

編號：F 509  
507

系所：醫學檢驗生物技術學系甲組乙組 科目：生物技術

本試題是否可以計算機： 可使用， 不可使用（請命題老師勾選）

## 一、選擇題：(9%)

1. A little girl received bone marrow from a compatible donor that manufactured the enzyme her body could not. This is an example of:  
A) protein therapy. C) somatic gene therapy.  
B) germline therapy. D) retroviral gene therapy.
2. A piece of foreign DNA was inserted into a plasmid with an antibiotic resistance gene and a lac Z gene. The plasmid DNA was cut with a restriction enzyme, which splits the lac Z gene and opens the circle. The foreign DNA was next inserted into the open restriction site of the plasmid. When the recombinant plasmid was introduced into bacterial cells and grown in the presence of antibiotic, some of the colonies turned blue in the presence of X-gal. The blue colonies contained:  
A) plasmid only. C) both foreign DNA and plasmid.  
B) foreign DNA only. D) neither plasmid nor foreign DNA.
3. Tiny fat bubbles used to deliver genes are:  
A) electropores. B) phospholipids. C) cholesterol. D) liposomes.
4. In gene targeting, the introduced gene:  
A) is injected into a somatic cell and enters the nucleus.  
B) is injected into a gamete, where it enters the nucleus.  
C) is recessive to the host cell gene.  
D) recombines with a homologous gene in a host cell chromosome.
5. Expressed sequence tags (ESTs) allow researchers to identify:  
A) genes that encode proteins. C) ribosomal RNA genes.  
B) microsatellites. D) introns.
6. Microsort is a new technique that separates sperm with the Y chromosome, which produces males, from sperm that carry the X chromosome, which produces females. The technique uses a fluorescent dye that reversibly binds DNA. Sperm are sorted using flow cytometry based on DNA content. How do Y bearing sperm differ from X bearing sperm?  
A) X sperm are diploid.  
B) Y sperm never as for directions when they are lost.  
C) Y sperm have less genetic material.  
D) X sperm have less genetic material.

## 二、選擇題：(9%)

(背面仍有題目,請繼續作答)

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. The similar principle is applied to which of the following two experiments?
  - (A) Reverse dot blot and microarray (or gene chip)
  - (B) Southern blot and PCR
  - (C) Sanger' sequencing and fluorescence in situ hybridization
  - (D) Microarray and PCR
  - (E) PCR and restriction enzyme digestion
  
2. Mutation of a single base pair could not be distinguished by which of the following experiments?
  - (A) Sequence analysis
  - (B) Gene chip
  - (C) Dot blot
  - (D) Fluorescence in situ hybridization
  - (E) Amplification refractory mutation system (ARMS)
  
3. Which of the most appropriate method to detect heterozygous deletions of approximately 2 Megabase?
  - (A) Southern blot
  - (B) Reverse dot-blot
  - (C) PCR to amplify deleted exons
  - (D) Fluorescence in situ hybridization using genomic clones as probes
  - (E) Chromosome analysis
  
4. Which of the following method could be used to differentiate between methylated and unmethylated DNA?
  - (A) Hpa II
  - (B) Bisulfite sequencing
  - (C) Methylation-specific PCR
  - (D) All of the above
  - (E) None of the above
  
5. Transcriptional regulation of a gene may involve which of the following factors?
  - (A) Methylation of CpG islands
  - (B) Core promoter
  - (C) Histone modification
  - (D) Enhancer
  - (E) All of the above
  
6. Which of following is the minimal length of a synthetic oligonucleotide for dot-blot analysis?
  - (A) Approximately 8 base pairs
  - (B) Approximately 12 base pairs
  - (C) Approximately 20 base pairs
  - (D) Approximately 30 base pairs
  - (E) Approximately 50 base pairs
  
7. Which of the following if the minimal length of a primer for PCR?
  - (A) Approximately 8 base pairs

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)

- (B) Approximately 12 base pairs
- (C) Approximately 20 base pairs
- (D) Approximately 30 base pairs
- (E) Approximately 50 base pairs

8. For array-based CGH, which of the following type of probes is the best choice?

- (A) YAC clone
- (B) BAC clone
- (C) Cosmid clone
- (D) Plasmid clone
- (E) Oligonucleotide

9. Which of the following is the correct answer for sequences at the beginning and ending of introns, respectively?

- (A) GT and AG
- (B) AT and CG
- (C) AG and GT
- (D) AC and GT
- (E) None of the above

三、Display technology refers to a collection of methods for creating libraries of modularly coded biomolecules that can be screened for desired properties. Four major display systems include protein on RNA/DNA, viral display, cell-based display, nonbiological display. Please describe one possible application which exploit display technology to seek for target molecules of your interest. (9%)

四、Your thesis advisor wanted you to study a human gene, LOC20060401, with unknown functions. Its nucleotide and peptide sequences can be found in GenBank. It matches to a Unigene cluster composed of 1945 ESTs. It is also being included in genechips from Affymetrix Human Genome Arrays. Please list 3 bioinformatic tools or methods and explain why they may help you to predict the functions of LOC20060401. (9%)

五、Integrating a specific target DNA fragment into chromosomal DNA of the host organism can involve either (a) only the target sequence or (b) the entire plasmid including the target sequence. Explain how each of these results might occur. What advantages or disadvantages might result if the plasmid vector becomes incorporated into the host chromosomal DNA? (9%)

(背面仍有題目,請繼續作答)

編號: F 509

系所: 醫學檢驗生物技術學系乙組 甲組 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)

六、 Define "DNA fingerprinting", and give an example of the application of DNA fingerprinting. (9%)

七、 Please answer the following questions regarding the properties of amino acids and protein. (9%)

- a. What is the absorbance wavelength most commonly used for determining protein concentration?
- b. You have messed up the two protein samples that your advisor gave you, protein A and B, because of ambiguous labeling on the tubes. Fortunately, your advisor also gave you the results of amino acid composition analysis of these two proteins as listed in the table below. Please suggest at least **two** experiments to distinguish these two proteins. Please also provide the rationale for the experiments you choose to do and the results you expect to see. (From your advisor's viewpoint and for your own good, the easier and less expensive approaches will be the better choices. Also, sending the samples back for another round of amino acid composition analysis will **not** be the option due to limited budget.)

Amino acid	A	C	D	E	F	G	H	I	K	L	M	N	P	Q	R	S	T	V	W	Y
Protein A	31	14	20	32	37	41	15	22	36	28	12	24	23	14	23	27	26	28	9	19
Protein B	73	15	49	70	27	76	19	68	74	70	32	40	39	34	32	46	43	63	3	20

八、 Cytokines form a complex network of interactions and therefore it is important to be able to study as many aspects as possible of the cytokine cascade in humans to accurately characterize the nature of the immune response to different pathogens. Cytokines act mainly at the local site near the immune reaction occurs and therefore most cytokines are detected at very low levels in peripheral blood. Thus there is a need for simple and standardized methods for measuring cytokine profiles in vitro. Stimulation of cells with mitogens usually provides a more rapid and general activation for cytokine production. Please set up a laboratory protocol to evaluate

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)

the **specific** cellular immunity of tuberculosis infection and an immunoassay method to measure multiple cytokines **simultaneously**? (10%)

九、Please describe method for the preparation of avian influenza vaccine using "Reverse genetics technology". (9%)

十、Match the following: (9%)

- |                           |  |
|---------------------------|--|
| 1. Transcription          | a. prevention of reaction-to-reaction carryover in PCR     |
| 2. dUTP                   | b. formation of phosphodiester bonds between nucleic acids |
| 3. Hoechst 33258          | c. genetically engineered version of T7 DNA polymerase     |
| 4. Intron                 | d. exposure of DNA to UV light                             |
| 5. Sequenase              | e. synthesis of RNA using a DNA template                   |
| 6. T4 DNA ligase          | f. blocking translation of a specific gene transcript      |
| 7. Thymine-thymine dimers | g. removal of a 5' phosphate group                         |
| 8. RNAi                   | h. fluorescent detection of DNA                            |
| 9. Alkaline phosphatase   | i. Untranslated DNA within a gene                          |

十一、Please describe briefly the applications of molecular techniques in species identification of bacteria. (9%)