國立屏東大學104學年度研究所碩士班入學考試

生物化學 試題

（應用化學系碩士班）

※請注意：1.本試題共三頁。
2.答案須寫在答案卷上，否則不予計分。

一、選擇題 A (請選出敘述錯誤的選項，每題 4 分，共 12 分)

1.【　】(1) Topoisomerases catalyze changes in the linking number of DNA
(2) Most cellular DNA is overwound
(3) Two forms of a circular DNA that differ only in a topological property such as linking number are referred to as topoisomers
(4) When these DNAs have no breaks in either strand, they are referred to as closed-circular DNAs
(5) When there is no net bending of the DNA axis upon itself, the DNA is said to be in a relaxed state.

2.【　】(1) RNA is synthesized by RNA polymerases
(2) Both introns and exons are transcribed from DNA into RNA
(3) Eukaryotic cells have three kinds of nuclear RNA polymerases
(4) Eukaryotic mRNAs are capped at the 5' End
(5) A gene can give rise to only one product by differential RNA processing.

3.【　】(1)The most common initiation codon is AUG
(2)Termination of polypeptide synthesis requires a special signal
(3)Wobble allows tRNAs to recognize only one codon
(4)Aminoacyl-tRNA synthetases attach the correct amino acids to their tRNAs
(5)Many bacterial genes are clustered and regulated in operons.

二、選擇題 B (每題 4 分，共 28 分)

4.【　】The macromolecules that serve in the storage and transmission of genetic information are:
(1) carbohydrates.
(2) lipids.
(3) membranes.
(4) nucleic acids.
(5) proteins.

5.【　】In a highly basic solution, pH = 13, the dominant form of glycine is:

(1) $NH_2—CH_2—COOH$.
(2) $NH_2—CH_2—COO^-$.
(3) $NH_2—CH_3^+—COO^-$.
(4) $NH_3^+—CH_2—COOH$.
(5) $NH_3^+—CH_2—COO^-$.

6.【　　】Determining the precise spacing of atoms within a large protein is possible only through the use of:
(1) electron microscopy.
(2) light microscopy.
(3) molecular model building.
(4) Ramachandran plots.
(5) x-ray diffraction.

7.【　　】Enzymes are potent catalysts because they:

(1) are consumed in the reactions they catalyze.
(2) are very specific and can prevent the conversion of products back to substrates.
(3) drive reactions to completion while other catalysts drive reactions to equilibrium.
(4) increase the equilibrium constants for the reactions they catalyze.
(5) lower the activation energy for the reactions they catalyze.

8.【　　】A major component of RNA but not of DNA is:

(1) adenine.
(2) cytosine.
(3) guanine.
(4) thymine.
(5) uracil.

9.【　　】The alkaline hydrolysis of RNA does *not* produce:

(1) 2′- AMP.
(2) 2′,3′-cGMP.
(3) 2′-CMP.
(4) 3′,5′-cAMP.
(5) 3′-UMP.

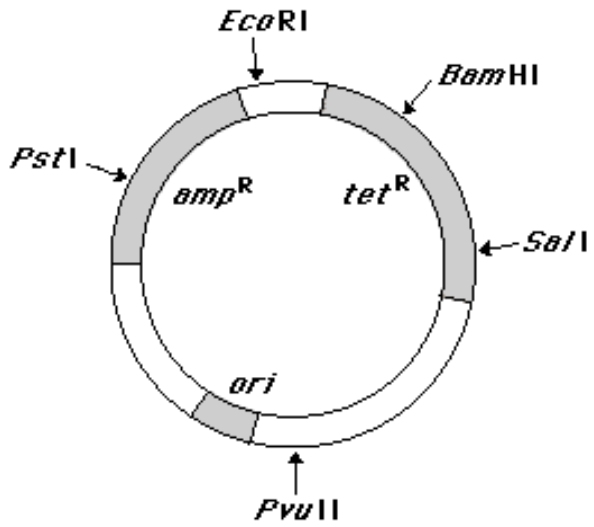
10.【　　】The PCR reaction mixture does *not* include:

(1) all four deoxynucleoside triphosphates.
(2) DNA containing the sequence to be amplified.
(3) DNA ligase.
(4) heat-stable DNA polymerase.
(5) oligonucleotide primer(s).

三、 問答題(共 60 分)

1. How can isoelectric focusing be used in conjunction with SDS gel electrophoresis? (10 分)
2. Describe the levels of protein structures and the factors that influence protein folding and stability. (15 分)
3. Draw the structures of the amino acids phenylalanine and aspartate in the ionization state you would expect at pH 7.0. Why is aspartate very soluble in water, whereas phenylalanine is much less soluble? (15 分)

4. Match each feature of the plasmid pBR322 (1,2,3,4,5) with *one* appropriate description presented (a,b,c,d,e) (see illustration of pBR322 below). Descriptions may be used more than once. (10 分，每小題 2 分)



(1)____ *amp*R sequence

(2)____ *ori* sequence

(3)____ *tet*R

(4)____ *Bam*HI sequence

(5)____ *Pst*I sequence

(a) permits selection of bacteria containing the plasmid
(b) a sequence required for packaging recombinant plasmids into bacteriophage
(c) origin of replication
(d) cleavage of the plasmid here does not affect antibiotic sequence resistance genes
(e) insertion of foreign DNA here permits identification of bacteria containing recombinant plasmids

5. For each of these methods of separating proteins, describe the principle of the method, and tell what property of proteins allows their separation by this technique. (10 分，每小題 5 分)

(a) ion-exchange chromatography
(b) affinity chromatography