

臺北醫學大學 104 學年度碩士班暨碩士在職專班招生入學考試

生物化學試題

本試題第 1 頁；共 3 頁

(如有缺頁或毀損，應立即請監試人員補發)

注
意
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項

- 一、本試題共三大題，共計 100 分。
- 二、請將最適當的答案依題號作答於考試答案用卷上。
- 三、試題答錯者不倒扣。

一、選擇題 (每題 3 分，共 45 分)

1. 威而鋼(Viagra)是 cGMP phosphodiesterase 的抑制劑，其作用為維持：
① 高活性的 G protein ② 高濃度的 cGMP ③ 低活性的 G protein ④ 低濃度的 cGMP
2. 下列關於 steroid hormone response element(HRE)的敘述，何者正確？
① 是一種 plasma membrane protein，可與 hormone 結合
② 是一種 nuclear protein，可與 hormone 結合
③ 為一段 intron sequence，可與 activated hormone receptor 結合
④ 為一段 DNA sequence，可與 hormone-receptor complex 結合
3. 下列何者被視為" Bad Cholesterol"？
① VLDL ② LDL ③ IDL ④ HDL
4. 下列何者可以提供 methyl group？
① homocysteine ② S-adenosyl homocysteine ③ S-adenosyl methionine ④ S-adenosyl cysteine
5. 神經系統的病變常常是因下列哪一類脂質的代謝失常所致？
① phosphatidylcholine ② phosphatidylethanolamine ③ cholesterol ④ sphingomyelin
6. What is the common product of purine catabolism?
① xanthine ② uric acid ③ xanthosine ④ hypoxanthine
7. Formation of malonyl-CoA, the committed step in fatty acid biosynthesis, is catalyzed by which of the following enzyme?
① fatty acid synthase ② pyruvate carboxylase
③ propionate carboxylase ④ acetyl-CoA carboxylase
8. What is the major application of the RFLP technique?
① is of most use with prokaryotic DNA.
② is of no use on DNA that contains introns.
③ is used on the DNA of organisms that have two sets of chromosomes.
④ provides fewer genetic markers than classical genetic techniques.
9. What is the "natural" function of restriction endonucleases?
① protect bacterial cells from invasion by viruses (bacteriophages).
② help bacteriophages to infect cells.
③ regulate gene expression from specific promoters.
④ remove chromatin from histones.

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10. Which of the following statements is the best description of a transcription?

- Ⓐ an mRNA-based vector.
- Ⓑ three-dimensional mRNA structure.
- Ⓒ a collection of all the genes being transcribed in a given cell or tissue at a given time.
- Ⓓ the mRNA transcribed to produce a fusion protein.

11. Which of the following events commonly occur in the processing of eukaryotic mRNA (mRNA post-transcriptional modification)?

- I. 5'-Capping, protect against exonucleases
- II. 5'-end created by ribonuclease P leave a phosphate on the 5'-terminal
- III. 3'-Poly A addition, stabilize the mRNA by increasing resistance to cellular nucleases
- IV. trimming of the 3'-ends by endonuclease
- V. Splicing of coding sequences

- Ⓐ I, II, III, IV, V Ⓑ I, III, V Ⓒ II, III, V Ⓓ II, IV, V

12. Which of the following conditions would result in the least amount of transcription of the lac operon?

	<u>[glucose]</u>	<u>[lactose]</u>
I.	high	high
II.	low	low
III.	high	low
IV.	low	high

- Ⓐ I Ⓑ II Ⓒ III Ⓓ IV

13. What is an Okazaki fragment?

- Ⓐ A fragment of DNA resulting from endonuclease action
- Ⓑ A segment of DNA that is an intermediate in the synthesis of the lagging strand
- Ⓒ A piece of DNA that is synthesized in the 3' → 5' direction
- Ⓓ A segment of mRNA synthesized by RNA polymerase

14. If an miRNA is completely complementary to an mRNA, what is the result of the pairing of these two molecules?

- Ⓐ rapid translation of the mRNA
- Ⓑ repeated translation as the miRNA prevents destruction of the mRNA
- Ⓒ slowed translation of the mRNA
- Ⓓ degradation of the mRNA

15. Assuming that the average amino acid residue contributes 110 to the peptide molecular weight, what will be the minimum length of the mRNA encoding a protein of molecular weight 50,000?

- Ⓐ A minimum length cannot be determined from the data given
- Ⓑ 450 nucleotides
- Ⓒ 900 nucleotides
- Ⓓ 1,400 nucleotides

二、簡答題 (共 25 分)

1. A biochemist is attempting to separate a DNA-binding protein (protein Un) from other proteins in a solution. Only three other proteins (A, B, and C) are present. The proteins have the following properties:

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	pI (isoelectric point)	Size M_r	Bind to DNA?
protein A	7.2	68,000	yes
protein B	7.9	22,500	no
protein C	3.5	24,000	yes
protein Un	7.8	21,000	yes

What type of protein separation techniques (chromatography) might be used to separate each of these proteins? Please describe the principle of the method, and tell what property of proteins allows their separation by this technique.

- (a) protein Un from protein A?(5%)
- (b) protein Un from protein B?(5%)
- (c) protein Un from protein C?(5%)

2. Non-coding small RNAs have now been discovered in higher eukaryotes. These non-coding small RNAs play an important role in regulation of the gene expression. Please describe five distinct characteristics and general functions of siRNA and miRNA.(10%)

三、問答題 (共 30 分)

1. 膽固醇(cholesterol)一般被認為是造成心血管疾病的主因，而在體內膽固醇主要是由脂蛋白中的高密度脂蛋白(HDL, High Density Lipoprotein)與低密度脂蛋白(LDL, Low Density Lipoprotein)負責主要的攜帶工作，其中 LDL 則是攜帶膽固醇從肝臟送到其他組織：
 - (a)請敘述細胞攝取膽固醇的機制。(5%)
 - (b)請敘述家族性高膽固醇症(familial hypercholesterolemia)所導致的心臟性疾病的機制。(5%)
 - (c)請敘述細胞內維持膽固醇平衡的機制。(5%)
2. 請以正常的 EGF receptor 基因為例，說明基因的變異對癌細胞產生的影響。(10%)
3. 試說明 RT-PCR 與 PCR 之原理與其在生命科學研究領域之應用。(5%)