

科目：生物化學 適用：應化系

編號：485

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

本試題  
共 5 頁  
第 1 頁

## 一、單選題 (1-28 題，每小題 3 分，共計 84 分)

1. Based on Chargaff's rules, which of the following are possible base compositions for double-stranded DNA?

	%A	%G	%C	%T	%U
(A)	45	5	45	15	0
(B)	20	20	20	20	20
(C)	35	15	35	15	0

- (D) All of the above.  
(E) None of the above.

2. Compounds that generate nitrous acid (such as nitrites, nitrates, and nitrosamines) change DNA molecules by:

- (A) breakage of phosphodiester bonds.  
(B) depurination.  
(C) transformation of A → T.  
(D) formation of thymine dimers.  
(E) deamination of bases.

3. Which of the following is a DNA sequence?

- (A) Mediator  
(B) Corepressor  
(C) Transactivator  
(D) Inducer  
(E) Enhancer

4. The binding of CRP (cAMP receptor protein of *E. coli*) to DNA in the *lac* operon:

- (A) prevents repressor from binding to the *lac* operator.  
(B) is inhibited by a high level of cAMP.  
(C) occurs in the *lac* repressor region.  
(D) occurs only when glucose is present in the growth medium.  
(E) assists RNA polymerase binding to the *lac* promoter.

5. Which one of the following antibiotics does not function by interfering with the translational process?

- (A) Chloramphenicol  
(B) Cycloheximide  
(C) Streptomycin  
(D) Puromycin  
(E) Ampicillin

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本試題

共 5 頁

第 2 頁

6. 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 5,000?
- (A) 133 nucleotides  
 (B) 460 nucleotides  
 (C) 1,400 nucleotides  
 (D) 5,000 nucleotides  
 (E) A minimum length cannot be determined from the data given.
7. Which one of the following is *true* about the genetic code?
- (A) Several different codons may encode the same amino acid.  
 (B) All codons recognized by a given tRNA encode different amino acids.  
 (C) It is absolutely identical in all living things.  
 (D) The base in the middle position of the tRNA anticodon sometimes permits "wobble" base pairing with 2 or 3 different codons.  
 (E) The first position of the tRNA anticodon is always adenosine.
8. 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?
- (A)  $\beta$ -barrel  
 (B) helix-turn-helix  
 (C) homeodomain  
 (D) leucine zipper  
 (E) zinc finger
9. Gene silencing by RNA interference acts by \_\_\_ of the target gene.
- (A) inhibiting transcription  
 (B) inhibiting translation  
 (C) inhibiting splicing  
 (D) degradation of the mRNA  
 (E) inhibiting polyadenylation
10. The protein \_\_\_ contains a structure with extended helical chains coiled into a triple helix, and the sequence contains stretches of repetitive amino acid sequences.
- (A) collagen  
 (B) hemoglobin  
 (C) triose phosphate isomerase  
 (D) nuclease  
 (E) none of the above

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本 試 題  
共 5 頁  
第 3 頁

11. Which of the following pairs of amino acids is most likely to form a covalent bond in a protein?

- (A) Cys:Cys
- (B) Ser:Glu
- (C) Asp:Asp
- (D) Asp:Glu
- (E) Ser:Ser

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12. Phosphate groups are usually added to enzymes by a \_\_\_\_\_ using \_\_\_\_\_.

- (A) phosphorylase, ADP
- (B) kinase, ADP
- (C) synthase, creatine phosphate
- (D) kinase, ATP
- (E) one of the above

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13. Proteins with charges can be separated by \_\_\_\_\_ chromatography.

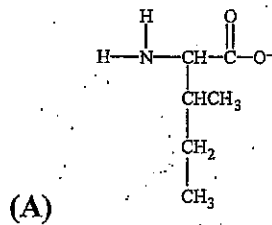
- (A) exclusion
- (B) size
- (C) affinity
- (D) ion exchange
- (E) gel

14. If the data from an enzyme experiment is plotted as a Lineweaver-Burk plot, and the  $V_{max}$  is 0.02 sec/mol, and x-intercept is  $-2.5 \text{ mM}^{-1}$ , then what is the  $K_M$  value?

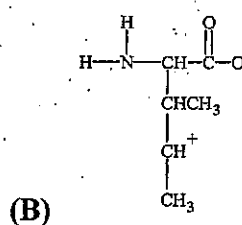
- (A)  $2.5 \mu\text{M}$
- (B)  $0.4 \text{ mM}$
- (C)  $0.008 \text{ mM}$
- (D)  $125 \mu\text{M}$
- (E) none of the above

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15. What would isoleucine look like at pH 14?



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endonuclease; (O) primase; (P) start site; (Q) kinase; (R) origin; (S) histone; (T) start codon; (U) polymerization.

二、簡答題 (29-30 題，每小題 8 分，共計 16 分)

29. Denaturing a native protein tends to decrease its water solubility. Why?

30. A peptide has a sequence E-H-W-S-G-L-R-P-G, what is the pI for this peptide?

Amino Acid	pK <sub>1</sub>	pK <sub>2</sub>	pK <sub>R</sub>
Glycine	2.34	9.6	
Alanine	2.34	9.69	
Valine	2.32	9.62	
Leucine	2.36	9.6	
Isoleucine	2.36	9.6	
Serine	2.21	9.15	
Threonine	2.63	10.43	
Methionine	2.28	9.21	
Phenylalanine	1.83	9.13	
Tryptophan	2.83	9.39	
Asparagine	2.02	8.8	
Glutamine	2.17	9.13	
Proline	1.99	10.6	
Cysteine	1.71	10.78	8.33
Histidine	1.82	9.17	6.0
Aspartic acid	2.09	9.82	3.86
Glutamic acid	2.19	9.67	4.25
Tyrosine	2.2	9.11	10.07
Lysine	2.18	8.95	10.79
Arginine	2.17	9.04	12.48