1. 敘述腫瘤標誌在生命科學之應用；並以 prostate specific antigen 說明其分子型式及對前列腺癌診斷之正確性，我們可以如何提高其診斷的正確性。(10%)

2. 人體內有很多重要的生理反應，如血液凝固 (Blood coagulation) 和補體活化 (Complement activation)，發生反應過程都藉 Cascade reaction 和 Complex formation 進行，您認為這樣有何生物意義存在？試說明之。(10%)

3. 研究數據指出 DNA 病毒與 RNA 病毒的自發性突變率 (spontaneous mutation rate) 比動物細胞大許多，約為 10^3-10^8 倍；(a) 請論述高自發性突變率與低自發性突變率在生命科學上的意義；並 (b) 舉例說明計算突變率在生命科學研究的應用性。(10%)

4. 請從訊息傳遞的角度說明內分泌如何作用在標的細胞而使其產生功能。(10%)

5. A biologist determined the amounts of several amino acids in two separate samples of pure protein. His data are shown below:
Protein A: leucine 7%, alanine 12%, histidine 4%, cysteine 2%, glycine 5%
Protein B: leucine 7%, alanine 12%, histidine 4%, cysteine 2%, glycine 5%
He concluded that protein A and protein B were the same protein. Do you agree with this conclusion? Justify your answer. (10%)

6. Please draw a figure to describe the antibody change during primary and secondary antibody response. (10%)

7. What is avian influenza? Please describe methods to identify highly pathogenic avian influenza. (10%)

(背面仍有題目，請繼續作答)

8. Please explain "cDNA library" and "gene library". (10%)

9. (A) Define **Cell Cycle Checkpoints (CCC)**.
   (B) List the major proteins that are **CCC molecules**.
   (C) Explain the possible molecular abnormalities caused by **CCC deficiency**.
   (D) Provide one **disease** caused by CCC deficiency, and explain the **mechanism** of how the CCC failure results in it. (10%)

10. The nutritional requirements of *Escherichia coli* cells are far simpler than those of humans, yet the macromolecules found in bacteria are about as complex as those of animals. Since bacteria can make all their essential biomolecules while subsisting on a simpler diet, do you think bacteria may have more biosynthetic capacity and hence more metabolic complexity than animals? Please organize your thoughts on this question into a rational argument. (10%)