(甲組)

考生注意事項：所有考題務必在答案卷上作答，在問題卷上作答者不計分。

一、解釋名詞

請由下欄之定義中選擇最適合於以下的名詞（每題二分）

1. Reverse transcriptase
2. Taq polymerase
3. Southern transfer
4. Transformation
5. DNA ligase
6. Ion exchange chromatography
7. Inclusion body
8. Gel filtration
9. Restriction endonuclease
10. Signal peptide

A. a segment of peptide at N-terminal of a protein to target protein for secretion or membrane-bound
B. to cut DNA at specific site
C. separation of proteins based on their sizes
D. a segment of peptide at C-terminal of protein to target protein for cystosol
E. transfer of protein from gel to membrane
F. transfer of plasmid DNA into mammalian cells
G. make a DNA copy of RNA molecule
H. an enzyme used in PCR to amplify a DNA fragment
I. transfer of DNA from gel to membrane
J. transfer of plasmid DNA into bacteria
K. synthesis of mRNA from DNA
L. fill gaps in DNA duplex by addition of nucleotide to 5'end
M. join two DNA molecules or fragment together
N. separation of protein based on charges of molecules
O. an overexpressed protein forms a crystalline array inside bacterial cells
P. a protein aggregate formed in mammalian cells
Q. to cut protein at specific site
R. add homopolymer tail to the 3'-OH end of a linear duplex
S. transfer of RNA from gel to membrane
T. separation of DNA on gel

(背面仍有題目,請繼續作答)

二、多重選擇題（每題四分，答案可能有數個）

11. 人体基因計劃中，EST sequencing (Expressed Sequence Tag)和 chromosome sequencing 有何不同：

A. EST clone 不包含 intron
B. EST clone 不包含 promoter 或 regulatory sequence
C. EST clone 包含 repetitive sequence
D. EST clone 包含 pseudogene sequence
E. 以上皆對

12. 比較利用 mammalian cells（前者）和 *E. coli* cells（後者）來表達蛋白質的優缺點：

A. 後者蛋白質有 glycosylation 故活性可能較高
B. 後者可用來表達 receptor
C. 後者蛋白質產量高且成本低
D. 後者易形成 inclusion body 故須作 refolding
E. 以上皆對

13. 以下哪些序列或蛋白和基因表達及調控(gene expression and regulation)有關係？

A. TATA box
B. Promoter
C. Ribosome binding sites
D. Transcription factor
E. 以上皆對

14. 人類基因體有多大？

A. 3000 Mb
B. 包含 3 萬到 4 萬個基因
C. 包含 10 萬個基因
D. 是所有生物基因體中最大的基因體
E. 以上皆對

15. 下列哪一個技術可用來偵察某一個基因在組織中表現情況？

A. RT-PCR
B. Northern
C. in situ hybridization
D. Southern
E. 以上皆對

三、簡答題及問答題

16. For gene cloning experiments, why is cleaved plasmid DNA often treated with alkaline phosphatase prior to the ligation step? (5%)

17. Outline a few different approaches that could be used to detect a cloned target gene within a library in *E. coli*. What conditions must be satisfied for each type of assay. (5%)

18. Sometimes the strategy for the expression of a target protein in a host organism involves synthesizing the protein as part of a fusion protein. Why is this approach useful? How is a fusion protein created? (5%)

19. What is DNA fingerprinting, and how is it used to characterize traces of DNA in forensic samples? (5%)

20. Briefly describe a protocol for developing a vaccine against a toxin-producing bacteria(5%)

21. Why is the Ti plasmid from *Agrobacterium tumefaciens* well suited for developing a vector to transfer foreign genes into plant chromosomal DNA? (5%)

22. 試述酵素免疫分析方法中，所謂(ELISA) (enzyme-linked immunosorbent assay, ELISA)之原理及應用 (10%)

23. 在大腸桿菌系統表現蛋白質時，常利用 IPTG (isopropyl thiogalactoside, IPTG)來誘導蛋白質大量生產，試述其原理(10%)

24. 純化血漿中γ-globulin(γ-球蛋白)常使用 DEAE-column 及 protein A-column 作柱層分析，試分別說明其純化的原理(10%)