亞洲大學

107 學年度學士後獸醫學系招生考試試題紙

學系別	考試科目	考試日期	時　　間
學士後獸醫學系	生物化學	**107.04.21**	**13:30-15:00**

1. When NaCl salt dissolve in water, which one of the following conditions is favorable?
   A. Increase of osmotic pressure
   B. Decrease of entropy
   C. Hydration of Na^+ and Cl^-
   D. Breaking of NaCl crystal
2. When ammonia gas (NH_3) dissolves in water, what interaction(s) does **not** favor the formation of ammonium ion (NH_4^+)?
   A. H-bonds　B. Dipole-dipole & dipole-charge interactions
   C. Hydrophobic interaction　D. A. and B.
3. What molecular factor(s) drives the formation of micelles when fatty acids are dissolved into water?
   A. Reduction of water-oil interface　B. Hydrophobic interaction　C. Increase in entropy
   D. All of the above
4. Acetic acid has a pKa of 4.76, but at pH5.76 what is the ratio of the conjugated acid (CH_3COOH) to the conjugated base (CH_3COO^-)?
   A. 1:100　B. 100:1　C. 1:10　D. 10:1
5. Which amino acids carry a positive charge at pH 7?
   A. Arg, His, Lys　B. Asp, Glu　C. Asn, Gln
   D. None of the above
6. Which amino acids are not aromatic but have a ring structures in its side chain?
   A. Phe, Tyr, Trp　B. Tyr, Ser, Thr　C. His, Pro　D. None of the above
7. Which amino acids have a secondary hydroxyl group that can be phosphorylated?
   A. Serine　B. Threonine　C. Tyrosine　D. Cysteine
8. Which amino acids have a functional sulfhydryl group in it?
   A. Met　B. Cys　C. Thr　D. Tyr
9. During the separation of protein molecules, which method will have smaller molecules being eluted out late?
   A. SDS-PAGE　B. Affinity chromatography
   C. Ion exchange　D. Size exclusion (gel filtration)
10. Given a polyalanine of 15 residues long, what kind of structure would you expect it to be in neutral solution?
    A. α-helix　B. β-sheet　C. β-turns　D. Random coils
11. When a polymer of 18-residue forms an α-helix, how many repeats would you expect it to be?
    A. 3　B. 5　C. 7　D. 9
12. How many cycle repeats would you expect to find from a β-sheet of 18 residues long?
    A. 5　B. 7　C. 9　D. 11
13. What amino acid residues are most likely to be found at type I or type II β-turns?
    A. Ala　B. Gly　C. Pro　D. Gly or Pro
14. Which cofactor is required during the formation of collagen?
    A. Retinol　B. Tocopherol　C. Ascorbate　D. Calcitriol
15. Which amino acid residues are more likely to be found at the N-terminus of an α-helix?
    A. D or E　B. H, K, or R　C. H, L, or R　D. N or Q
16. What kind of protein secondary structure is human hair made of?
    A. α-helix　B. β-sheet　C. β-turns　D. Random coils
17. What kind of protein secondary structure is spider silk made of?
    A. α-helix　B. β-sheet　C. β-turns　D. Random coils
18. What proteins are involved in protein folding?
    A. Ribonuclease A　B. Myoglobulin　C. Chaperonins and Chaperone proteins　D. None of the above

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19. Which protein denaturant can unfold a protein reversibly?
    A. Acid or alkaline　B. Organic solvent　C. Urea or guanidinium　D. All of the above
20. What forces drive the formation of protein tertiary structure?
    A. Hydrophobic interaction　B. Electrostatic interaction　C. H-bonds　D. All of the above
21. Which statement regarding to enzymes below is incorrect?
    A. Most enzymes are proteins.
    B. Enzymes favor the formation of products.
    C. Enzymes catalyze the reactions by lowering the activation energy.
    D. A. and C.
22. Which statement about enzymes below is correct?
    A. An enzyme has specificity toward its substrates.
    B. An enzyme binds to the substrate better than the product.
    C. Enzymes have active sites that bind to products poorly.
    D. All of the above.
23. An enzyme will have higher affinity for which one of the following?
    A. The substrate　B.The reaction intermediate　C. The product　D. None of the above
24. How does an enzyme lower the reaction activation energy?
    A. By lowering the entropy
    B. By binding to the substrate firmly
    C. By providing an active site that best fits the reaction intermediate
    D. By desolvation of the substrate
25. Regarding to inhibition mechanisms, which statement below is correct?
    A. If the inhibitor binds to the active site, it is a competitive inhibitor.
    B. If the inhibitor binds to the enzyme/substrate complex only, it is an uncompetitive inhibitor.
    C. If the inhibitor binds to the free enzyme as well as the enzyme/substrate complex, it is a noncompetitive inhibitor.
    D. All of the above.
26. With an enzyme following Michaelis behavior, what initial velocity would you expect, when the substrate concentration is twice that of its K_m?
    A. 0.5 V_{max}　B. 0.667 V_{max}　C. 0.75 V_{max}　D. 0.9 V_{max}
27. If an enzyme has a V_{max} of 10 unit and its K_m is 8 mM, how fast can the enzyme catalyze the reaction if the substrate concentration is 4 mM?
    A. 2 unit　B. 3.33 unit　C. 5 unit　D. 6.67 unit
28. Which type of inhibitor will a minimal impact on the enzyme's K_m ?
    A. Competitive　B. Un-competitive　C. Mixed type　D. Non-competitive
29. Which type of inhibitor will a minimal impact on the enzyme's V_{max}?
    A. Competitive　B. Un-competitive　C. Mixed type　D. Non-competitive
30. When a protein is hydrolyzed with strong alkaline, which amino acids will be underestimated?
    A. N & Q　B. E & N　C. D & Q　D. D & E
31. Which nucleosides below contain both purines?
    A. C, T　B. C, G　C. A, G　D. A, T
32. Which nucleoside occurs rarely in RNA?
    A. Thymidine　B. Uridine　C. Cytodine　D. Guanosine
33. Which part of nucleotide determines if it is DNA or RNA?
    A. Purines　B. Pyrimidines　C. Ribose　D. Phosphoanhydrides

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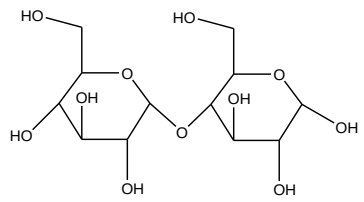
34. Which part of ATP contributes to its energy charge?
    A. Purines　B. Pyrimidines　C. Ribose　D. Phosphoanhydrides
35. Which one of the following is not a purine?
    A. Adenine　B. Cytosine　C. Guanine　D. Inosine
36. Which nucleotide pairing is more stable than the rest?
    A. dC, dG　B. dA, dT　C. G, U　D. Hoogsteen pair
37. Which molecule below is most likely to form hair-pin structures
    A. dsDNA　B. mRNA　C. ssRNA　D. palindromic sequence
38. What factors may affect the melting temperature of DNA
    A. Nucleotide length　B. C, G content　C. Salt concentration　D. All of the above
39. With uv light exposure, what DNA damage is likely to form?
    A. de-purination　B. de-amination　C. thymine dimer　D. cytosine dimer
40. Which statement(s) below regarding to double stranded DNA is/are correct?
    A. All DNA are right handed
    B. When dsDNA anneal, the uv absorbance increases.
    C. When dsDNA anneal, the initial pairing is the slowest step.
    D. All of the above.
41. What is this disaccharide?



    A. Sucrose
    B. Lactose
    C. Maltose
    D. None of the above
42. Under anaerobic condition, when one molecule of glucose is degraded to 2 pyruvates, how many NADH and ATP would be generated during the process?
    A. No NADH but 2 ATP
    B. 2 NADH but 4 ATP
    C. 2 NADH but 2 ATP
    D. One NADH and one ATP
43. Assuming 1 ($NADH + H^+$) can generate 2.5 ATP, and 1 $FADH_2$ can generate 1.5 ATP in the electron transport chain mitochondia, how many high energy phosphoric anhydrides (ATP & GTP) can be generated with a pyruvate?
    A. 11.5 ATP/GTP
    B. 12.5 ATP/GTP
    C. 14 ATP/GTP
    D. 15 ATP/GTP
44. Which enzyme(s) in Krebs cycle require(s) thiamine pyrophosphate (TPP) as a cofactor?
    A. Pyruvate Dehydrogenase
    B. α-Ketoglutarate Dehydrogenase
    C. Glyceraldehyde 3-phosphate Dehydrogenase
    D. A. and B.

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45. Which enzyme(s) in mitochondria require a lipoic acid as a cofactor?
    A. Pyruvate Dehydrogenase
    B. Isocitrate Dehydrogenase
    C. α-Ketoglutarate Dehydrogenase
    D. A. and C.
46. Which enzyme(s) in the TCA Cycle do(es) not generate NADH + H^+?
    A. Isocitrate Dehydrogenase
    B. α-Ketoglutarate Dehydrogenase
    C. Succinate Dehydrogenase
    D. Malate Dehydrogenase
47. Which enzyme(s) is/are unique to glyoxylate cycle?
    A. Citrate Synthase
    B. Isocitrate Lyase
    C. Malate Synthase
    D. B. and C.
48. Which enzyme(s) in the glycogen synthesis Rx is/are highly regulated?
    A. UDP-glucose pyrophosphorylase
    B. Glycogen Synthase
    C. Branching enzyme
    D. All of the above
49. Which enzyme(s) in the glycogen degradation Rx is/are highly regulated?
    A. Glycogen phosphorylase
    B. Glycan transferase
    C. Debranching enzyme
    D. All of the above
50. Which one of the following is the direct product of glycogen phosphorylase?
    A. Glucose 6-phosphate
    B. Glucose 1-phosphate
    C. Glucose 4-phosphate
    D. Glucose
51. When lactic acids undergo gluconeogenesis, how many high energy phosphate units (e.g., ATP) are needed per glucose generated?
    A. 2　　B. 4　　C. 6　　D. 8
52. Which one of the following is the primary regulated enzyme in gluconeogenesis?
    A. Pyruvate carboxylase
    B. Phosphoenolpyruvate caroboxylase (PEPCK)
    C. Pyruvate kinase
    D. All of the above
53. Which one of the following is the most potent metabolite at regulating glycolysis/gluconeogenesis?
    A. Glucose 6-phosphate
    B. Fructose 6-phosphate
    C. Fructose 1,6-bisphosphate
    D. Fructose 2,6-bisphosphate

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54. In Cori cycle, what Rx takes place at liver and muscle, respectively?
    A. Anaerobic glycolysis in muscle and gluconeogenesis in liver
    B. Gluconeogenesis in muscle and glycolysis in liver
    C. Oxidative phosphorylation in muscle and glycolysis in liver
    D. Oxidative phosphorylation in muscle and gluconeogenesis in liver
55. How many NADPH + H^+ were generated when a glucose undergoes the phosphopentose pathway to generate a ribose 5-phosphate?
    A. 1　B. 2　C. 3　D. 4
56. Which complex in the electron transport chain oxidizes coenzyme Q?
    A. Complex I　B. Complex II　C. Complex III　D. All of the above
57. Which complex in the electron transport chain does not transfer protons to the intermembrane space in the mitochondria?
    A. Complex I　B. Complex II　C. Complex III　D. Complex IV
58. How many high energy protons are required to generate an ATP by complex V within the mitochondrial matrix?
    A. 1.5　B. 2.5　C. 3　D. 10
59. How many high energy proton(s) is/are required to transport an ATP from the mitochondrial matrix to the cytosol?
    A. 1　B. 2　C. 3　D. 4
60. How many ATP can be generated when a glucose is oxidized to CO_2 and H_2O and the NADH+H^+ generated during glycolysis take the malate/aspartate shuttle to enter mitochondria?
    A. 32　B. 30　C. 36　D. 38
61. During the synthesis of fatty acid, where does the conversion of pyruvate to acetyl CoA take place?
    A. Cytosol
    B. Mitochondrial matrix
    C. Mitochondrial inner membrane
    D. Mitochondrial intermembrane space
62. Which enzyme of the following is responsible for converting acetyl CoA to malonyl CoA?
    A. Acetyl CoA carboxylase
    B. Malonyl CoA Synthetase
    C. Malonyl CoA Decarbosxylase
    D. None of the above
63. What coenzyme is required during the conversion of acetyl CoA to malonyl CoA?
    A. Coenzyme A
    B. NADPH
    C. FAD
    D. Biotin
64. How many NADPH are consumed for each round of FAS enlongation by 2 carbons?
    A. 2　B. 4　C. 6　D. 8
65. Where does NADPH come from for fatty acid synthesis?
    A. Phosphopentose pathway
    B. Malic enzyme
    C. Isocitrate dehydrogenase
    D. All of the above
66. Which coenzyme is required for transporting acyl CoA into mitochondria?
    A. Carnitine　B. Coenzyme A　C. Biotin　D. NAD
67. When a palmitic acid ($C_{15}H_{31}COOH$) is oxidized through the β-oxidation, how many acetyl CoA can be generated?
    A. 7　B. 8　C. 14　D. 16

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68. When a palmitic acid ($C_{15}H_{31}COOH$) is degraded to acetyl CoAs, how many ($NADH+H^+$) can be generated from the β-oxidation?
    A. 7　B. 8　C. 14　D. 16
69. In addition to those enzyme involved in fatty acid β-oxidation, what enzymes are required during the degradation of polyunsaturated fatty acid (PUFA)?
    A. Enoyl CoA isomerase
    B. 2,4-Dienoyl CoA reductase
    C. Acyl CoA hydrogenase
    D. A. & B.
70. Which lipids below contain fatty acid?
    A. Phospholipids
    B. Ceramide
    C. Cholesterol ester
    D. All of the above
71. Which amino acid contributes the aminocarbon part of phospholipids?
    A. Alanine　B. Cystein　C. Serine　D. Tyrosine
72. Which enzyme is the key controlling one during the synthesis of cholesterol?
    A. HMG CoA Lyase
    B. HMG CoA Reductase
    C. HMG CoA Synthase
    D. None of the above
73. Which enzyme is responsible for converting nitrogen (N_2) to ammonium ion (NH_4^+) in the bean nodule?
    A. Ammonium synthetase
    B. Nitrogen reductase
    C. Dinitrogenase
    D. None of the above
74. Why is conversion of gaseous nitrogen to ammonia difficult?
    A. Nitrogen gas is very stable
    B. The reaction has a very high activation barrier (about 100 kcal/mole N_2)
    C. The overall free energy change is -45.2 kJ/mole
    D. A. & B.
75. Which cofactor is the key functional group of aminotransferase
    A. Biotin　B. Folic acid　C. Pyridoxal phosphate　D. Pantothenic acid
76. What amino acids are ketogenic?
    A. Lysine and leucine
    B. Tryptophan and tyrosine
    C. Glycine and proline
    D. None of the above
77. Which enzyme is responsible for generation of uric acid?
    A. Xanthine oxidase (XO)
    B. Hypoxanthine-guaine phosphoribosyltransferase (HGPRT)
    C. Urease
    D. B. & C.

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78. During the synthesis of pyrimidine or the salvage of purine, which ribosyl substrate is needed?
    A. Ribose 1-phosphate
    B. Ribose 6-phosphate
    C. Phosphoribose pyrophosphate (PRPP)
    D. None of the above
79. What enzymes are involved in the reduction of NDP?
    A. Ribonucleotide reductase
    B. Thioredoxin
    C. Thioredoxin reductase
    D. All of the above
80. When synthesizing DNA, which enzyme cofactor is uniquely required?
    A. Folic acid
    B. NADPH
    C. Homocysteine
    D. Pyridoxal phosphate

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