亞洲大學

97 學年度碩士班入學招生考試試題紙

學系別	考試科目	考試日期	時　　間
生物資訊學系碩士班	生物化學(A-3)	97.4.26	15:50-17:30

一、單選題 (60%)

1. Living systems are:
   a. closed systems exchanging only energy with the surroundings.
   b. isolated systems that are totally contained.
   c. open systems exchanging only energy with the surroundings.
   d. open systems exchanging both energy and matter with their surroundings.
   e. none of the above.
2. The amino and carboxyl groups of amino acids react in a head-to-tail fashion, eliminating water, and forming a covalent _____ linkage typically referred to as a _____bond.
   a. ester, aromatic
   b. anhydride, phosphoanhydride
   c. amide, peptide
   d. dehydration, hydrogen
   e. none of the above
3. Which of the following amino acids has more than one chiral carbon?
   a. serine
   b. lysine
   c. threonine
   d. cysteine
   e. aspartic acid
4. The amino acid with a side-chain pK_a near neutrality and which therefore plays an important role as proton donor and acceptor in many enzyme catalyzed reactions is:
   a. histidine.
   b. cysteine.
   c. proline.
   d. serine.
   e. methionine.
5. The peptide bond has partial _____ character.
   a. hydrogen bond
   b. double bond
   c. triple bond
   d. van der Waals bond
   e. all of the above

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6. Proteins with two different polypeptide chains are:
   a. monomeric proteins.
   b. trimeric proteins.
   c. homodimeric proteins.
   d. heterodimeric proteins.
   e. none of the above.
7. Tertiary structure is defined as:
   a. the sequence of amino acids.
   b. the folding of a single polypeptide chain in three-dimensional space.
   c. hydrogen bonding interactions between adjacent amino acid residues into helical or pleated segments.
   d. the way in which separate folded monomeric protein subunits associate to form oligomeric proteins.
   e. all are true.
8. _____ is an example of a disulfide-rich protein.
   a. Insulin
   b. Glyceraldehydes-3-phosphate dehydrogenase
   c. Hemoglobin
   d. Triose phosphate isomerase
   e. All are true.
9. All are structural and functional advantages to quaternary structure EXCEPT:
   a. cooperativity.
   b. stability.
   c. bringing catalytic sites together.
   d. genetic economy and efficiency.
   e. all are true.
10. _____ amino acids are almost never found in the interior of a protein, but the protein surface may consist of _____ amino acids.
    a. Nonpolar, both polar and nonpolar
    b. Nonpolar, mostly nonpolar
    c. Polar, both polar and nonpolar
    d. Polar, only polar
    e. Polar, only nonpolar

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11. Liposomes are all EXCEPT:
    a. used to introduce contrast agents into the body for diagnostic imaging procedures.
    b. able to fuse with cells.
    c. highly stable structures.
    d. possible to prepare with different inside and outside solutions.
    e. all are true.
12. The anion transporter of erythrocytes exchanges HCO_3^- for _____ and operates by _____ .
    a. Cl-; facilitated diffusion
    b. Cl-; active transport
    c. HPO42-; facilitated diffusion
    d. CO2; active transport
    e. HPO42-; passive diffusion
13. How do catalysts work to accelerate a chemical reaction?
    a. They raise the average energy of the reactants.
    b. They provide a means of acceleration by being completely consumed in the reaction.
    c. They lower the energy of activation.
    d. They lower the overall free energy change of the reaction.
    e. They raise the overall free energy change of the reaction.
14. When every enzyme molecule in the reaction mixture has its substrate-binding site occupied by substrate, it is considered _____, the kinetics is _____-order, and the velocity is _____.
    a. complementary; zero; Vmax
    b. inhibited; first; Vmax/2
    c. saturated; first; Vmax/2
    d. saturated; zero; Vmax
    e. inhibited; zero; Vmax
15. In transforming the Michaelis-Menten equation into a straight line equation, y = mx + b, the Lineweaver-Burk double reciprocal plot, which of the following is NOT a true representation?
    a. slope = Km/Vmax
    b. y-intercept is 1/Vmax
    c. x-intercept is 1/Km
    d. y = 1/V
    e. x = 1/[S]

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16. Penicillin is an example of a mechanism-based enzyme inactivator and is a(n):
    a. competitive inhibitor.
    b. noncompetitive inhibitor.
    c. suicide substrate.
    d. uncompetitive inhibitor.
    e. none of the above.
17. The initial bond formation in the covalent intermediate in the chymotrypsin catalyzed reaction is between:
    a. serine and the carbonyl carbon in the peptide backbone.
    b. serine and the nitrogen in the peptide backbone.
    c. histidine and the carbonyl carbon in the peptide backbone.
    d. histidine and the nitrogen in the peptide backbone.
    e. aspartate and the carbonyl carbon in the peptide backbone.
18. Proinsulin is converted into insulin by:
    a. proteolytic excision of a specific peptide.
    b. allosteric binding of glucose.
    c. phosphorylation to the active form.
    d. removal of phosphate by converter enzymes.
    e. none of the above.
19. When binding one equivalent of S to an allosteric protein enhances the binding of additional equivalents of S to the same protein molecule, it is termed a(n):
    a. negative heterotropic effector.
    b. positive homotropic effector.
    c. positive heterotropic effector.
    d. negative homotropic effector.
    e. none of the above.
20. Fetal hemoglobin (Hb F) has an intrinsically greater affinity for O_2 than adult hemoglobin (Hb A) because:
    a. Hb F has a diminished capacity to bind BPG compared to Hb A.
    b. Hb A has a greater affinity for oxygen than does Hb F.
    c. BPG binds Hb F with greater affinity than it binds Hb A.
    d. The pH of fetal blood is less than the pH of maternal blood.
    e. All of the above are correct.

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21. The structure of DNA must be in the _____ for transcription to occur.
    a. closed promoter complex
    b. biphasic promoter complex
    c. open promoter complex
    d. all of the above e. none of the above
22. The actual three-dimensional structure of tRNA is
    a. L-shape.
    b. cloverleaf.
    c. twisted triple helix.
    d. all of the above.
    e. none of the above.
23. Many DNA binding proteins, including the CAP and lac repressor, contain a(n) _____ in their structure.
    a. helix-turn-helix motif
    b. acid blob motif
    c. zinc finger motif
    d. all of the above
    e. none of the above
24. All are characteristics of Okazaki fragments EXCEPT:
    a. newly synthesized short lagging strand fragments
    b. synthesis performed in the 5'→3' direction
    c. initiated with an RNA primer
    d. about 20-30 nucleotides in length
    e. binds anti-parallel to the template strand
25. The enzyme that removes the RNA primer from the Okazaki fragment is:
    a. DNA polymerase I
    b. DNA ligase
    c. Helicase
    d. DNA polymerase III
    e. DNA gyrase

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26. All are properties of DNA polymerase III EXCEPT:
    a. It is responsible for incorporating most of the nucleotides in the lagging strand
    b. It synthesizes most of the leading strand prior to aiding in the synthesis of the lagging strand
    c. It contains a 3' to 5' exonuclease activity
    d. It is a large protein complex containing more than five subunits
    e. Much greater processivity than DNA polymerase I
27. The β oxidation of myristyl-CoA (C-14:0) yields
    a. 7 Acetyl-CoA + 7 FADH2 + 7 NADH + 7 H+
    b. 6 Acetyl-CoA + 7 FADH2 + 7 NADH + 7 H+
    c. 7 Acetyl-CoA + 6 FADH2 + 6 NADH + 6 H+
    d. 7 Acetyl-CoA + 7 FAD + 7 NAD+
    e. 14 Acetyl-CoA + 12 FADH2 + 12 NADH + 12 H^+
28. In the urea cycle, the carbon skeleton of aspartate is preserved as
    a. succinate.
    b. fumarate.
    c. urea.
    d. all of the above.
    e. none of the above.
29. Fructose can enter glycolysis at two distinct points, depending on the tissue. How is fructose metabolized in adipose tissue?
    a. Fructose is cleaved to two molecules of GAP.
    b. Fructose is converted to fructose-1-phosphate.
    c. Fructose is converted to fructose-6-phosphate.
    d. Fructose is cleaved to GAP and DHAP.
    e. Fructose is converted to glucose, which enters the pathway.
30. What molecule initiates the citric acid cycle by reacting with oxaloacetate?
    a. pyruvate
    b. acetyl CoA
    c. oxaloacetate
    d. All of the above.
    e. None of the above.

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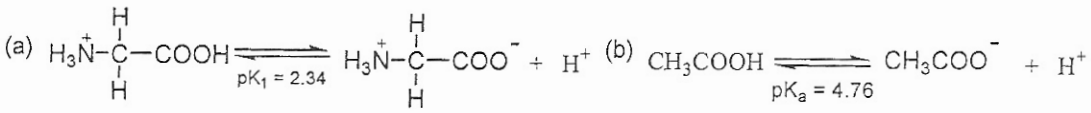
二、簡答題 (40%)

1. 阿斯巴甜(Aspartame)是由哪二種氨基酸組成？ (10%)

2. 哪一種遺傳疾病不能飲用含有阿斯巴甜的飲料？(10%)

3. 下列 (a)、(b)的酸解離方程式中，解釋(a)、(b) 中pK_1及pKa值為何不同？(10%)



4. 血紅蛋白質(Hemoglobin)由四亞單元 $\alpha_2\beta_2$ 組成。鐮刀型貧血症(Sickle-Cell Anemia)形成的原因是其中哪一條 polypeptide chain 的第幾個胺基酸被取代掉？由哪一胺基酸被取代成哪一胺基酸？(10%)

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