

Directions (Questions 1-5): Select the ONE lettered option that is MOST closely associated with the numbered items. Each lettered option may be selected once, more than once, or not at all.

Questions 1-5 (10%)

- (A) Electrophoretic mobility shift assay
- (B) Pulse-field gel electrophoresis
- (C) DNase footprinting
- (D) Primer extension
- (E) Nuclear run-on transcription
- (F) Two-dimensional gel electrophoresis
- (G) S1 mapping

1. A method can locate the 5'-end of a transcript.
 2. An electrophoresis technique in which the electric field is repeatedly reversed.
 3. A means can be used to find the target DNA sequence, or binding site, of DNA binding protein.
 4. The isoelectric focusing is used in the part of the method.
 5. A method detects interaction between a protein and DNA.
6. Please describe several methods for molecular weight determination of proteins. (10%)
7. In the century since the discovery of the ABO blood groups, numerous associations between ABO groups and disease have been noted. If you want to study the association of ABO blood group phenotypes and malaria infection, please set up three important experiments should be performed in support of this hypothesis (10%).
8. **Biochip** is one of a rapidly growing biotechnology which encompasses wide range of basic research and application including genomics, proteomics, bioinformatics, and drug discovery. Please give one example to describe the principle, procedure, and application of biochip. (10%)

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）

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9. Please list two optic techniques and describe their principle and applications in cell biology. (10%)
10. Please describe the principle and application of proteomic technology (10%).
11. In clinical diagnosis we often use secondary antibodies such as anti-human IgG specific antibody or anti-human IgM specific antibody to detect primary antibody in patients' sera. Please describe at least two different ways to generate these anti-human IgG or IgM specific antibodies. (10%)
12. Define "Whole-Genome Genotyping". Provide three different techniques to perform "whole-genome genotyping", and state the brief principles and experimental procedures for each technique/method. (10%)
13. Describe "high-resolution melting analysis" and its medical application. (10%)
14. What are the differences between gene knockout and gene knockdown? Please include in your answer a brief description on the molecular mechanisms of these two methods and the comparison between them. (10%)