1. RNAi uses small segment of double stranded RNA (dsRNA) to trigger certain RNase to cleave specific mRNA having the same sequence as that of the dsRNA. This technique silences a gene's normal function by working at post-transcriptional level. Scientists have thus found a tremendously powerful research in the post-genomic era.
   Please list **advantages** of using RNAi to assay a gene's function (10 points) and explain why RNAi is particularly useful when the genome project is about to finish (3 points). Given the powerfulness of RNAi technique on assaying a gene's function, the "traditional" gene knock-out method, however, is still indispensable. Why is that? (5 points).

2. Scientists like to assay a gene's function by knowing **where, when** and **how** the gene is expressed in addition to know **what** the phenotype is.
   Please write down **the techniques** that you will use to collect information to answer the **where, when, how** and **what** questions for gene expressions. (12 points).

3. **"Functional proteomics"** is a novel and powerful tool to identify proteins you are interested in. Please describe your thoughts about functional proteomics. (15 points)

4. **"Vectors"** are ubiquitously used in the labs of molecular biology and biotechnology. What are "vectors" for? Please describe the functions and basic components of "vectors". (15 points)

5. What is **microarray biochip**? Please state the principles for microarray techniques, the major materials used to make the chips, and the applications of microarray biochips for biomedical sciences. (15 points)

6. What is **single nucleotide polymorphism (SNP)?** Please define SNP and describe the main methods for SNP detection. Also, explain the importances of SNP information for detection of genetic diseases (15 points).

7. What is **real-time PCR**? Please define the real-time PCR, and describe the main procedures for the real-time PCR (10 points).