

國立中興大學103學年度碩士班招生考試試題

科目：生物化學

系所：生物科技學研究所

**本科目不得使用計算機**

本科目試題共4頁

1. Describe two biological functions provided by each of the following substances (1) protein (2) carbohydrate (3) lipid (4) nucleic acid (5) metal ions. (10%)
2. Several techniques have been developed on the basis of specific binding between antibodies and their antigens. Please explain the following techniques briefly: (1) Western blotting (2) Immunoaffinity chromatography (antibody column) (3) ELISA (4) Immunocytochemistry (immunofluorescence labeling) (5) immunoprecipitation (10%)
3. Answer the properties of amino acids in the following five questions. (10%)
  - (1) Which amino acid can form disulfide bonds?
  - (2) Which three amino acids are commonly glycosylated?
  - (3) Which amino acid is the first amino acid in a newly synthesized polypeptide?
  - (4) Which three amino acids can be phosphorylated?
  - (5) Which two amino acids are positively charged at pH 7.5?
4. Single choice: 2 points for each question (單選題 每題 2 分) (20%)
  - (1) Which purification method can be used to estimate molecular weight of proteins? (A) ion exchanger (B) native gel electrophoresis (C) ultracentrifuge (D) gel filtration (E) affinity column
  - (2) Which one can be considered as a second message? (A) G protein (B) protein kinase C (C) cyclin (D) phospholipase C (E) diacylglycerol
  - (3) The  $\alpha$ -amino group for all amino acids is derived from (A) glutamine (B) glutamate (C) asparagine (D) proline (E) glycine
  - (4) Which one is NOT a protein (A) abzyme (B) ribozyme (C) lysozyme (D) isomerase (E) DNA restriction enzyme.
  - (5) Which one is NOT a protein. (A) selectin (B) integrin (C) pectin (D) actin (E) lectin.
  - (6) Dietary triacylglycerol is absorbed in the small intestine in the form of fatty acids and (A) monoacylglycerol (B) diacylglycerol (C) triacylglycerol (D) glycerol (E) acetone
  - (7) Which one is useful in predicting transmembrane from protein sequences (A) micelle (B) liposome (C) membrane potential (D) hydrophathy index (E) freeze-fracture.
  - (8) Which one is NOT considered as an amphipathic molecule? (A) triacylglycerol (B) cholesterol (C) phosphatidic acid (D) glycolipid (E) phospholipid.
  - (9) Which compound is NOT present in TCA cycle (A) citrate (B) isocitrate (C) succinate (D) acetoacetate (E) oxaloacetate.
  - (10) Gout is resulted from an excess of which compound in body fluids (A) uric acid (B) urea (C) urine (D) purine (E) pyrimidine

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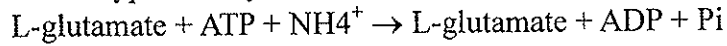
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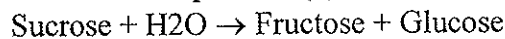
5. 單選題，每題2分 (24%)

(1) Which type of enzyme can catalyze the reaction below?



- (A) Ligase
- (B) Lyase
- (C) Transferase
- (D) Oxidoreductase
- (E) Hydrolase

(2) Choose from question (1), which enzyme is for this reaction?



- (A) Ligase
- (B) Lyase
- (C) Transferase
- (D) Oxidoreductase
- (E) Hydrolase

(3) The tetranucleotide AGCT in a DNA molecule has a free hydroxyl group on -

- (A) A
- (B) T
- (C) A, G and C
- (D) G, C, and T
- (E) All of them

(4) Deoxyadenosine -

- (A) is a nucleotide found mainly in DNA.
- (B) is a deoxynucleotide found mainly in DNA.
- (C) is a nucleoside found mainly in DNA.
- (D) differ from adenosine by the replacement of a hydroxyl group (-OH) by hydrogen (-H) at the 2' position of its ribose sugar moiety.
- (E) can pair with uridine in some double-stranded RNA.

(5) Which of the following statement about histone is NOT true?

- (A) They are positively charged at physiological pH.
- (B) They only occur in eukaryotes.
- (C) Most species have five types of histone.
- (D) They are highly conserved in sequences among species.
- (E) In bacteria, DNA wrap around histone to form bead-like structure called nucleoids.

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- (6) Bacteria produce many restriction endonucleases. What prevents these enzymes from degrading their own DNA?
- (A) The restriction endonucleases are exported out of the cell right after synthesis.
  - (B) The host DNA is specifically methylated by enzyme and is therefore protected from cleavage.
  - (C) The strong association between the histones and bacterial DNA prevent the endonuclease from acting on them.
  - (D) The bacterium can avoid produce restriction endonuclease that recognize its own genomic DNA.
  - (E) All of the above are possible.
- (7) Which is NOT a biological function of a RNA?
- (A) Participate in the modification of newly synthesized RNA.
  - (B) Act as the genetic material of some virus.
  - (C) Serve as a scaffold component for chromosome.
  - (D) Composes an integral part of the ribosome.
  - (E) None of the above.
- (8) Prokaryotic mRNA that contain several open reading frames that encode several polypeptides are –
- (A) impossible
  - (B) synonymous
  - (C) tandemly coded
  - (D) polycistronic
  - (E) having IRIS (Internal ribosome entry site)
- (9) Which of the following statement about cancer formation is WRONG?
- (A) Cancer is generally the result of an accumulation of mutations in oncogenes and tumor suppressor genes.
  - (B) Tumor suppressor genes encode proteins that normally inhibit cell division.
  - (C) Mutations in tumor suppressor genes are recessive.
  - (D) Oncogenes encode proteins that normally inhibit cell division.
  - (E) Mutations in oncogenes are dominant.

- (10) According to the genetic code table shown on the side, what is the 5'→3' anticodon for the cysteine residue?

- (A) TGT
- (B) GCA
- (C) TGG
- (D) AGA
- (E) ACG

First Position 5'	Second Position				Third Position 3'
	U	C	A	G	
U	UUU F UUC F UUA L UUG L	UCU S UCC S UCA S UCG S	UAU Y UAC Y UAA stop UAG stop	UGU C UGC C UGA stop UGG W	U C A G
C	CUU L CUC L CUA L CUG L	CCU P CCC P CCA P CCG P	CAU H CAC H CAA Q CAG Q	CGU R CGC R CGA R CGG R	U C A G
A	AUU I AUC I AUA I AUG M	ACU T ACC T ACA T ACG T	AAU N AAC N AAA K AAG K	AGU S AGC S AGA R AGG R	U C A G
G	GUU V GUC V GUA V GUG V	GCU A GCC A GCA A GCG A	GAU D GAC D GAA E GAG E	GGU G GGC G GGA G GGG G	U C A G

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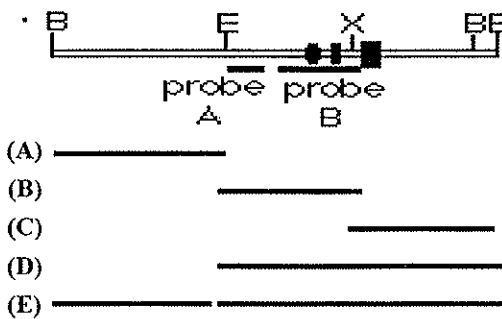
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- (11) The average molecular weight of a DNA base pair is about 660 Dalton, so the calculated molecular number of a 3.3 ug dsDNA with 1 kb in length will be -
- (A)  $3 \times 10^{12}$
  - (B)  $3 \times 10^9$
  - (C)  $2.2 \times 10^{11}$
  - (D)  $2.2 \times 10^6$
  - (E)  $2 \times 10^6$

- (12) On a Southern hybridization data, which DNA fragment will you see after E enzyme digestion and probe A hybridization?



6. 簡答題，每題3分，請務必僅選擇六題回答，否則以前六題計分 (18%)

- (1) Peripheral protein
- (2) Micelle
- (3) ABC transporter
- (4) Antigenic determinant site (epitope)
- (5) Operator
- (6) Shine-Dalgarno sequence
- (7) Homeotic genes
- (8) Single nucleotide polymorphism (SNP)
- (9) Expressed sequence tag (EST)
- (10) Green fluorescent protein (GFP)

7. 請簡譯成英文，請選擇一題做答，8分 (8%)

- (1) 去氧核糖核酸 (DNA) 是一種生物大分子，可儲存遺傳資訊，指導合成特定蛋白質。
- (2) 以食用作物製作生質能源的效率雖然良好，但卻高度引發糧食安全的疑慮，反而使生質能源的推動受到強大阻礙。