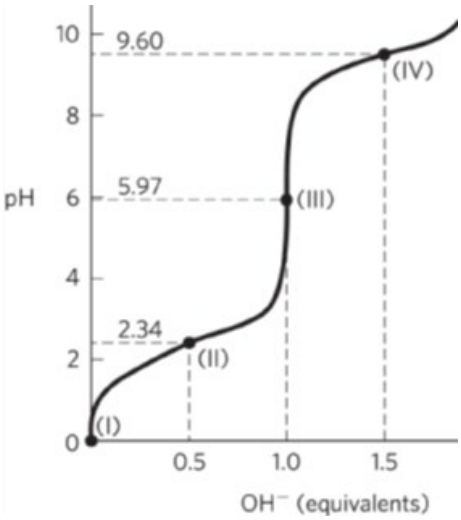
亞洲大學

111 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	111.04.30	13:30-15:00

1. Histidine has the following pK_a values: pK_1 = 1.82, pK_2 = 9.17, pK_R = 6.0
   Give the net charge of histidine at pH = 12
   A. 0 **B.** +1 **C.** +2 **D.** -1
2. Which amino acid is **NOT** a building block of proteins?
   A. Tryptophan **B.** Tyrosine **C.** Proline **D.** Ornithine
3. The figure below shows the relationship between the titration curve and the acid-base properties of glycine. The key points in the titration are designated I to IV. Which key point of the figure where the average net charge of glycine is 0?



   A. I **B.** II **C.** III **D.** IV
4. Referring to above question 3, which key point of the figure where the glycine exists as a 50:50 mixture of $^{+}H_3N\text{-}CH_2\text{-}COOH$ and $^{+}H_3N\text{-}CH_2\text{-}COO^{-}$?
   A. I **B.** II **C.** III **D.** IV
5. Referring to above question 3, which region of the figure where glycine has its maximum buffering capacity?
   A. I→II **B.** I→III **C.** II→IV **D.** III→IV
6. Which amino acid has two chirality centers?
   A. Glycine **B.** Tyrosine **C.** Threonine **D.** Valine
7. Which of the following is a method of isolating ribosomes from mechanically homogenizing *E. coli* cells?
   A. Edman degradation **B.** Polymerase chain reaction
   C. Differential centrifugation **D.** X-ray crystallography
8. What is the pH of a solution that has an H^+ concentration of 1.0×10^{-4} mol/L?
   A. 9 **B.** 10 **C.** 1 **D.** 4

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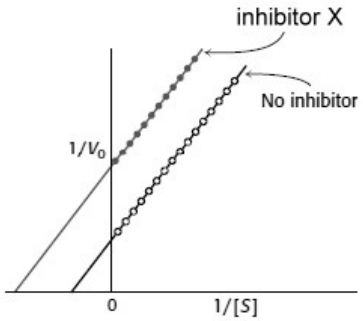
9. Which the following aqueous solution has the lowest pH?
   A. 0.1 M lactic acid (pK_a = 7.86) **B.** 0.1 M acetic acid (pK_a = 4.86)
   C. 0.1 M succinic acid (pK_a = 4.19) **D.** 0.1 M formic acid (pK_a = 3.75)
10. Which following structural biology method is best suited to obtaining reconstruction of spike (S) protein of SARS-CoV-2 binding with host receptor?
   A. Circular dichroism, CD **B.** X-ray crystallography
   C. Nuclear magnetic resonance, NMR **D.** cryo-EM
11. Which the following molecular bonds primary affect the mechanical properties of α-keratin, such as tensile strength and hardness?
   A. Disulfide bonds **B.** Covalent bond
   C. Ionic bond **D.** van der Waals force
12. Which the following amino acid primary affects the flexibility of proteins?
   A. Phenylalanine **B.** Proline **C.** Tyrosine **D.** Tryptophan
13. Protein 1, 2, 3, and 4 have a binding site for ligand X, respectively. According to the following dissociation constants with ligand X, which protein has the highest affinity for ligand X?
   A. Protein 1: K_d of 3.0×10^{-7} M **B.** Protein 2: K_d of 4.0×10^{-8} M
   C. Protein 3: K_d of 2.0×10^{-5} M **D.** Protein 4: K_d of 6.0×10^{-4} M
14. Which of the following proteins performs oxygen binding in the blood?
   A. Hemoglobin **B.** Collagen **C.** Albumin **D.** Gamma globulin
15. When a polymer of 18-residue forms an α-helix, how many repeats would you expect it to be?
   A. 5 **B.** 6 **C.** 9 **D.** 10
16. Which of the following molecules is an enzyme?
   A. Fibrin **B.** Albumin **C.** Trypsin **D.** Insulin
17. 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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18. Sarin is an extremely toxic synthetic organophosphorus compound. It is a potent inhibitor of acetylcholinesterase. What type of inhibitors does Sarin belong to?
A. Competitive inhibition **B.** Uncompetitive inhibition
C. Noncompetitive inhibition **D.** Irreversible inhibitors

19. Which following description of the "Michaelis-Menten equation" is correct?
A. K_m = [S], when $V_0 = V_{max}$
B. K_m << [S], when V_0 = 1/2 V_{max}
C. High values of K_m correspond to low enzyme affinity for substrate
D. High value of [S] correspond to high enzyme affinity for substrate

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

21. 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 series of zymogens activation.
D. Glycosylation is a highly effective means of regulating the activities of target proteins.

22. Which of the following characteristics describe glycoproteins?
A. Exclusively located at the cell surface and in the extracellular matrix.
B. Include the heparan sulfate family.
C. May contain *N*-linked glycosidic bonds.
D. Sulfated glycosaminoglycan chains can only be covalently linked to a Ser residue.

23. What is the major component of vascular plant cell walls?
A. Homopolysaccharide **B.** Peptidoglycan **C.** Cellulose **D.** Glycosaminoglycans

24. Which of the following carbohydrate is heteropolysaccharides?
A. Starch **B.** Peptidoglycan **C.** Cellulose **D.** Glycogen

25. Which of the following carbohydrates is reducing sugar?
A. Fructose **B.** Cellulose **C.** Starch **D.** Sucrose

26. Which description of Apurinic (AP) site in DNA is **NOT** correct?
A. Apurinic (AP) site is a kind of spontaneous DNA damage.
B. Hydrolysis of the N-glycosyl bond between deoxyribose and purine in DNA creates AP site.
C. AP sites can occur as intermediates in base excision repair.
D. AP site is more thermodynamically stabilizing to a DNA molecule than is a mismatched base pair.

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27. Which step of the polymerase chain reaction (PCR) cycle occurs the primers bind to the template?
A. Denaturation **B.** Annealing **C.** Elongation **D.** Hybridization
28. Which nucleosides below contain both purines?
A. A, T **B.** C, T, U **C.** C, G **D.** A, G
29. Which of the following enzymes is **NOT** required when you clone a foreign DNA fragment into a plasmid?
A. Restriction endonuclease **B.** DNA ligases **C.** DNA polymerase **D.** DNA gyrase
30. Which following method is best suited to identify the protein-protein interaction?
A. Yeast two-hybrid analysis **B.** Immunofluorescence **C.** qPCR **D.** ELISA
31. Which following is **NOT** omega-3 fatty acid?
A. DHA, 22:6($\Delta^{4,7,10,13,16,19}$) **B.** EPA, 20:5 ($\Delta^{5,8,11,14,17}$)
C. ALA, 18:3 ($\Delta^{9,12,15}$) **D.** GLA, 18:3 ($\Delta^{6,9,12}$)
32. The melting points of a series of 18-carbon fatty acids are stearic acid, 69.6°C; oleic acid, 13.4°C; linoleic acid, −5°C; and linolenic acid, −11°C. Which of the above fatty acids has the largest number of *cis* double bonds?
A. Stearic acid **B.** Oleic acid **C.** Linoleic acid **D.** Linolenic acid
33. How does the food industry increase the melting point of lipids containing fatty acids?
A. Catalytic oxidation **B.** Catalytic hydrogenation
C. Catalytic methylation **D.** Catalytic phosphorylation
34. Which following molecular is amphipathic?
A. Triacylglycerols **B.** Glycerole **C.** Cholesterol **D.** Succinic acid
35. Which of the following hormone is derived from cholesterol?
A. Estrogens **B.** Progesterone **C.** Androgens **D.** All of the above
36. Which eukaryotic organelles are surrounded by a double membrane?
A. Golgi apparatus **B.** Endoplasmic reticulum
C. Mitochondria **D.** All of the above
37. Which description for photosynthesis is **NOT** correct?
A. The site of photosynthesis in eukaryotes such as green plants and green algae is the chloroplast.
B. In the dark reactions, water is oxidized to produce oxygen, accompanied by the reduction of NAD^+ to NADH.
C. The overall reaction pathway of sugar production is cyclic and is called the Krebs cycle.
D. C4 plants grow more quickly than C3 plants.
38. Which codon is stop signals for protein synthesis?
A. UAA **B.** UAG **C.** UGA **D.** All of the above

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39. What kind of protein secondary structure is hair α-keratin made of?
A. α-helix **B.** β-sheet **C.** β-turns **D.** Random coils

40. Which description for lipid bilayers is **NOT** correct?
A. Lipid bilayers form when phospholipids are suspended in oil.
B. Lipids that form bilayers are amphipathic molecules.
C. The hydrophilic regions of lipid bilayers exposed to water and the hydrophobic regions buried in the interior of the sheet.
D. Lipid bilayers close on themselves.

41. Which of the following disease is associated with protein misfolding?
A. Alzheimer's disease **B.** Parkinson's disease
C. Mad cow disease **D.** All of the above

42. Which of the following lipoproteins is primarily responsible for transporting cholesterol from surrounding tissues to the liver or steroidogenic organs?
A. VLDL **B.** LDL **C.** IDL **D.** HDL

43. Which description for fatty acid oxidation is **NOT** correct?
A. Fatty acid oxidation occurs in mitochondria.
B. Fatty acid oxidation is the primary source of energy for many tissues, including the central nervous system and circulating red blood cells.
C. Fatty acid oxidation defects can cause metabolic abnormalities.
D. Fatty acid oxidation is regulated by metabolites and hormones.

44. Which description for the biological membrane is **NOT** correct?
A. Cell membrane lipid constituents include phospholipids, glycosphingolipids, and cholesterol.
B. Cell membrane protein constituents include glycoproteins and lipid-linked proteins.
C. The constituent lipid and protein molecules are held together by a covalent bond in the membrane.
D. Membranes are fluid structures.

45. Which of the following does **NOT** cross a cellular membrane without transporters or channels?
A. Na^+ **B.** K^+ **C.** Ca^{2+} **D.** All of the above

46. Which of the following is a second messenger molecule that can activate protein kinase A (PKA) in eukaryotes?
A. Cyclic AMP **B.** Cyclic GMP **C.** Inositol 1,4,5-trisphosphate (IP_3)
D. Diacylglycerol (DAG)

47. Which of the following metabolisms can **NOT** be regulated by protein kinase A (PKA)?
A. Enhance lipolysis in adipocyte **B.** Enhance glycogenesis in skeletal muscle
C. Enhance glycogenolysis in liver **D.** Enhance gluconeogenesis in liver

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48. Which ions are required for the glucose symporter transporter in the intestinal epithelium?
A. Zn^{2+} **B.** Mg^{2+} **C.** Ca^{2+} **D.** Na^{+}
49. How many fatty acid molecules do a phosphatidylcholine (PC) of plasma membrane have?
A. 1 **B.** 2 **C.** 3 **D.** None of above
50. Which of the following molecule does **NOT** affect membrane fluidity?
A. Sphingomyelin **B.** Triglyceride **C.** Cholesterol **D.** Glycosphingolipids
51. Which description for receptor tyrosine kinases (RTK) is **NOT** correct?
A. RTKs is a family of plasma membrane receptors with protein kinase activity.
B. RTKs transduce extracellular signals through a mechanism similar to G protein-coupled receptors (GPCRs).
C. RTKs have a ligand-binding domain on the extracellular face of the plasma membrane.
D. RTKs have an enzyme active site on the cytoplasmic face.
52. Which description for G protein-coupled receptors (GPCRs) is **NOT** correct?
A. G protein-coupled receptors (GPCRs) have seven transmembrane beta-sheets domains.
B. GPCRs act through heterotrimeric G proteins.
C. GPCRs are found only in eukaryotes, including yeast, choanoflagellates, and animals.
D. GPCRs are involved in many diseases.
53. Which receptor of signal-transduction pathways is involved in glucose uptake regulation?
A. Sialic acid receptor **B.** Insulin receptor
C. β-Adrenergic receptor **D.** EGF receptor
54. Which of the following is **NOT** pentose phosphate pathway (PPP) product in oxidative nonreversible phase?
A. Ribose-5-phosphate **B.** NADH **C.** NADPH **D.** CO_2
55. Which one of the following molecules is **NOT** the second messenger in the phosphoinositol signaling pathway?
A. Calcium ions (Ca^{2+}) **B.** Inositol 1,4,5-trisphosphate (IP_3)
C. Cyclic adenosine monophosphate (cAMP) **D.** Diacylglycerol (DAG)
56. Which of the following DNA type is left-handed forms?
A. A-DNA **B.** B-DNA **C.** Z-DNA **D.** None of above
57. Which of the following enzyme is contained in mitochondria?
A. Succinate dehydrogenase **B.** Fumarase
C. Cytochrome oxidase **D.** All of the above

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58. Which of the following ion plays a key role in the enzymatic activity of ribulose-1,5-bisphosphate carboxylase-oxygenase (RuBisCO)?
A. Calcium **B.** Natrium **C.** Manganese **D.** Iron
59. What is the main place for the fatty acid β-oxidation in cells?
A. Cytosol **B.** Mitochondria **C.** Endoplasmic reticulum **D.** Peroxisome
60. Ketone bodies are water-soluble molecules that contain the ketone groups produced from fatty acids by the liver. Which of the following molecule is **NOT** liver-derived ketone bodies?
A. Acetoacetate **B.** Acetic acid **C.** Beta-hydroxybutyrate **D.** Acetone
61. What is the net gain of ATP molecules production in the lactic fermentation with the homofermentative process?
A. 30 **B.** 8 **C.** 4 **D.** 2
62. Which of the following molecules is the final electron acceptor in the electron transport chain?
A. Nitrogen **B.** Hydrogen **C.** H_2O **D.** Oxygen
63. Which of the following metabolic reactions occurs in the mitochondrial matrix?
A. Citric acid cycle **B.** Glycolysis
C. Pentose phosphate pathway **D.** Gluconeogenesis
64. Which of the following amino acid is achiral?
A. Proline **B.** Leucine **C.** Glycine **D.** Alanine
65. Which of the following is **NOT** basic amino acid?
A. Histidine **B.** Leucine **C.** Arginine **D.** Lysine
66. Which of the following is **NOT** glucogenic amino acid?
A. Asparagine **B.** Methionine **C.** Leucine **D.** Proline
67. The intermediate compound common for aerobic and anaerobic respiration is
A. Succinic acid **B.** Acetyl CoA **C.** Pyruvic acid **D.** Citric acid
68. Which of the following is the common intermediate compound for carbohydrate, lipid and amino acid to enter the citric acid cycle in the respiratory pathway?
A. Succinic acid **B.** Acetyl CoA **C.** Pyruvic acid **D.** Citric acid
69. Which of the following compound is involved in urea cycle?
A. Aspartate **B.** Ornithine **C.** Fumarate **D.** All of the above
70. With more of which base-pair content will a DNA melting temperature (T_m) be higher?
A. GC **B.** AT **C.** AU **D.** GT
71. Which of the following coenzyme is required for acetyl CoA carboxylase activity in fatty acid synthesis?
A. Folic acid **B.** Biotin **C.** Flavin adenine dinucleotide **D.** Pyridoxal phosphate

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72. Which amino acid has an indole ring?
A. Proline **B.** Asparagine **C.** Lysine **D.** Tryptophan
73. During the separation of protein, which method relates to the molecular size of the protein?
A. Immunoprecipitation **B.** Affinity chromatography
C. Ion exchange **D.** Gel filtration
74. Which of the following immunoglobulin plays a significant role in the mucous membranes?
A. IgG **B.** IgA **C.** IgM **D.** IgD
75. In patients who have not been infected with SARS-CoV-2 or vaccination past, what type of immunoglobulin can be detected first in the body after infection?
A. IgG **B.** IgA **C.** IgM **D.** IgD
76. How many cycles of β-oxidation are required to completely process a saturated palmitic acid (C16)?
A. 7 **B.** 8 **C.** 9 **D.** 18
77. Which of the following is a component of succinate dehydrogenase in electron transport chain?
A. Complex I **B.** Complex II **C.** Complex III **D.** Complex VI
78. What is **NOT** required for the coenzyme A (CoA) synthesis in humans?
A. Cysteine **B.** ATP **C.** Vitamin B5 **D.** UTP
79. Which of the following is primarily responsible for synthesizing tRNAs in eukaryotes?
A. RNA polymerase I **B.** RNA polymerase II
C. RNA polymerase III **D.** RNA polymerase IV
80. Which of the following do **NOT** affects gene expression without changing the DNA sequence (epigenetic modification)?
A. DNA methylation I **B.** Non-coding RNA (ncRNA)
C. Histone modification **D.** DNA mismatch repair

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