

科目：生物化學

系所組：基礎醫學研究所

一、單選題（共60分，每題2分）

- Ninhydrin has all these properties EXCEPT:
 - It reacts with an amino acid by oxidatively deaminating its amino group.
 - It can be used to detect the location of amino acids following chromatography.
 - It produces a yellow product upon reaction with histidine.
 - It can be used to quantify most amino acids.
- What is the overall net charge on the peptide lys-lys-ser-glu at pH 7.0?
 - +2
 - +1
 - 0
 - 1
- Tertiary structure is defined as:
 - the sequence of amino acids.
 - the folding of a single polypeptide chain in three-dimensional space.
 - hydrogen bonding interactions between adjacent amino acid residues into helical or pleated segments.
 - the way in which separate folded monomeric protein subunits associate to form oligomeric proteins.
- Which of the following statements correctly identifies a type II restriction endonuclease?
 - They work on both DNA and RNA.
 - They recognize a palindromic sequence and cut before the palindromic sequence.
 - The result of this endonuclease is blunt ends.
 - They cut DNA only at sites in specific nucleotide sequences with a two-fold axis of symmetry.
- All of the following are characteristics for in vitro DNA synthesis EXCEPT:
 - DNA polymerase adds nucleotides in a 5' → 3' direction.
 - The primer strand of DNA determines the nucleotides added.
 - Correct hydrogen bonding is the primary check of the newly synthesized DNA.
 - A primer strand must contain a free 3'-OH.
- RT-PCR differs from basic PCR in that:
 - reverse temperatures are used for annealing and transcription.
 - transcription is reversed from 5' to 3' ends.
 - reverse transcriptase is used to synthesize a cDNA strand complementary to an RNA strand.
 - reverse transcriptase is used to synthesize an RNA strand from the DNA strand.
- When every enzyme molecule in the reaction mixture has its substrate-binding site occupied by substrate, the kinetics become _____-order, and the velocity is _____.
 - zero; V_{max}
 - first; V_{max}
 - first; $V_{max}/2$
 - zero; $V_{max}/2$
- The catalytic triad common to many serine proteases involves:
 - ser-his-asp
 - his-ser-asp
 - ser-his-his
 - ser-asp-his
- All of the following are characteristics of hemoglobin's binding of oxygen EXCEPT:
 - CO_2 promotes dissociation of O_2 from hemoglobin by lowering the pH.
 - Protons promote binding of oxygen by Hb.
 - 2,3-Bisphosphoglycerate (BPG) promotes release of O_2 by Hb.
 - CO_2 can bind with Hb's free amino groups and stabilize deoxy-Hb.

※ 注意：1. 考生須在「彌封答案卷」上作答。

2. 本試題紙空白部份可當稿紙使用，試題須隨答案卷繳回。

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10. Which of the following is an essential amino acid?
A) proline B) valine C) glutamine D) aspartate
11. What is the common product of purine catabolism?
A) xanthine B) uric acid C) inosine D) hypoxanthine
12. DNA is replicated by a _____ mechanism.
A) dispersive B) conservative C) semiconservative D) semidispersive
13. The DNA-binding proteins that recognize and accurately initiate transcription at specific eukaryotic promoter sequences are called:
A) Enhancers. B) transcription factors.
C) response elements. D) chromatin-remodeling complexes.
14. Protein synthesis in bacterial cells usually starts with a:
A) methionine residue. B) formylmethionine residue.
C) cysteine residue. D) phenylalanine residue.
15. Which amino acid in a protein targeted for destruction is most commonly the receptor for ubiquitin?
A) Ser B) Lys C) Asn D) Tyr
16. In animals, the bulk of energy is stored as _____.
A) fatty acids B) triacylglycerols C) glycogen D) waxes
17. Which of the following explains the importance of sucrose as a disaccharide?
A) the glycosidic bond is much more stable than a typical glycosidic bond
B) the presence of two glucose residues provides a readily available glucose source
C) β -glycosidic bonds are much more stable than α -glycosidic bonds
D) since both anomeric carbons are involved in the glycosidic bond, oxidation is limited
18. The following sugar is also called blood sugar:
A) Fructose B) Glucose C) Lactose D) Sucrose
19. A flippase is an enzyme that moves lipids from one side of a lipid bilayer to another in order to maintain the concentrations of specific lipids on each side of the bilayer. Which of the following can be said regarding the reaction of the flippase enzyme?
A) it works against a concentration gradient and requires ATP
B) it works against a concentration gradient but does not require ATP
C) it works with a concentration gradient and requires ATP
D) it works with a concentration gradient but does not require ATP
20. Which of the following would most likely move across a membrane by simple diffusion?
A) potassium ions B) glucose C) carbon dioxide D) sodium ions
21. Molecules that are produced inside a cell in response to a hormone binding to its receptor are called _____.
A) primary messengers B) second messengers
C) transduction messengers D) intracellular messengers

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22. During aerobic glycolysis, pyruvate is most likely oxidized to _____ while in anaerobic glycolysis, pyruvate is converted to _____.
- A) acetaldehyde; ethanol B) acetyl CoA; glyceraldehyde
C) acetyl CoA; lactate D) acetaldehyde; lactate
23. In the vertebrate liver, which major regulatory point is bypassed during fructose metabolism, often leading to conversion of excess fructose into fat?
- A) hexokinase B) phosphofructokinase
C) glyceraldehyde-3-phosphate dehydrogenase D) pyruvate kinase
24. In its non-phosphorylated state, glycogen phosphorylase can be activated by which of the following molecules?
- A) ATP B) glucose-6-phosphate C) glucose D) AMP
25. What is the link between glutathione and the pentose phosphate pathway (PPP)?
- A) during the oxidative phase, thiol groups on glucose-6-phosphate dehydrogenase become oxidized and must be reduced by glutathione
B) glutathione acts as an inhibitor of glucose-6-phosphate dehydrogenase
C) NADPH from the PPP is needed to keep glutathione in its reduced state
D) phosphopentose epimerase often produces free radicals that are quenched by glutathione
26. Which of the following is an inhibitor of citrate synthase, isocitrate dehydrogenase, and α -ketoglutarate dehydrogenase?
- A) NADH B) succinyl-CoA C) ATP D) acetyl-CoA
27. Which of the following uses the energy of the proton gradient to drive transport of its substrates?
- A) ADP/ATP carrier B) phosphate translocase in symport mode
C) phosphate translocase in antiport mode D) all of the above
28. Which of the following roles does the liver play in lipoprotein metabolism?
- A) production of chylomicrons B) uptake of VLDL
C) production of LDL D) uptake of HDL
29. The primary activation of triacylglycerol mobilization in adipocytes is through _____ of the enzyme _____.
- A) phosphorylation; perilipin
B) phosphorylation; hormone sensitive lipase
C) dephosphorylation; hormone sensitive lipase
D) phosphorylation; adipose triglyceride lipase
30. 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

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二、問答題。(40%)

1. What are the amino acids with cyclic structures? (4%)
2. Please explain what is "salvage pathway" in nucleotide biosynthesis? (4%)
3. Please describe what is "yeast two-hybrid system"? (5%)
4. What are the enzymatic activities found in prokaryotic DNA polymerase I? (3%)
5. Please explain the mechanism of "allopurinol" in gout treatment? (4%)
6. What is the role of HIF (hypoxia inducing factor) to increase the rate of glycolysis in tumors? (4%)
7. Please describe briefly about the difference of starch and glycogen, including the structures and functions. (4%)
8. How is the ATP-synthase to produce the ATP by conformation changing? (4%)
9. Please describe detail about the major functions of citric acid cycle? (4%)
10. Please describe briefly about the functions and composition of ketone bodies? (4%)

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