

國立成功大學

112學年度碩士班招生考試試題

編 號：60

系 所：生物科技與產業科學系

科 目：生物化學

日 期：0207

節 次：第 1 節

備 註：不可使用計算機

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

一、單選題 (60%)

1. Which of the following is a major difference between B-DNA and A-DNA?
 - A) B-DNA has a right-handed helix, A-DNA has a left-handed helix
 - B) B-DNA has 10 residues per helix turn while A-DNA has 9
 - C) B-DNA base pairs are stacked almost parallel to one another while A-DNA base pairs are significantly tilted with respect to each other
 - D) the major groove of A-DNA is much larger than that in B-DNA
 - E) none of the above
2. Below are the steps involved in cloning gene sequences using mRNA. Arrange the steps in the appropriate order.
 1. The double-stranded cDNA is treated with a restriction endonuclease to generate compatible ends for annealing and ligation.
 2. mRNA is isolated from the cell and converted back into double-stranded sequences using reverse transcriptase to generate complementary DNA.
 3. The RNA-DNA hybrid is treated with a nuclease to cleave the RNA strand, producing RNA fragments.
 4. Reverse transcriptase completes the single-stranded cDNA when it reaches the 5' end of the mRNA transcript.
 5. RNA fragments serve as primers for DNA synthesis of the second strand of cDNA using DNA polymerase.
 - A) 4, 2, 1, 5, 3
 - B) 2, 4, 3, 5, 1
 - C) 2, 3, 5, 4, 1
 - D) 3, 2, 5, 4, 1
 - E) 2, 4, 1, 5, 3
3. Which amino acid is often referred to as a "helix-breaker" due to its absence from α -helices but is often found in structures such as β -turns?
 - A) Val
 - B) Met
 - C) Pro
 - D) Phe
 - E) Leu
4. Which of the following mutations is correctly defined?
 - A) silent: change of a single base in the non-coding intron region of a gene
 - B) missense: substitution of a single base results in a premature stop codon
 - C) nonsense: substitution of a single base results in a complete change of amino acid sequence

- D) frameshift: deletion of a single base results in a single amino acid change
E) permissive: results in a protein that has greater thermodynamic stability
5. An N-linked glycan would be attached to _____ while an O-linked glycan would be attached to _____.
- A) Asn; Ser
B) Lys; Tyr
C) Gln; Thr
D) Arg; Ser
E) Lys; Ser
6. The fatty acid designated 18:2 Δ 9,12 is best described as a _____ fatty acid.
- A) saturated
B) unsaturated
C) polyunsaturated
D) hydrogenated
E) partially hydrogenated
7. Which of the following mechanisms of membrane transport is correctly defined?
- A) simple diffusion: uses concentration gradient to move highly polar molecules and ions across membranes
B) facilitated diffusion: uses proteins such as ion channels to move substances against their concentration gradient across a membrane
C) primary active transport: uses ATP hydrolysis to move ions against their concentration gradient across a membrane
D) secondary active transport: uses ATP hydrolysis along with an ion gradient to move polar molecules or ions against their concentration gradient across a membrane
E) all of the above
8. Which of the following represents a correct compartmentation of a biochemical process with its cellular location?
- A) fatty acid oxidation: endoplasmic reticulum
B) RNA synthesis: Golgi complex
C) citric acid cycle: mitochondria
D) gluconeogenesis: lysosome
E) none of the above
9. Which of the following glycolytic reactions is freely reversible?
- A) triose phosphate isomerase
B) phosphofructokinase
C) hexokinase
D) pyruvate kinase
E) none of the above
10. The oxidation reactions that convert pyruvate to CO₂ are specifically catalyzed by _____ enzymes.
- A) oxygenase

- B) oxidase
 - C) decarboxylase
 - D) dehydrogenase
 - E) none of the above
11. Which of the following types of tissue can use glucose, but not fatty acids, as a source of fuel?
- A) skeletal muscle
 - B) cardiac muscle
 - C) liver
 - D) adipose
 - E) brain
12. Which of the following is the regulatory step in cholesterol synthesis?
- A) HMG-CoA synthase
 - B) HMG-CoA lyase
 - C) HMG-CoA reductase
 - D) squalene synthase
 - E) squalene epoxidase
13. In most cases, the first codon in prokaryotic mRNA codes for _____ while the first codon in eukaryotic mRNA codes for _____.
- A) methionine; N-formylmethionine
 - B) N-formylmethionine; methionine
 - C) proline; N-formylproline
 - D) N-formylproline; proline
 - E) none of the above
14. High concentration of CI protein in the cell _____ expression of the _____.
- A) prevents; lytic promoter
 - B) allows; lytic promoter
 - C) prevents; trp operon
 - D) allows; attenuator sequence
 - E) prevents; lysogenic cycle
15. Which are paired by a Shine-Dalgarno sequence?
- A) the 30S subunit with the 50S subunit of the ribosome
 - B) the first codon of the mRNA with its tRNA
 - C) a termination codon with a release factor
 - D) the mRNA sequence just upstream from the start codon with the ribosome
 - E) none of the above

II Essay (40%)

1. List the three temperature phases of the PCR cycle and explain what occurs during each. (10%)

2. Please describe an example of how to create a transgenic animal. (10%)

3. Please describe the general concepts of the following methods: (20%)

A. SDS PAGE

B. Chip (Chromatin Immunoprecipitation)

C. DNA microarray

D. Western Blot

E. RNAi (RNA interference)