亞洲大學

108 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	108.4.27	13:30-15:00

1. Chymotrypsin is a proteolytic enzyme acting in the digestive systems of many organisms. Which amino acid is **NOT** contained in the catalytic triad in chymotrypsin?
   A. Lys **B.** Ser **C.** His **D.** Asp

2. Which attribute of biological membrane is **NOT** correct?
   A. Membranes consist mainly of lipids and proteins.
   B. The constituent protein and lipid molecules are held together by covalent bond in the membrane.
   C. Membranes are asymmetric.
   D. Membranes are fluid structures.

3. Which molecule below is the key regulator of membrane fluidity in animals?
   A. Glycolipids **B.** Fatty acid **C.** Integral membrane proteins **D.** Cholesterol

4. Which description is **NOT** correct?
   A. A nucleic acid consists of four kinds of bases linked to a sugar–phosphate backbone.
   B. A pair of nucleic acid strands with complementary sequences can form a double-helical structure.
   C. DNA is a structurally rigid molecule that only exist in a specific helical form.
   D. Double-stranded DNA can wrap around itself to form a supercoiled structure.

5. Which of the following force does **NOT** exist in the quaternary structure of the protein?
   A. Electrostatic interaction **B.** Van der Waals force **C.** H-bonds **D.** Disulfide bond

6. What kind of protein secondary structure is silk (fibroin) made of?
   A. α-helix **B.** β-sheet **C.** β-turns **D.** Random coils

7. What type of inhibitor does penicillin belong to?
   A. Competitive inhibition **B.** Uncompetitive inhibition
   C. Noncompetitive inhibition **D.** Irreversible inhibitors

8. Which enzyme reactions do **NOT** obey Michaelis–Menten kinetics?
   A. Ping-pong reactions **B.** Sequential reactions **C.** Allosteric regulations
   D. Double-displacement reactions

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9. Which of the following is least likely to cross a cellular membrane without transporters or channels?
   A. Inorganic ions **B.** Larger uncharged polar molecules
   C. Small uncharged polar molecules **D.** Small nonpolar molecules

10. Which description is **NOT** correct?
   A. Cyclic AMP stimulates the phosphorylation of many target proteins by activating protein kinase A.
   B. Natrium ion is a widely used second messenger.
   C. Activated G proteins transmit signals by binding to other proteins.
   D. G proteins spontaneously reset themselves through GTP hydrolysis.

11. Which description is **NOT** correct?
   A. The insulin receptor is a dimer that closes around a bound insulin molecule.
   B. Insulin binding results activation of the insulin receptor.
   C. The activated insulin-receptor kinase initiates a kinase cascade.
   D. Insulin signaling is terminated by the action of methyltransferases.

12. What is a prion which cause mad cow disease?
   A. Misfolded DNA **B.** Misfolded RNA **C.** Misfolded protein
   D. Misfolded polysaccharide

13. Which of the following is **NOT** high energy molecule in cellular respiration?
   A. ATP **B.** AMP **C.** NADH **D.** $FADH_2$

14. Which of the following is **NOT** a second messenger molecule?
   A. Estrogen **B.** Inositol 1,4,5-trisphosphate (IP_3) **C.** Diacylglycerol (DAG)
   D. Cyclic AMP

15. The binding of signaling molecules to their receptors initiates pathways that lead to important physiological responses. Which receptor of signal-transduction pathways is involved in glucose uptake regulation?
   A. Sialic acid receptor **B.** β-Adrenergic receptor **C.** Insulin receptor
   D. EGF receptor

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16. Which description is **NOT** correct?
    A. The insulin receptor is a dimer that closes around a bound insulin molecule.
    B. Insulin binding results activation of the insulin receptor.
    C. The activated insulin-receptor kinase initiates a kinase cascade.
    D. Insulin signaling is terminated by the action of methyltransferases.

17. Which description is **NOT** correct?
    A. Actin is a polar, self-assembling, dynamic polymer.
    B. Myosin motion along actin.
    C. Actin motion along myosin.
    D. Phosphate release triggers the myosin power stroke.

18. Microtubules are key components of cilia and flagella present on some eukaryotic cells. What is the structural type of the microtubules (called an axoneme)?
    A. 8+1 array **B.** 9+1 array **C.** 8+2 array **D.** 9+2 array

19. What is the major electron donor in reductive biosynthesis reactions?
    A. ATP **B.** NADH **C.** NADPH **D.** $FADH_2$

20. What is the universal currency of free energy in biological system?
    A. ATP **B.** NADH **C.** NADPH **D.** $FADH_2$

21. Which bases of DNA can be methylated?
    A. Adenine and Cytosine **B.** Adenine and thymine **C.** Guanine and thymine
    D. Guanine and Cytosine

22. Oseltamivir (Tamiflu) is an antiviral medication used to treat influenza. Which of the following molecule is this neuraminidase inhibitor mimicking?
    A. Matrix-2 (M2) protein **B.** Hemagglutinin (HA) **C.** Endonuclease **D.** Sialic acid

23. What is the net gain of ATP molecules production in the glycolysis?
    A. 30 **B.** 8 **C.** 4 **D.** 2

24. Which of the following molecule is the final product of the glycolysis?
    A. Pyruvate **B.** Ethanol **C.** Glucose **D.** Acetyl CoA

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25. What is the main place for the tricarboxylic acid (TCA) cycle in cells?
A. Cytosol **B.** Mitochondria **C.** Endoplasmic reticulum **D.** Peroxisome

26. Which complex in the respiratory chain is **NOT** a proton pump?
A. Complex I **B.** Complex II **C.** Complex III **D.** Complex VI

27. What complex can be inhibited by Rotenone and Amytal?
A. Complex I **B.** Complex II **C.** Complex III **D.** Complex VI

28. How many ATPs are spent synthesizing glucose from pyruvate in gluconeogenesis?
A. 2 **B.** 4 **C.** 6 **D.** 8

29. Which of the following level of molecule can regulate the rate of pentose phosphate pathway (PPP)?
A. ATP **B.** ADP **C.** NAD^+ **D.** $NADP^+$

30. Which of the following hormone can regulate the metabolism of glycogen?
A. Insulin **B.** Epinephrine **C.** Glucagon **D.** All of the above

31. Which of the following molecule is **NOT** generated in fatty acid oxidation?
A. NADPH **B.** NADH **C.** Acetyl CoA **D.** $FADH_2$

32. Which description is **NOT** correct?
A. The complete oxidation of palmitate ($CH_3(CH_2)_{14}COOH$) yields 106 molecules of ATP.
B. Animals can convert fatty acids into glucose directly.
C. Fatty acids are synthesized in the cytoplasm.
D. Intermediates in fatty acid synthesis are covalently linked to the sulfhydryl groups of an acyl carrier protein (ACP).

33. Which of the following receptor plays a key role in controlling cholesterol metabolism?
A. VLDL receptor **B.** IDL receptor **C.** LDL receptor **D.** HDL receptor

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34. Which of the following hormone is **NOT** derived from cholesterol?
A. Insulin **B.** Progesterone **C.** Androgens **D.** Estrogens

35. Which description of cytochrome P450 is correct?
A. Steroids are hydroxylated by cytochrome P450 monooxygenases that use NADPH and O_2.
B. The cytochrome P450 system, which in mammals is located primarily in the smooth endoplasmic reticulum of the liver and small intestine.
C. The cytochrome P450 system metabolize ethanol.
D. All of the above.

36. Which of the following compound is **NOT** involved in urea cycle?
A. Glutamate **B.** Ornithine **C.** Fumarate **D.** Aspartate

37. Which of the following coenzyme is required for aminotransferase?
A. Folic acid **B.** Biotin **C.** Flavin adenine dinucleotide **D.** Pyridoxal phosphate

38. Which of the following coenzyme is required for DNA synthesis?
A. Folic acid **B.** Biotin **C.** Flavin adenine dinucleotide **D.** Pyridoxal phosphate

39. Which description of ubiquitin is **NOT** correct?
A. Ubiquitin is highly conserved in eukaryotes and prokaryotes.
B. Ubiquitin attached to the ε-amino groups of several lysine residues on a protein destined to be degraded.
C. The energy for the isopeptide bonds of ubiquitination comes from ATP hydrolysis.
D. Three enzymes (E1, E2 and E3) participate in the attachment of ubiquitin to a protein.

40. Which description of CRISPR/Cas9 is correct?
A. CRISPR/Cas9 is a novel protein metabolic pathway.
B. CRISPR/Cas9 is a novel coenzyme.
C. CRISPR/Cas9 is a novel protein purification technology.
D. CRISPR/Cas9 is a novel technology that can be used to edit genes within organisms.

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41. Mitochondria are the primary sources of energy for cells, organs, and the living animal. Which enzyme is **NOT** contained in this organelle?
A. Succinate dehydrogenase **B**. Fumarase **C**. Cytochrome oxidase **D**. Rubisco

42. Which of the following ion plays a key role in extracting electrons from H_2O to form O_2 in photosystem II of photosynthesis?
A. Calcium **B.** Natrium **C.** Manganese **D.** Iron

43. Metabolism produces both inorganic and organic acids. Which metabolism produce(s) are nonvolatile and excreting via the kidney?
A. Lactic acid **B**. Acetoacetic acid **C**. β-hydroxybutyrate **D**. All of the above

44. Which of the following aqueous solutions has the lowest pH? The solutions have H^+ concentration respectively of
A. 1.2×10^{-4} mol/L **B**. 2.3×10^{-3} mol/L **C**. 3.1×10^{-10} mol/L **D**. 4.5×10^{-6} mol/L

45. Acetic acid (CH_3COOH) has a pKa of 4.76. What is the molar ratio of potassium acetate (CH_3COOK) to acetic acid at pH 4.76?
A. 1:1 **B**. 2:1 **C**. 10:1 **D**. 1:10

46. Which amino acids are relatively nonpolar (hydrophobic)?
A. Phe, Tyr, Trp **B**. Ser, Asn, Gln **C**. Lys, Arg **D**. Asp, Glu

47. Which amino acids have positive charge at pH 7.0?
A. Phe, Tyr, Trp **B**. Ser, Asn, Gln **C**. Lys, Arg **D**. Asp, Glu

48. *N*-linked glycosylation is important process for both the structure and function of some eukaryotic proteins. Which amino acid plays a key role in this process? (*N*-glycans are attached to the nitrogen atom of this amino acid)
A. Pro **B.** Trp **C**. Lys **D**. Asn

49. Which amino acid has a significant effect on the tertiary structure of the protein?
A. Pro **B.** Trp **C**. Lys **D**. Asn

50. The indole group absorbs UV light at 280 nm. It is useful for spectrophotometric measurement of protein concentration. Which amino acid has an indole ring?
A. Pro **B.** Trp **C.** Lys **D.** Asn

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51. Which amino acids carry a negative charge at pH 7.0?
A. Arg, Lys **B.** Phe, Try, Trp **C.** Glu, Asp **D.** None of the above

52. Which of the following pairs bonds can rotate within a peptide backbone and the torsion angle of the latter assigned as phi angle?
A. N-C_α and C_α-CO **B.** C_α-CO and N-C_α **C.** CO-N and N-C_α **D.** N-C_α and CO-N

53. Which one is **NOT** a component of inner mitochondrial membrane?
A. Cytochrome *c* **B.** NADH dehydrogenase **C.** Phosphatidylcholine
D. Deoxyribonucleic acid

54. During the separation of protein molecules, which method relates to the isoelectric point (pI) of the protein?
A. Immunoprecipitation **B.** SDS-PAGE **C.** Ion exchange **D.** Gel filtration

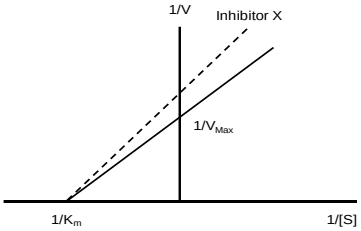
55. During the separation of protein molecules, which method is related to protein denaturation?
A. Immunoprecipitation **B.** SDS-PAGE **C.** Ion exchange **D.** Gel filtration

56. Which nucleosides below contain both pyrimidines?
A. A, T **B.** C, T, U **C.** C, G **D.** A, G, U

57. What force drives the formation of protein tertiary structure?
A. Van der Waals force **B.** Electrostatic interaction **C.** H-bonds **D.** All of the above

58. When a polymer of 36-residue forms an α-helix, how many repeats would you expect it to be?
A. 7 **B.** 8 **C.** 9 **D.** 10

59. What type of inhibitor X is this Lineweaver–Burk plot shown?



A. Competitive inhibition **B.** Uncompetitive inhibition
C. Noncompetitive inhibition **D.** Irreversible inhibitors

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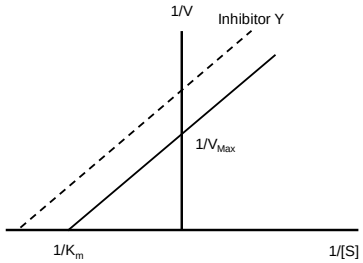
60. What type of inhibitor Y is this Lineweaver–Burk plot shown?



A. Competitive inhibition **B.** Uncompetitive inhibition
C. Noncompetitive inhibition **D.** Irreversible inhibitors

61. Which description is **NOT** correct?
A. Allosteric interactions in Aspartate transcarbamoylase (ATCase) are mediated by large changes in quaternary structure.
B. Chymotrypsinogen is activated by specific cleavage of a single peptide bond.
C. Blood clotting is accomplished by a single-step zymogen activation.
D. Phosphorylation is a highly effective means of regulating the activities of target proteins.

62. Which description is **NOT** correct?
A. Water-soluble proteins fold into compact structures with polar cores.
B. The water-soluble proteins have an interior formed of amino acids with hydrophobic side chains.
C. The water-soluble proteins have a surface formed largely of hydrophilic amino acids.
D. The hydrophobic interactions between the interior residues are the driving force for the formation of the tertiary structure of water-soluble proteins.

63. Which one is **NOT** a component of ribonucleic acid?
A. Adenine **B.** Guanine **C.** Thymine **D.** Cytosine

64. Which step of polymerase chain reaction (PCR) cycle requires the highest temperature?
A. Denaturation **B.** Annealing **C.** Elongation **D.** Hybridization

65. Which step of polymerase chain reaction (PCR) cycle requires a heat-stable DNA polymerase?
A. Denaturation **B.** Annealing **C.** Elongation **D.** Hybridization

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66. Which of the following immunoglobulin has the largest molecular weight?
A. IgG **B.** IgA **C.** IgM **D.** IgY

67. What kind of immunoglobulin does **NOT** exist in humans?
A. IgG **B.** IgA **C.** IgM **D.** IgY

68. Which kind of cells are involved in monoclonal antibody production?
A. Epithelial Cells **B.** Endothelial cells **C.** Cardiomyocyte Cells
D. Hybridoma cells

69. Which method can determine the amino acid sequence from a protein?
A. Edman degradation **B.** Polymerase chain reaction **C.** Ultracentrifugation
D. X-ray crystallography

70. Which method can determine the three-dimensional structure from a protein?
A. Edman degradation **B.** Polymerase chain reaction **C.** Ultracentrifugation
D. X-ray crystallography

71. Which kind of molecule is **NOT** included in the central dogma of molecular biology?
A. Phospholipid **B.** Deoxyribonucleic acid **C.** Ribonucleic acid **D.** Protein

72. Which kind of mechanism is included in the central dogma of molecular biology?
A. Replication **B.** Transcription **C.** Translation **D.** All of the above

73. Which codon is **NOT** stop signals for protein synthesis?
A. UAA **B.** UAG **C.** UGA **D.** AUG

74. Which one is **NOT** key tools in forming recombinant DNA molecules?
A. DNA topoisomerases **B.** Restriction enzyme **C.** DNA ligase **D.** Plasmid

75. Which molecule below is most likely to form a base-paired hairpin structure?
A. Palindromic sequence **B.** dsDNA **C.** mRNA **D.** ssRNA

76. Which of the following amino acids are ketogenic?
A. Leu, Lys **B.** Arg, Pro **C.** Ile, Met **D.** Phe, Tyr

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77. Which of the following molecule is the most important substrate for hexokinase?
A. ADP **B.** ATP **C.** Glucose **D.** Mannose

78. What enzyme catalyzes the relaxation of supercoiled DNA?
A. Telomerase **B.** Helicase **C.** Ligase **D.** Topoisomerase

79. What enzyme catalyzes to separate strands of a DNA double helix?
A. Telomerase **B.** Helicase **C.** Ligase **D.** Topoisomerase

80. Which of the following sequence is **NOT** contained in the promoter of the eukaryotes?
A. GC box **B.** TATA box **C.** Pribnow box **D.** Initiator element

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