

# 臺北醫學大學 101 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<br>意<br>事<br>項 | 一、本試題共二大題，共計 100 分。<br>二、請將最適當的答案依題號作答於答案用卷本上。<br>三、試題答錯者不倒扣；題次號碼錯誤或不按順序或鉛筆作答，不予計分。 |
|------------------|---|

一、選擇題：(每題 2%，共 64%)

- Which of the peptides would absorb light at 280 nm?  
(A) Ala-Lys-His                      (B) Ser-Leu-Asn                      (C) Ala-Ala-Trp                      (D) Val-Pro-Gly
- Prions are defined as:  
(A) ions with an inappropriate number of protons                      (B) proteinaceous infectious particles  
(C) ionic proteins that bind DNA                      (D) particle ions that bind proteins
- The eukaryotic TATA-binding protein (TBP) functions in a manner similar to which of the following in *E. coli* :  
(A) CAP                      (B) rho ( $\rho$ ) factor                      (C) lac I                      (D) sigma ( $\sigma$ ) factor
- In competitive inhibition, an inhibitor:  
(A) binds at several different sites on an enzyme                      (B) lowers the characteristic  $V_{max}$  of the enzyme  
(C) binds reversibly at the active site                      (D) binds only to the ES complex
- Which of the following is *not* a reducing sugar?  
(A) Fructose                      (B) Glucose                      (C) Ribose                      (D) Sucrose
- In comparison with DNA-DNA double helices, the stability of DNA-RNA and RNA-RNA helices is:  
(A) RNA-RNA > DNA-RNA > DNA-DNA                      (B) RNA-RNA > DNA-DNA > DNA-RNA  
(C) DNA-DNA > DNA-RNA > RNA-RNA                      (D) DNA-DNA > RNA-RNA > DNA-RNA
- In the laboratory, recombinant plasmids are commonly introduced into bacterial cells by:  
(A) transformation - heat shock of the cells incubated with plasmid DNA in the presence of  $CaCl_2$   
(B) infection with a bacteriophage that carries the plasmid  
(C) electrophoresis - a gentle low-voltage gradient draws the DNA into the cell  
(D) microinjection
- Ubiquitin is a:  
(A) component of the electron transport system                      (B) protease  
(C) protein kinase                      (D) protein that tags another protein for proteolysis
- Programmed cell death is called:  
(A) metastasis                      (B) apoptosis                      (C) oncogenic transformation                      (D) ubiquitination
- Glycolysis in the erythrocyte produces pyruvate that is further metabolized to:  
(A)  $CO_2$                       (B) ethanol                      (C) glucose                      (D) lactate
- Galactosemia is a genetic error of metabolism associated with:  
(A) deficiency of UDP-glucose: galactose 1-phosphate uridylyltransferase  
(B) deficiency of UDP-glucose  
(C) deficiency of galactokinase  
(D) excessive ingestion of galactose
- An isoschizomer is a(n):  
(A) DNA sequence that is identical to one in a different organism  
(B) restriction enzyme that has the same sequence specificity as another restriction enzyme from a different organism  
(C) enzyme that cuts DNA from the 3' end  
(D) DNA sequence from a virus that mimics a sequence in bacteria
- The human genetic disease phenylketonuria (PKU) can result from:  
(A) deficiency of protein in the diet                      (B) inability to catabolize ketone bodies  
(C) inability to convert phenylalanine to tyrosine                      (D) inability to synthesize phenylalanine

14. Which of the activities of DNA Polymerase I is the most important in removing the primer?  
Ⓐ Polymerase activity Ⓑ Ability to nick intact double stranded DNA  
Ⓒ 3' → 5' exonuclease Ⓓ 5' → 3' exonuclease
15. If DNA fragments of about 4 kb are to be cloned, which vector would be the most useful?  
Ⓐ cosmid Ⓑ plasmid  
Ⓒ YACs (yeast artificial chromosomes) Ⓓ bacteriophage lambda
16. How does siRNA interference function?  
Ⓐ siRNA binds to genes and prevents transcription  
Ⓑ the double stranded siRNA binds to mRNA to prevent ribosomal association  
Ⓒ a single strand of the siRNA binds to the gene transcript, preventing translation  
Ⓓ siRNA binds to RNA polymerase preventing mRNA production
17. AZT (3'-azido-2',3'-dideoxythymidine) is a drug that gets incorporated into growing viral DNA and blocks the activity of :  
Ⓐ reverse transcriptase Ⓑ DNA polymerase  $\beta$  (beta)  
Ⓒ DNA polymerase  $\alpha$  (alpha) Ⓓ DNA ligase
18. Nucleotide sequences that identify the location of transcription start sites and regulate the level of transcription are called :  
Ⓐ pribnow boxes Ⓑ promoters Ⓒ TATA boxes Ⓓ enhancers
19. Treatment of the RNA polymerase/DNA complex with DNase *in vitro* is a DNA footprinting technique used to :  
Ⓐ locate the promoter site Ⓑ locate the start site for transcription  
Ⓒ identify the termination sequence for transcription Ⓓ identify the position of enhancer sequences
20. A transcriptome is :  
Ⓐ an mRNA-based vector  
Ⓑ three-dimensional mRNA structure  
Ⓒ the mRNA transcribed to produce a fusion protein  
Ⓓ a collection of all the genes being transcribed in a given cell or tissue at a given time
21. A Shine-Dalgarno Sequence is a sequence of nucleotides in :  
Ⓐ the DNA that interacts with the  $\sigma$ -subunit of RNA polymerase to begin transcription  
Ⓑ an mRNA that interacts with the small subunit of a ribosome to begin translation  
Ⓒ the DNA that interacts with  $\rho$ -protein to terminate transcription  
Ⓓ an mRNA that functions to terminate translation
22. Protein structural motifs often have general functions in common Which one of the following motifs is known to be involved in protein dimer formation, but not in direct protein-DNA interactions?  
Ⓐ zinc finger Ⓑ helix-turn-helix Ⓒ homeodomain Ⓓ leucine zipper
23. Which of the following is a DNA sequence?  
Ⓐ enhancer Ⓑ coactivators Ⓒ repressors Ⓓ transactivators
24. The protein which marks proteins for degradation is called :  
Ⓐ chaperonin Ⓑ proteasomin Ⓒ ubiquitin Ⓓ apoptosin
25. Nucleosomes :  
Ⓐ bind DNA and alter its supercoiling  
Ⓑ are composed of proteins rich in acidic amino acids, such as Asp and Glu  
Ⓒ are composed of protein and RNA  
Ⓓ are important features of chromosome organization in eukaryotes and bacteria
26. The Ames test is used to:

# 臺北醫學大學 101 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 3 頁；共 3 頁  
(如有缺頁或毀損，應立即請監試人員補發)

- (A) detect bacterial viruses  
(B) determine the rate of DNA replication  
(C) examine the potency of antibiotics  
(D) measure the mutagenic effects of various chemical compounds
27. Which of the conditions would result in the least amount of transcription of the *lac* operon?
- |     | [glucose] | [lactose] |
|-----|-----------|-----------|
| I   | high      | high      |
| II  | low       | low       |
| III | high      | low       |
| IV  | low       | high      |
- (A) I                      (B) II                      (C) III                      (D) IV
28. Which of the following types of eukaryotic regulatory proteins interact with enhancers?
- (A) basal transcription factors                      (B) transactivators  
(C) repressors                      (D) coactivators
29. Which one of the following antibiotics does not function by interfering with the translational process?
- (A) chloramphenicol                      (B) penicillin                      (C) cycloheximide                      (D) puromycin
30. Compared with DNA polymerase, reverse transcriptase:
- (A) makes more errors because it lacks the 3' → 5' proofreading exonuclease activity  
(B) introduces no errors into genetic material because it synthesizes RNA, not DNA  
(C) does not require a primer to initiate synthesis  
(D) synthesizes complementary strands in the opposite direction from 3' → 5'
31. 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) 333 nucleotides  
(B) 660 nucleotides  
(C) 1,400 nucleotides  
(D) a minimum length cannot be determined from the data given
32. The following reactions are all common parts of some hormone processes:
- ① binding of the hormone to a receptor
  - ② synthesis of cyclic AMP
  - ③ phosphorylation of the target enzyme
  - ④ release of a G-protein from the interior cell membrane
  - ⑤ activation of a protein kinase
- A typical path of reactions would follow this sequence:
- (A) ①→②→④→③→⑤    (B) ①→②→④→⑤→③    (C) ①→④→②→⑤→③    (D) ①→④→②→③→⑤

## 二、簡答題：(36%)

1. 真核與原核生物於合成 mRNA 過程中最大的差別在於前者有 mRNA processing，就您所知，有幾種 mRNA processing 過程，其重要性為何？(10%)
2. 說明 tRNA、rRNA 及 mRNA 如何協助蛋白質之合成？(10%)
3. 就您所知，說明粒線體(mitochondria)及內質網(ER)在細胞內的功能。(10%)
4. 蛋白質變性(denature)後，若除去變性因素，為何大部份蛋白質可再恢復原來構形(renature)？(6%)