty acids? (10 pt)

6. Compare the **photorespiration** with the **mitochondrial respiration**. Why are both processes referred to as respiration? Where in the cell do these two reactions occur, and under what circumstances? (20 pt)