

准考證號碼：

※注意事項

請確實核對准考證號碼是否正確

## 嘉南藥理科技大學九十八學年度碩士班考試入學招生

### 生物技術概論試題（生物科技系碩士班不分組）

本試題共 1 張 2 面

一、選擇題 60%（答案請填入答案欄，每題 3 分）

- DNA ligase  
(A) synthesizes DNA from an RNA template (B) forms a phosphodiester bond (C) joins Okazaki fragments (D) B and C (E) all of the above
- Which of the following is **not** a functional element of a plasmid?  
(A) origin of replication (B) drug-resistance gene (C) multiple cloning sites (D) reverse transcriptase (E) non of the above
- How does ethidium bromide interact with DNA to allow it to make DNA visible?  
(A) It binds to specific DNA sequences (B) It binds to the phosphate groups of DNA (C) It binds to the sugar groups of DNA (D) It intercalates into the double helix.
- Which of the following statements about  $\lambda$  phage are **not** true?  
(A)  $\lambda$  phage lyse *E. coli* upon release of newly synthesized phage (B) A primary advantage of  $\lambda$  phage is that they allow for the cloning of larger DNA fragments up to 25 kb (C) Both cDNA and genomic DNA can be cloned into  $\lambda$  phage (D)  $\lambda$  Phage is one of the yeast vector for cloning.
- In the large-scale production of a particular human protein in *E. coli* cells, the cDNA corresponding to the protein was modified so that the expressed protein would have six histidine residues at the C-terminus. The purpose of this modification was  
(A) to facilitate transfer of the cDNA into the *E. coli* cells (B) to provide a promoter for the transcription of the cDNA in *E. coli*. (C) to facilitate purification of the expressed protein though binding to an affinity column containing chelated nickel atoms (D) to prevent degradation of the expressed protein by *E. coli* proteases.
- A mutation that changes the recognition sequence for the restriction enzyme *EcoRI* from GAATTC to GATTTC is an example of a (A) restriction fragment length polymorphism (RFLP). (B) microsatellite DNA (C) simple sequence repeat (SSR). (D) A and B (E) all of the above
- What method can be used to functionally inactivate a gene without altering its sequence?  
(A) gene knockout (B) RNA interference (C) antisense RNA (D) B and C (E) all of the above
- Which of the following statements about microarrays and Northern blots are incorrect?  
(A) Microarrays allow a more global analysis of gene expression by analyzing thousands of genes simultaneously. (B) Using microarrays, groups of known and unknown genes that are regulated in a coordinated fashion can be revealed. (C) Northern blots allow the analysis of only a few genes at a time (D) Northern blot can reveal the presence of multiple DNA fragments.
- How are integral membrane proteins isolated from membranes?  
(A) They are denatured by heating and then renatured (B) They are extracted with ionic or nonionic detergents (C) They are extracted with salt solutions (D) They are extracted by centrifuge
- How is the green fluorescent protein (GFP) attached to the protein for which it serves as a label allowing that protein's dynamic activities to be tracked?  
(A) The GFP is attached to the desired protein in the laboratory (B) A recombinant RNA is produced by attaching the GFP mRNA to the mRNA of the desired protein (C) GFP adheres specifically to the desired protein via weak interactions (D) The coding region of the GFP gene is joined to the coding region of the gene of the protein being studied (E) The GFP itself is attached directly to the coding region of the gene of the protein being studied.
- 如果想要表現人類凝血因子蛋白，這是一個被醣基化的蛋白。下列何種蛋白質表現系統最不適宜？  
(A)大腸桿菌 (B)酵母菌 (C)哺乳動物細胞 (D)昆蟲細胞。
- 利用 agarose gel electrophoresis 來分離 DNA，下列敘述何者正確？ (A)根據分子極性來分離 DNA (B)利用 Coomassie blue 來使 DNA 呈色 (C)電流通過時，DNA 分子往正極移動 (D)分子較大的 DNA 移動較快。
- 親和力層析法(affinity chromatography)是依據什麼原理來分離不同的蛋白質？(A)蛋白質的大小 (B)蛋白質的正負電荷特徵 (C)標的蛋白質與配位子的專一性結合 (D)蛋白質的疏水性特徵。
- 關於單一核苷酸多型性(SNP)的敘述何者為非？(A)因人而異所發生的 DNA 序列單一核苷酸變化現象 (B)如果 SNP 發生在基因序列中，可能會改變蛋白質的結構，引發疾病 (C)SNP 可能改變一些疾病的敏感性 (D)又可稱為限制片段長度多型性分析。
- 關於限制片段長度多型性分析方法 (RFLP) 的敘述何者為非？ (A) 利用限制酶切割正常基因與突變基因，而產生不同長度片段 (B) 因為突變基因的長度變短，所以限制酶切割後的 DNA 長度變短 (C) 基因突變導致限制酶辨識位置的增加或減少而導致限制酶切割後的 DNA 長度改變 (D) 如果基因突變不改變限制酶辨識位置，就不能用 RFLP (E) 可用來區別正常基因及突變基因。
- 關於蛋白質沈澱反應的敘述何者正確？ (A) 利用蛋白質沈澱反應將蛋白質與脂肪、核酸等其他物質分離 (B) 通常加入高濃度的鹽類，例如硫酸銨，來沈澱出蛋白質 (C) 蛋白質通常利用表面親水性胺基酸而吸引水 (D) 高濃度鹽類可與水分子作用，導致蛋白質的疏水性區域暴露出來，進行非極性區域間的交互作用而沈澱下來 (E) 以上皆是。

<背面尚有題目>

17. 關於基因剔除技術，下列敘述何者錯誤？(A) 基因剔除鼠因得到外來基因而產生遺傳疾病 (B) 藉由基因剔除鼠研究該基因缺陷所造成的影響 (C) 在胚胎幹細胞進行同源重組過程來破壞染色體上特定的基因 (D) 基因剔除的胚胎幹細胞再植入另一個正常囊胚，進行發育
18. 關於人類基因組計畫的敘述何者為非？(A) 目標在定序人類染色體的三十億鹼基對 (B) DNA 定序和其他基因組的研究工作，發展出基因組學 (C) 同時也對其他模式生物進行 DNA 定序工作 (D) 計畫結果估計的人類基因數目約為 80000 (E) 影響到人類遺傳疾病相關基因的辨識工作。
19. 胚胎幹細胞可由何處取得？(A) 臍帶血 (B) 囊胚層時期胚胎的內細胞團 (C) 羊水 (D) 囊胚層時期胚胎的外層滋養細胞 (E) 骨髓。
20. 複製動物技術主要是利用何種原理？(A) 將捐贈者的體細胞核轉移至去核的卵細胞 (B) 將捐贈者的卵細胞核轉移至去核的受精卵細胞 (C) 將捐贈者精細胞的基因體植入胚胎細胞內 (D) A 與 B (E) 以上皆是。

答案欄

1( ) 2( ) 3( ) 4( ) 5( ) 6( ) 7( ) 8( ) 9( ) 10( ) 11( ) 12( ) 13( ) 14( ) 15( ) 16( ) 17( ) 18( ) 19( ) 20( )

## 二、問答題 40%

假設 p24 和 p25 是兩種新發現的膜蛋白，被認為與腸病毒的進入人類細胞有關。為了研究這個問題，打算分別利用 p24 和 p25 的 siRNA 進行 RNA interference 的實驗。

- 請敘述何謂 RNA interference 實驗？(8%) 如何確認 p24 和 p25 的 siRNA 是有效的？(8%)
- 將 p24、p25 和病毒蛋白的 siRNA 送進人類細胞後，測量細胞的病毒產生量，結果如表一。請解釋 p24、p25 蛋白與病毒感染的關係。(8%)
- 當進一步製造出 p24 和 p25 的基因缺陷小鼠，再用腸病毒感染，並分析肝臟與肺臟的病毒感染情形，得到結果如表二。請說明如何建立基因缺陷小鼠。(8%) 並解釋 p24 和 p25 蛋白在腸病毒感染過程的角色。(8%)

表一

| Cell Treatment         | Number of Viruses/ml |
|------------------------|----------------------|
| Control (no siRNA)     | $1 \times 10^7$      |
| siRNA-p24              | $3 \times 10^6$      |
| siRNA-p25              | $2 \times 10^6$      |
| siRNA-p24 and -p25     | $1 \times 10^4$      |
| siRNA to viral protein | $1 \times 10^2$      |

表二

| Mouse                    | Liver    | Lung     |
|--------------------------|----------|----------|
| Wild type                | infected | infected |
| Knockout of p24 in liver | normal   | infected |
| Knockout of p24 in lung  | infected | infected |
| Knockout of p25 in liver | infected | infected |
| Knockout of p25 in lung  | infected | normal   |