

國立暨南國際大學九十二學年度碩士班研究生入學考試試題

第 1 節生物化學 適用:(應化所 445)

(本試題共 5 頁, 第 1 頁)

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, 並限以藍黑色筆作答。

3. 試題隨卷繳回。(餘請詳閱試場規則)

I. Multiple Choice (75%)

1. Which of the coenzyme is required for the conversion of pyruvate to oxaloacetate?
 - a) Vitamin B₆
 - b) Biotin
 - c) Ascorbic acid
 - d) Flavin adenine dinucleotide
2. The function of enzyme is to change:
 - a) Concentration of reactants
 - b) Concentration of products
 - c) Entropy of the reaction
 - d) Rate of the reaction
3. What is the term used when RNA molecules demonstrate catalytic activity?
 - a) Exonuclease
 - b) Endonuclease
 - c) Ribonuclease
 - d) Ribozyme
4. Before proteins secrete out of a cell, where is the place for them to sort and package?
 - a) Endosome
 - b) Lysosome
 - c) Endoplasmic reticulum
 - d) Golgi net work
5. For the signal transduction, which enzyme is activated by diacylglycerol?
 - a) Phosphorylase
 - b) Aconitase
 - c) Protein kinase C
 - d) Protein kinase A
6. What are the major components of very low density lipoprotein (VLDL) and high density lipoprotein (HDL) carried except protein?
 - a) VLDL: cholesterol. HDL: triacylglycerol
 - b) VLDL: triacylglycerol. HDL: cholesterol
 - c) VLDL: squalene. HDL: cholesterol
 - d) VLDL: squalene; HDL: phospholipid
7. Which of the following enzyme is required to catalyze the formation of cholesterol ester?
 - a) Cholesterol ester transfer protein
 - b) Lecithin:cholesterol acyltransferase
 - c) Microsomal triglyceride transfer protein
 - d) Tyrosine kinase

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(本試題共 5 頁，第 2 頁)

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8. How many moles of ATP will be generated as a result of the oxidation of one mole of NADH in an actively respiring?
- a) 0
b) 1.0
c) 2.0
d) 3.0
9. Which of the statement about aromatic amino acid is correct?
- a) On a molar base, tryptophan absorbs more ultraviolet light than tyrosin
b) The major contribution to the characteristic absorption of light at 280 nm by protein is the phenylalanine R group.
c) Histidine's ring structure results in its being categorized as aromatic or basic amino acid, depending on pH.
d) The presence of a ring structure in its R-group determines whether an amino acid is aromatic or not.
10. Which of the following process is not occurred in mitochondria of mammalian cells?
- a) TCA cycle
b) Fatty acid biosynthesis
c) DNA synthesis
d) Protein synthesis.
11. The Michaelis constant (K_m) is:
- a) Not changed by the presence of a noncompetitive inhibitor.
b) The substrate concentration at $V = 1/2 V_{max}$.
c) The intercept on the e/v axis of a Lineweaver-Burk plot.
d) Equal to $1/2 V_{max}$
12. In the mechanism of activation of glycogenolysis in liver via the alpha-adrenergic receptor, the increased concentration of intracellular inositol trisphosphate (IP_3) leads to a release of Ca^{2+} from:
- a) Lysosome
b) Nucleus
c) Golgi apparatus
d) Smooth endoplasmic reticulum
13. All of the following are true of the TCA cycle except which one?
- a) It begins with the condensation of acetyl CoA and oxaloacetic acid.
b) If the cycle begins with one mole of oxaloacetic acid and one mole of acetyl CoA, one mole of oxaloacetic acid will be regenerated.
c) The cycle directly requires molecular oxygen in one of its enzymatic reactions.
d) The cleavage of two thioester linkages helps drive the cycle to make it exergonic.

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3. 試題隨卷繳回。(餘詳詳閱試場規則)

14. A mutant specie of *E. coli* lacking of DNA polymerase I is deficient in DNA:

- a) Transcription
- b) Methylation
- c) Repair
- d) Degradation

15. DNA synthesis is occurred in what step of cell cycle:

- a) G₀
- b) G₁
- c) S
- d) G₂

16. What is the function of "zinc fingers"?

- a) A enzyme active binding site
- b) An active transporter for molecular exchange
- c) A structural motif for DNA binding
- d) A structural motif for RNA binding

17. Which of the following mechanisms is not involved in gene expression?

- a) Methylation of cytosine nucleotide
- b) Intron splicing
- c) Use of alternative promoters
- d) Mutation of consensus sequences

18. During RNA synthesis, the DNA template sequence 5'-TpApGpCp-3' would be transcribed to produce which of the following RNA sequences?

- a) 5'-ApUpCpGp-3'
- b) 5'-GpCpTpAp-3'
- c) 5'-GpCpUpAp-3'
- d) 5'-ApTpCpGp-3'

19. Prokaryotic DNA polymerase III:

- a) Contains a 5' → 3' proofreading activity to improve the fidelity of replication.
- b) Synthesizes DNA 3' → 5'.
- c) Has a beta subunit that acts as a circular clamp to greatly improve the processivity of DNA synthesis.
- d) Synthesizes only the leading strand; DNA polymerase I synthesizes the lagging strand.

20. The repair of cyclobutane pyrimidine dimers by bacterial DNA photolyase involves the cofactor:

- a) FADH⁺
- b) Coenzyme A.
- c) Thiamine pyrophosphate (TPP)

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d) Coenzyme Q

21. In homologous recombination in *E. coli*, the protein that moves along a double-stranded DNA, unwinding the strands ahead of it and rewinding those behind it, is:

- a) RecA protein.
- b) RuvC protein (resolvase)
- c) *chi*.
- d) RecBCD enzyme.

22. The Ames test is used to:

- a) Measure the potency of antibiotics.
- b) Quantify the damaging effects of UV light on DNA molecules.
- c) Detect bacterial viruses.
- d) Measure the mutagenic effects of various chemical compounds.

23. The role of the Dam methylase is to:

- a) Remove a mismatched nucleotide from the template strand.
- b) Replace a mismatched nucleotide with the correct one.
- c) Tag (methylate) the template strand for recognition by repair systems.
- d) Add a methyl group to uracil, converting it to thymine.

24. The fuel for skeletal muscle is:

- a) Fatty acid.
- b) Ketone bodies.
- c) Glucose.
- d) All of the above are correct.

25. RNA polymerase:

- a) Separates DNA strands throughout a long region of DNA (up to thousands of base pairs), then copies one of them.
- b) Has a subunit called λ , which acts as a proofreading ribonuclease.
- c) Binds tightly to a region of DNA thousands of base pairs away from the DNA to be transcribed.
- d) Can synthesize RNA chains de novo (without a primer).

II. Assay (25%)

1. Describe the sequence of events in the initiation of transcription by *E. coli* RNA polymerase.
2. Describe the mechanistic difference that distinguishes the splicing of group I introns from that of group II introns.
3. Beginning with the primary transcript containing a tRNA sequence, describe the steps in the formation of a mature tRNA molecule in *E. coli*.
4. You have isolated a fragment of viral DNA that totally encodes at least two proteins, 120 and 80 amino acids long. The DNA fragment is 400 base pairs long. (a) Why might you

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consider this unusual? (b) You sequence the two proteins and find no sequence homology. Propose a model to account for these findings.

5. The citric acid cycle is frequently described as the major pathway of aerobic catabolism, which means that it is an oxygen-dependent degradative process. However, none of the reactions of the cycle directly involves oxygen as a reactant. Why is the pathway oxygen-dependent?

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