

本試題是否可以使用計算機：可使用，不可使用（請命題老師勾選）

1. Viruses are frequently used to deliver new genetic material into a cell. What special abilities of viruses make them well suited to carry out this function? (12.5%)
  
2. An effective DNA probe can sometimes be developed by knowing the amino acid sequence of the protein encoded by the gene. A student argued that this process is too time-consuming since it is necessary to determine the complete amino acid sequence in order to create the probe. Does the student have a valid argument? Why or why not? (12.5%)
  
3. Please read the following Abstract of an article from Zhu, C. et al (Nature Immunology, 2004, 6: 1245-52) and answer questions. (12.5%)  
  
Tim-3 is a T helper type 1 (T(H)1)-specific cell surface molecule that seems to regulate T(H)1 responses and the induction of peripheral tolerance. However, the identity of the Tim-3 ligand and the mechanism by which this ligand inhibits the function of effector T(H)1 cells remain unknown. Here we show that galectin-9 is the Tim-3 ligand. Galectin-9-induced intracellular calcium flux, aggregation and death of T(H)1 cells were Tim-3-dependent in vitro, and administration of galectin-9 in vivo resulted in selective loss of interferon-gamma-producing cells and suppression of T(H)1 autoimmunity. These data suggest that the Tim-3-galectin-9 pathway may have evolved to ensure effective termination of effector T(H)1 cells.  
  
(A) What are T helper type (T(H)1) cells and their function in immunity?  
(B) What is the effect of "Galectin-9" on T(H)1 cells and through what mechanisms?
  
4. Cells need to constantly communicate with other cells and the environment to accomplish appropriate biological responses.  
How cells achieve this goal? Please give an example to describe this process. (12.5%)

(背面仍有題目,請繼續作答)

編號： 503 系所：醫學檢驗生物技術學系

科目：生物技術

本試題是否可以使用計算機：可使用，不可使用（請命題老師勾選）

5. Please describe **briefly** 5 different kinds of biochips (生物晶片) and their respective applications. (No more than 5 sentences for each biochip). (12.5%)

6. 配合題 (12.5%)

請將 (1)-(8) 與 A~H 之間的正確配對寫在答案卷上（配對關係為一對一）。

- (1) BLAST
- (2) ClustalW
- (3) OMIM
- (4) InterPro
- (5) Ensembl
- (6) KEGG
- (7) ExPASy
- (8) Map Viewer

- A. A proteomics server of the Swiss Institute of Bioinformatics dedicated to the analysis of protein sequences and structures as well as 2-D PAGE.
- B. A software system which produces and maintains automatic annotations on selected eukaryotic genomes.
- C. A database of human genes and genetic disorders.
- D. Finding regions of local similarity between sequences.
- E. A database of protein families, domains and functional sites in which identifiable features found in known proteins can be applied to unknown protein sequences.
- F. Searching and displaying genomic information by chromosomal position.
- G. Wiring diagrams of molecular pathways, interactions, and relations.
- H. A tool for multiple sequence alignment.

7. List five different methods to screen for unknown (or novel) mutations, state the brief principles and procedures of each of these five methods. (12.5%)

編號： 503 系所：醫學檢驗生物技術學系

科目：生物技術

本試題是否可以使用計算機：可使用，不可使用（請命題老師勾選）

8. Chromosomal aberrations (including translocations, deletions, inversions, and duplications) are genetic markers for various genetic diseases and cancers. Provide three methods to detect chromosomal aberrations, state the principles and brief procedures of each of these methods. (12.5%)