

## I. 選擇題 (1-7 題, 每題二分, 答錯倒扣 0.5 分, 均為單選)

- ( ) 1. The in situ hybridization technique is used to detect:
- The specific DNA in the gel.
  - The specific mRNA in the gel.
  - The total mRNA in the tissue samples.
  - The specific protein in the tissue samples.
  - The specific mRNA in the tissue samples.
- ( ) 2. Which of the following material is not necessary for the polymerase chain reaction:
- Template DNA
  - Tag polymerase
  - Pair of primer
  - DNA ligase
  - All the materials above are required.
- ( ) 3. Which host cell(s) of protein expression system do(es) not have the ability to perform N-linked glycosylation?
- Bacteria
  - Yeast
  - Insect
  - Mammalian cells
  - Plant cells
- ( ) 4. Thioredoxin (trx A) fusion protein expression in the *E. coli* might have the following effects:
- Increase protein expression.
  - Fusion protein is secreted to the inner membrane.
  - Increase heat stability of the fusion protein.
  - Decrease formation of inclusion body.
  - All the statements above are correct.
- ( ) 5. Which statements of retroviral vector for gene therapy is correct?
- It is an enveloped DNA virus.
  - It could not be inserted into host DNA
  - It could not form stable expression.
  - It may cause insertional mutagenesis.
  - All the statements above are correct.

(背面仍有題目, 請繼續作答)

- ( )6. Which statements of adenoviral vector for gene therapy is correct;
- A. It can only transfect mitotic cells.
  - B. Its DNA can insert into host DNA.
  - C. It is a RNA virus.
  - D. It may induce severe immunoreaction.
  - E. It is a double strand RNA virus.
- ( )7. Histidine tag in the fusion proteins can:
- A. increase protein solubility
  - B. increase protein stability
  - C. make it easier to be purified by a gel filtration column.
  - D. make it easier to be purified by an affinity column.
  - E. make the protein to be secreted in to the medium.

II. 多重選擇題 (8-15題, 每題4分, 答案可能數個)

- ( )8. Which statement is true for human genome for a diploid cells ?
- A. It contains  $3 \times 10^9$  bp nucleotides.
  - B. It is predicted to encode for 70,000-100,000 proteins.
  - C. It contains 100,000 genes.
  - D. It is the biggest genome in eukaryotic cells.
  - E. All the above are true.
- ( )9. Which of the following technique can be used to purify protein?
- A. agarose gel electrophoresis
  - B. Western Blot
  - C. affinity chromatography
  - D. gel filtration
  - E. all the above are true
- ( )10. Which of the following may be related to gene expression and regulation?
- A. promoter
  - B. ribosome binding site
  - C. TATA box
  - D. transcription factor
  - E. all the above are true

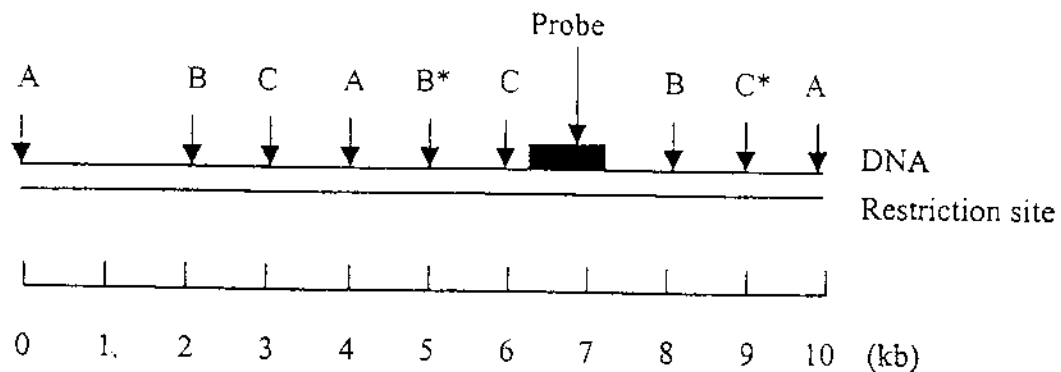
- ( )11. Which of the following techniques may be used in RFLP (restriction fragment length polymorphism)?
- A. restriction enzyme digestion of DNA
  - B. hybridization of  $^{32}\text{P}$ -label probe to the membrane
  - C. Southern Blot
  - D. Northern Blot
  - E. all the above are true
- ( )12. A protein contains a signal peptide at its N-terminal. Where is the possible location of the protein after it is synthesized in the cell?
- A. secret outside of the cell
  - B. cell membrane
  - C. cytoplasm
  - D. nucleus
  - E. all the above are true
- ( )13. What is the difference in sequences between an EST (expressed sequence tag) clone and a genome clone?
- A. EST clone contains promoter sequence.
  - B. Genomic clone has poly A tail at its 3' end.
  - C. Genomic clone has intron sequence.
  - D. Genomic clone contains TATA box.
  - E. All the above are true.
- ( )14. Which of the following technique can be used to detect gene or protein specific for cancer cells?
- A. Northern Blot analysis
  - B. DNA chip (microarray)
  - C. proteomics
  - D. In situ hybridization
  - E. all the above are true
- ( )15. Which of the following statements about expression system of recombinant protein (重組蛋白質表現系統) are true?
- A. Yeast system may have the problem of overglycosylation.
  - B. *E. coli* system may need to do denaturation and refolding of the protein.
  - C. Protein expressed by *Baculovirus* is most close to native protein.
  - D. Mammalian cells may express protein in inclusion body.
  - E. All the above are true.

(背面仍有題目,請繼續作答)

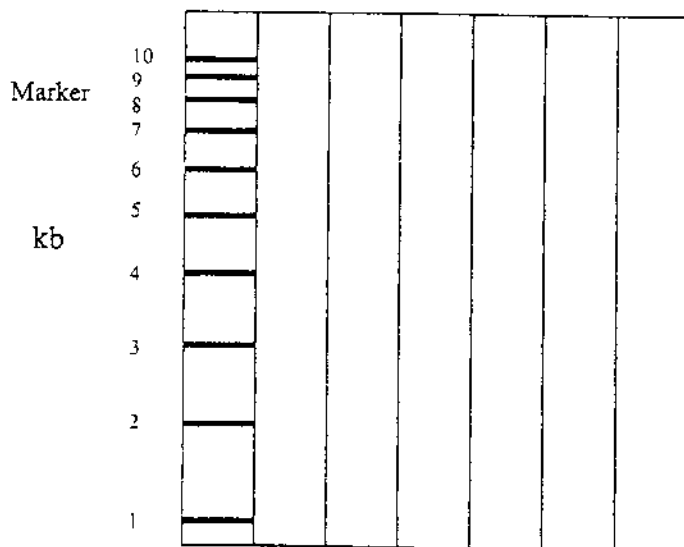
III. 問答題 (16-22 題)

16. 若您以一段  $^{32}\text{P}$ -labelled 的 cDNA fragment 當作 probe, 去進行 Northern Blot analysis, 發現在某一 tissue 中顯示有 2 條 bands (transcript signal) 請問您如何解釋此結果? (這二條 bands 是如何造成的?) (4%)
17. 試比較與對照 E. coli 表現系統和 mammalian cell 表現系統, 兩者之間的優缺點。(2%)
18. 您用電腦軟體去分析出 genomic clone 中所包含的一段 exon sequences, 但是在 EST (expressed sequence tag) 的 database 中卻找不到這段 exon sequence, 請問可能的原因為何?(2%)
19. RNA interference (Rnai) 被 Science 雜誌選為分子生物科技界去年最重大發展. (1) 描述 RNAi 原理 (2) 描述 RNAi 在 mammalian cell 和 C. elegans 有何不同 (3) 如何利用 RNA interference 在分子生物科技界之研究 (20%)
20. 描述中藥生物科技化之願景和研究方法 (10%)
21. Describe four techniques that can be used to enhance the entry of recombinant DNA molecules into the host cells. (4%)

22. DNA is extracted from the blood cells of two different humans. The DNA from each individual is digested with restriction endonucleases A, B, and C, and the fragments separated with by electrophoresis. A hypohetic of 10,000 base pair segment of human chromosome is shown. Individual #1 has point mutations that eliminate restriction recognition sites B\* and C\*. The gel was probed with a radioactive oligonucleotide complementary to the indicated sequence and exposed an x-ray film to the gel. Indicate where you would expect to see the bands on the film. (12 %)



Restriction Enzyme	A		B		C	
Patient #	1	2	1	2	1	2



Answer the question by making marks on the plot

第22題的答案請考生在答案卷之指定位置(第七頁)上作答。