

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

### 生物化學試題（生物科技系碩士班不分組、藥物科技研究所碩士班乙組、 保健營養系碩士班不分組）

本試題共 1 張 2 面

一、選擇題（每題 2 分）60%（單選，將正確答案的序號填入答案欄中）

1. 下列那一個代謝路徑會產生 ATP？(A) glycolysis (醣解作用) (B) gluconeogenesis (葡萄糖新生作用) (C) glycogenesis (肝醣合成) (D) PPP (戊醣磷酸徑路)
2. 在 TCA 循環中，那一個步驟中會生成 CO<sub>2</sub>？(A) citrate(檸檬酸) → isocitrate(異檸檬酸) (B) α-KG (α-酮基戊二酸) → succinyl CoA(琥珀醯輔酶 A) (C) succinate(琥珀酸) → fumarate(延胡索酸) (D) L-malate(L-蘋果酸) → OA(草醯醋酸)
3. 藥物誘發溶血性貧血症（亦稱蠶豆症，favism）係因為何種酵素有缺陷？(A) glycogen synthase(肝醣合成酶) (B) G-6-P dehydrogenase(G-6-P 去氫酶) (C) transketolase(轉酮基酶) (D) transaldolase(轉醛基酶)
4. electron transport chain (電子傳輸鏈)和 oxidative phosphorylation (氧化磷酸化) (A) 為偶合反應 (B) 兩者都出現在粒腺體的外膜 (C) NADPH 為開始物資 (D) 電子梯度(electron gradient) 為兩者的媒介物
5. 何者為 essential fatty acid (必需脂肪酸)？(A) linoleic acid(亞麻油酸)(18:2) (B) stearic acid (硬脂酸)(18:0) (C) arachidonic acid(次花生油酸)(20:4) (D) oleic acid(油酸)(18:1)
6. 在 TCA 循環中，由 <sup>-</sup>OOC-CH<sub>2</sub>-CH<sub>2</sub>-COO<sup>-</sup>(琥珀酸)至 <sup>-</sup>OOC-CO-CH<sub>2</sub>-COO<sup>-</sup>(草醯醋酸)之程序包括 (A) 脫氫、水化、脫氫 (B) 氫化、水化、氫化 (C) 脫氫、水化、氫化 (D) 氫化、脫水、氫化反應
7. 醫學檢驗時所需要的血液樣本有時會添加肝素(heparin)，其作用是 (A) 防腐 (B) 殺菌 (C) 保護劑 (D) 抗凝血
8. Coenzyme A (CoA)中含何種維生素？(A) riboflavin (B) nicotinamide (C) pantothenic acid (D) thiamine
9. 有關 NAD<sup>+</sup>( nicotinamide adenine dinucleotide) 之敘述何者正確 (A) 參與反應時每次接受 2 個氫原子 (B) 係維生素 B<sub>2</sub> 的衍生物 (C) 為參與氧化還原反應的輔酶 (D) 分子內含 ATP
10. 生物分子中 BP (bis-phosphate) 與 DP (di-phosphate)的不同在於兩個 phosphate 根 (A) 在 BP 中是接在同一個碳原子上 (B) 在 BP 中為醚鍵 (C) 在 DP 中含酸酐鍵 (D) 在 DP 中是接在不同的碳原子上
11. 何者不是組成 pyruvate dehydrogenase(丙酮酸去氫酶) 複合體中之 cofactor 的 B 屬維生素 (A) thiamine(B<sub>1</sub>) (B) biotin (C) riboflavin(B<sub>2</sub>) (D) lipoic acid
12. 一分子 Phosphoenolpyruvate (PEP) 經由 glycolysis, TCA cycle 和 oxidative phosphorylation 完全異化成 CO<sub>2</sub> 及 H<sub>2</sub>O 可產生幾個 ATP？(A) 13.5 (B) 32 (C) 27 (D) 10
13. 下列何者屬於 anaplerotic reaction(補復反應)？(A) malate → OA (B) pyruvate → OA (C) α-KG → succinyl-CoA (D) acetyl-CoA → malonyl-CoA
14. Fatty acids 分解與合成途徑的不同不包括 (A) 發生部位 (B) 有無先形成 CoA 衍生物 (C) 中間產物之光學性 (L/D) (D) 還原劑 NAD(P)H 之參與或形成
15. 下列何者發生在真核細胞粒腺體的間質中？(A) glycolysis (B) electron transport chain(ETC) (C) β-oxidation (D) fatty acids 合成
16. 乙醛酸循環 (glyoxylate cycle) 是利用 glyoxylate 與下列何者先形成蘋果酸 (malate)，再進一步形成葡萄糖 (A) malonyl-CoA (B) acetyl-CoA (C) succinyl-CoA (D) propionyl-CoA
17. Protein kinase 催化下列何種反應？(A) phosphorylation (B) acetylation (C) glycosylation (D) methylation
18. 假設真核生物雙股 DNA 包含 22 mole% guanine，則此 DNA 中 A/T/G/C 的 mole 比率應為多少？(A) 22/28/22/28 (B) 28/28/22/22 (C) 28/22/28/22 (D) 22/22/28/28
19. 下列有關 B 型 DNA 雙股螺旋結構的敘述何者不正確？(A) 各單股走向皆為 5'至 3'且互相平行 (B) adenine 與 thymine 間有兩個氫鍵 (C) 在正常生理狀況下雙股不會分開 (D) 鹼基對垂直於螺旋軸心
20. TCA cycle 每一輪會直接生成三種具高能的產物，不包括 (A) ATP (B) NADH (C) GTP (D) FADH<sub>2</sub>
21. Collagen 中 proline 及 lysine 殘基的氫氧化(hydroxylation)會促進安定，試問該反應的進行需要何種 vitamin 的協助 (A) A (B) B<sub>1</sub> (C) C (D) D
22. 下列何者為 spontaneous reaction(自發性反應)？(A) glucose 氧化成 CO<sub>2</sub> 和水 (B) 細胞結構的維持 (C) ADP 磷酸化形成 ATP (D) 脂肪酸合成

<背面尚有題目>

23. 下列何者不存在於生物膜中 (A) triacylglycerol (B) phosphatidyl ethanolamine(磷脂醯乙醇胺) (C) cholesterol (D) lecithin
24. 胺基酸聚合成蛋白質後，能夠進一步形成鏈內共價鍵結的殘基是 (A) cysteine (B) glycine (C) methionine (D) proline
25. lovastatin 用於治療家族型 hypercholesterolemia(高膽固醇血症)係因為它是 (A) acetoacetate (B) HMG-CA (C) isoprene (D) mevalonate 的構造類似物。
26. 核苷酸(nucleotides)及其衍生物的生理功能**不包括** (A) 當作酵素的 cofactors (B) 核酸合成的原料 (C) 當作能量代謝的媒介 (D) 生物膜的組成份。
27. 肌肉中之肝醣降解 (glycogenolysis) 程序的特性**不包括** (A) phosphorylase 為主要負責酵素 (B) G-1-P 為主要產物 (C) 由肝醣的非還原端開始 (D) 會受 NADH 的調控
28. urea cycle (A) 在內質網中進行 (B) 參與之胺基酸不包括 aspartic acid (C) carbamoyl phosphate 來自 CO<sub>2</sub>與 NH<sub>4</sub><sup>+</sup> (D) 為氨屬動物所專有的代謝路徑
29. 五碳醣磷酸路徑 (pentose phosphate pathway) 的主要功能是 (A) 提供能量 (B) 提供 NADPH (C) 提供 Krebs cycle 的中間產物 (D) 當作 glycolysis 的替代路徑
30. Tetrahydrofolic acid (四氫葉酸；THF) 衍生物在胺基酸生合成中可提供 (A)胺基 (B)羧基 (C)單碳基 (D)硫氫基

答案欄

- 1( ) 2( ) 3( ) 4( ) 5( ) 6( ) 7( ) 8( ) 9( ) 10( ) 11( ) 12( ) 13( ) 14( ) 15( )  
 16( ) 17( ) 18( ) 19( ) 20( ) 21( ) 22( ) 23( ) 24( ) 25( ) 26( ) 27( ) 28( ) 29( ) 30( )

## 二、解釋下列名詞 (每題 4 分) 20%

1. fusion proteins
2. ω3-fatty acid
3. zymogen
4. zwitterions
5. epimer

## 三、問答題 (每題 5 分) 20%

1. 舉兩個證據說明 chemiosmotic coupling(化學滲透偶合) hypothesis 中 proton gradient 的形成與回流是形成 ATP 的主要機制。
2. 何謂 base pair(鹼基對)? 在 DNA 及 RNA 中分別有哪些? 何謂 Tm (transition temperature)值? Tm 值高低的主要決定因素為何?
3. 簡述 immunoglobulins(Ig;即抗體)的形成機制? 並以圖簡述 Ig 的分子結構與免疫反應的特異性結合部位。
4. 一 dodecapeptide 胜肽經蛋白酶作用會出現下列兩組片段，請問所使用兩種蛋白酶之作用特性及此胜肽之序列為何?(請用三字縮寫表示，記得胺基酸順序從 N 端到 C 端)
  - A. Trypsin 分解: LSYAIR, DGMFVK
  - B. Chymotrypsin 分解: VKLSY, AIR, DGMF

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## 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殖入胚胎細胞內 (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   |

准考證號碼： \_\_\_\_\_

嘉南藥理科技大學九十八學年度碩士在職專班甄試入學筆試

生物技術概論試題(生物科技系)

本試題共 2 張 3 面

選擇題 (60%)

- DNA fragments and DNA probes are to Southern blotting as \_\_\_\_\_ are to Northern blotting.
  - DNA fragments and RNA probes
  - protein fragments and antibodies
  - RNA fragments and DNA probes
  - protein fragments and DNA probes
- Why does one need to make replica plates when screening for a specific DNA sequence among a large number of recombinant bacterial colonies?
  - It may take several tries to positively identify the specific sequence of interest.
  - The screening process requires several different steps, each of which must be done on a new colony of recombinants.
  - One wants a living culture of recombinant cells available after screening, a process that destroys some specific types of cells.
  - It is good science to replicate all experimental results.
- Why are heat-stable DNA polymerases from thermophilic bacteria required for the polymerase chain reaction?
  - The heat-stable forms are the only ones that recognize all four deoxyribonucleotides.
  - These enzymes amplify DNA in a reasonable amount of time.
  - These enzymes are the most readily available forms of DNA polymerase in the world.
  - These enzymes are stable enough to withstand the temperatures required to melt DNA.
- What is the significance of the varying porosity of gel filtration media?
  - It allows water to restrict solubility.
  - It allows proteins or nucleic acids to diffuse in and out of the beads differentially.
  - It causes the proteins or nucleic acids to denature.
  - It causes the proteins or nucleotides to precipitate.
- What are the two sequential techniques in two-dimension electrophoresis?
  - affinity chromatography and ion exchanger
  - isoelectric focusing and SDS-PAGE
  - ion exchanger and SDS-PAGE
  - SDS-PAGE and isoelectric focusing
- Treatment with what chemical or chemicals causes the deproteinization of the DNA extract in the DNA isolation procedure?
  - NaOH
  - SDS
  - buffered salt solution
  - a phenol/chloroform mixture
- How is RNA eliminated as a contaminant during the DNA isolation procedure?
  - by heating the mixture
  - by changing the pH
  - by adding ribonuclease (RNase)
  - by adding deoxyribonuclease
- How can a researcher visualize all of the DNA fragments present in an electrophoresis gel?
  - using a labeled probe with a sequence complementary to the desired DNA fragment
  - staining with ethidium bromide
  - staining with coomassie blue
  - using labeled antibodies
- Which of the following is common to both E. coli and eukaryotic chromosomes?
  - the DNA is circular
  - the DNA is packaged into nucleosomes
  - the DNA contained in the nucleus
  - the DNA is negatively supercoiled

10. telomerase
- A. exist in all eukaryotic cells  
 B. exist only in tumor and stem cells  
 C. is an enzyme adds DNA to centromere  
 D. is a enzyme responsible for eukaryotic DNA replication
11. Transformation is
- A. the take-up of a plasmid into a bacterium  
 B. the expression of a gene in a bacterium  
 C. the take-up of a bacteriophage into a bacterium  
 D. the isolation of a plasmid from a bacterium
12. In agarose gel electrophoresis
- A. DNA migrates towards the negative electrode  
 B. supercoiled plasmids migrate slower than their nicked counterparts  
 C. larger molecules migrate faster than smaller molecules  
 D. ethidium bromide can be used to visualize the DNA
13. Blue-white selection is used
- A. to test for the presence of a plasmid in a bacteria  
 B. to reveal the identity of a cloned DNA fragment  
 C. to express the product of a cloned gene  
 D. to test for the presence of a cloned insert in a plasmid
14. A multiple cloning site
- A. contains many copies of a cloned gene  
 B. allows flexibility in the choice of restriction enzymes for cloning  
 C. allows flexibility in the choice of organism for cloning  
 D. contains many copies of the same restriction enzyme site
15. Which vector would be most appropriate for Human Genome Project
- A. plasmid      B. lamda phage      C. Yeast artificial chromosome      D. retroviral vector
16. Which one of the following statements about PCR is false?
- A. the PCR cycle involves denaturation of the template, annealing of the primers and polymerization of nucleotides  
 B. PCR uses thermostable DNA polymerases  
 C. PCR optimization usually include varying the  $Mg^{++}$  concentration and the annealing temperature  
 D. if PCR was 100% efficient, one target molecule would amply to  $2^n$  after n cycles
17. What are the three amino acids that are positively charged at a neutral pH?
- A. K, R, H      B. K, R, W      C. I, K, W      D. M, K, W
18. When substrate concentration is much greater than  $K_m$ , the rate of catalysis is almost equal to?
- A.  $V_{max}$       B.  $K_m$       C.  $V_0$       D.  $K_d$
19. How big is the haploid human genome size?
- A.  $3 \times 10^6$  bp      B.  $3 \times 10^7$  bp      C.  $3 \times 10^8$  bp      D.  $3 \times 10^9$  bp
20. The structural difference between ATP and dATP lies in
- A. the number of phosphate group  
 B. the base structure  
 C. the pentose structure  
 D. the dehydration level

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

問答題(40%)

1. 試說明中國不肖業者添加三聚氰胺(Melamine)的目的是什麼？現在國內檢測三聚氰胺的標準方法是什麼？為何早期政府公告的三聚氰胺容許含量較高？
  
2. 今年諾貝爾化學獎頒發給三位對 fluorescent protein 的發現及應用有傑出貢獻的三位科學家。請問(1) Osamu Shimomura 是從哪種生物裡分離純化出 green fluorescent protein? (2) Martin Chalfie 將 GFP gene 放到 *Caenorhabditis elegans* 去，主要的目的及貢獻是什麼？(3) Roger Y. Tsien 的貢獻是什麼？
  
3. The Nobel Prize in Physiology or Medicine for 2008 with one half to Harald zur Hausen for his discovery of "human papilloma viruses causing cervical cancer" and the other half jointly to Françoise Barré-Sinoussi and Luc Montagnier for their discovery of "human immunodeficiency virus".
  - (1) What are the major discoveries for the Nobel Prize in Physiology or Medicine for 2008 ?
  - (2) Who are the Nobelists for Medicine of 2008?
  - (3) What is the genome composition of human immunodeficiency virus?
  - (4) What is the disease caused by human immunodeficiency virus?
  - (5) What is the most effective method to prevent cervical cancer?
  
4. 解釋名詞 (1) apoptosis (2) ELISA (3) reverse transcription (4) siRNA (5) knockout mice