亞洲大學

112 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	**112.04.29**	**13:30-15:00**

1. What is the primary difference between prokaryotic and eukaryotic cells?
   A. Prokaryotic cells lack a cytosol
   B. Prokaryotic cells lack a nucleus
   C. Prokaryotic cells lack a cell envelope
   D. Prokaryotic cells are multi-compartmented
2. Which one of the following amino acids is nonpolar?
   A. Phenylalanine **B**. Serine **C**. Threonine **D**. Cysteine
3. What is the origin of the capacity for oxidative phosphorylation in eukaryotic cells?
   A. Endosymbiosis with other eukaryotic cells
   B. Endosymbiosis with bacteria
   C. Horizontal gene transfer from bacteria
   D. None of the above
4. Which complex in the respiratory chain does NOT direct increase the electrochemical proton gradient?
   A. Complex I **B.** Complex II **C.** Complex III **D.** Complex VI
5. What type of interaction is decisive in protein and nucleic acid folding?
   A. Covalent bonds **B.** Hydrogen bonds
   C. Ionic bonds **D.** Van der Waals interactions
6. Which of the following carbohydrate is NOT a homopolysaccharide?
   A. Starch **B.** Peptidoglycan **C.** Cellulose **D.** Glycogen
7. What buffer systems can maintain intracellular and extracellular fluids at their optimum pH in cells and tissues?
   A. Nitrate and sulfate buffer systems
   B. Carbonate and hydrogen sulfide buffer systems
   C. Ammonia and acetic acid buffer systems
   D. Phosphate and bicarbonate buffer systems
8. Which of the following carbohydrates is non-reducing?
   A. Glucose **B.** Fructose **C.** Lactose **D.** Sucrose
9. 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 = 4
   A. 0 **B.** +1 **C.** +2 **D.** -1
10. Which protein is involved in some neurodegenerative diseases?
    A. Albumin **B.** Amyloid **C.** Hemoglobin **D.** Myoglobin
11. Which amino acids do NOT exist in stereoisomeric forms?
    A. Glycine **B.** Alanine **C.** Aspartic acid **D.** Phenylalanine

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亞洲大學

112 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	112.04.29	13:30-15:00

12. How are defective proteins degraded?
    A. They are degraded by proteasomes, which are not highly conserved.
    B. They are first tagged by linkage to ubiquitin, a highly conserved protein.
    C. They are not degraded, but are instead excreted from the cell.
    D. They are degraded by an ATP-independent system.
13. How are amino acids classified based on their R group?
    A. According to their size
    B. According to their shape
    C. According to their polarity and charge at pH 7
    D. According to their ability to form hydrogen bonds
14. Which of the following is the first antibody to appear in response to initial exposure to an antigen?
    A. IgG **B.** IgA **C.** IgM **D.** IgD
15. Which of the following chromatographic procedures is NOT used to separate proteins?
    A. Ion-exchange chromatography **B.** Gel filtration chromatography
    C. Affinity chromatography **D.** Gas chromatography
16. Which of the following is true about protein targeting in eukaryotic cells?
    A. Signal sequences are always located at the carboxyl terminus of a newly synthesized protein.
    B. Polypeptides with signal sequences are moved into the Golgi apparatus as they are synthesized.
    C. Proteins targeted to the nucleus have an internal signal sequence cleaved once the protein is successfully targeted.
    D. Proteins targeted to mitochondria and chloroplasts do not use an amino-terminal signal sequence.
17. How does electrophoresis separate proteins?
    A. By differences in their primary structure
    B. By differences in their tertiary structure
    C. By differences in their hydrophobicity
    D. By differences in their mass or charge
18. Which of the following is the major contributor to stabilizing the globular form of most soluble proteins?
    A. Hydrophobic effect **B.** Van der Waals interactions
    C. Ionic interactions **D.** Hydrogen bonds
19. Which amino acid has two chiral centers?
    A. Glycine **B.** Tyrosine **C.** Valine **D.** Isoleucine

※ 試題請隨卷繳回

亞洲大學

112 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	112.04.29	13:30-15:00

20. What is the quaternary structure in proteins?
    A. The arrangement of a protein's side chains
    B. The local spatial arrangement of the main-chain atoms in a selected segment of a polypeptide chain
    C. The complete three-dimensional structure of a polypeptide chain
    D. Interactions between the subunits of multi-subunit proteins or large protein assemblies
21. What is the primary carrier of energy within cells?
    A. NADH **B.** NADPH **C.** $FADH_2$ **D.** ATP
22. What is the role of Hsp70 chaperones and chaperonins in protein folding?
    A. They catalyze the disulfide-bond formation
    B. They facilitate protein folding
    C. They degrade misfolded proteins
    D. They isomerize Pro peptide bonds
23. What is the primary electron donor in reductive biosynthesis?
    A. NADH **B.** NADPH **C.** $FADH_2$ **D.** ATP
24. Which of the following statements is true regarding hemoglobin?
    A. Oxygen binding to hemoglobin is not allosteric
    B. Oxygen binding to hemoglobin is cooperative and allosteric
    C. Hemoglobin exists in a single structural state
    D. Hemoglobin contains a single heme prosthetic group
25. Which is NOT a key tool for forming recombinant DNA molecules?
    A. Restriction enzyme **B.** DNA ligase **C.** Plasmid **D.** DNA topoisomerases
26. Which immunoglobulin class is the most abundant in humans?
    A. IgA **B.** IgG **C.** IgD **D.** IgE
27. Which technique exploits the binding specificity of immunoglobulins?
    A. Western blotting **B.** Northern blotting
    C. Southern blotting **D.** Polymerase chain reaction
28. Which of the following methods can determine protein sequence?
    A. Polymerase chain reaction (PCR) **B.** Edman degradation
    C. Sanger dideoxy method **D.** Oligonucleotide synthesis
29. What is the function of Ca^{2+} in muscle contraction?
    A. It binds to myosin to promote its dissociation from actin.
    B. It binds to troponin to trigger a conformational change in a troponin-tropomyosin complex.
    C. It binds to actin to promote its dissociation from myosin.
    D. It binds to myoglobin to promote oxygen binding.

※ 試題請隨卷繳回

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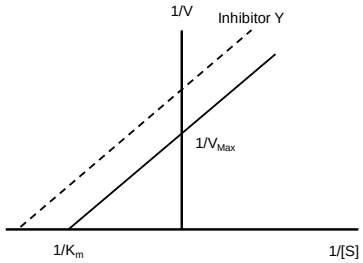
學士後獸醫學系	生物化學	**112.04.29**	**13:30-15:00**

30. Which step of polymerase chain reaction (PCR) cycle requires the highest temperature?
    A. Annealing **B.** Elongation **C.** Hybridization **D.** Denaturation
31. What is the function of enzymes in a reaction?
    A. To stabilize the reaction products
    B. To change the equilibrium constant of the reaction
    C. To increase the activation energy of the reaction
    D. To lower the activation energy of the reaction
32. What type of inhibitor Y is the following Lineweaver-Burk plot shown?



    A. Competitive inhibition **B.** Noncompetitive inhibition
    C. Uncompetitive inhibition **D.** Irreversible inhibitors
33. What is the definition of the constant K_m of the Michaelis-Menten equation in enzyme kinetics?
    A. The concentration of enzyme that results in a reaction rate equal to one-half V_{max}
    B. The substrate concentration that results in a reaction rate equal to one-half V_{max}
    C. The maximum rate of an enzyme-catalyzed reaction at saturation
    D. The turnover number of an enzyme
34. Which amino acid has an indole ring?
    A. Asn **B.** Trp **C**. Lys **D**. Pro
35. What is the primary mean by which the activity of allosteric enzymes?
    A. Cleavage of zymogens
    B. Covalent modification
    C. Reversible binding of a specific modulator to a regulatory site
    D. Remove inhibitor
36. Which amino acid significantly affects the tertiary structure of the protein?
    A. Asn **B.** Trp **C**. Lys **D**. Pro
37. What is zymogen?
    A. Enzymes that are synthesized as inactive precursors and activated by cleavage.
    B. Enzymes that are regulated by covalent modification.
    C. Intermediates in metabolic pathways.
    D. Modulators that bind to allosteric enzymes.

※ 試題請隨卷繳回

38. Which amino acid plays a key role in *N*-linked glycosylation? (*N*-glycans are attached to the nitrogen atom of this amino acid)
A. Asn **B.** Trp **C**. Lys **D**. Pro

39. Which of the following is a polysaccharide that serves as a structural component in the exoskeletons of arthropods such as crustaceans and insects?
A. Starch **B.** Cellulose **C.** Chitin **D.** Dextran

40. Which of the following characteristics describe glycoproteins?
A. Proteins with covalently attached oligosaccharides
B. Glycoconjugates with sulfated glycosaminoglycans covalently attached to a core protein
C. Extracellular structural proteins that provide rigidity to tissues
D. Heteropolysaccharides that strengthen bacterial and algal cell walls

41. What is the difference between RNA and DNA?
A. RNA contains thymine, while DNA contains uracil
B. RNA contains adenine, while DNA contains guanine
C. RNA contains deoxyribose, while DNA contains ribose
D. RNA contains ribose, while DNA contains deoxyribose

42. How are nucleotides joined together to form nucleic acids?
A. By covalent bonds between the phosphate groups
B. By phosphodiester linkages between the 5'-hydroxyl group of one pentose and the 3'-hydroxyl group of the next
C. By peptide linkages between the nitrogenous bases
D. By hydrogen bonds between the nitrogenous bases

43. Which of the following aqueous solutions has the lowest pH? The solutions have H^+ concentration respectively of
A. 3×10^{-4} mol/L **B**. 8×10^{-3} mol/L **C**. 2×10^{-10} mol/L **D**. 4×10^{-6} mol/L

44. What is a method for routine DNA sequencing of gene segments?
A. Polymerase chain reaction (PCR) **B.** Edman degradation
C. Sanger dideoxy method **D.** Oligonucleotide synthesis

45. What is the role of adenosine triphosphate (ATP) in cells?
A. It is a cofactor for enzyme catalysis.
B. It is the central carrier of chemical energy in cells.
C. It is a common second messenger produced in response to hormones and other chemical signals.
D. It serves as a neurotransmitter in signaling pathways.

學系別	考試科目	考試日期	時　　間
學士後獸醫學系	生物化學	112.04.29	13:30-15:00

46. How does the genetic code vary among different species?
    A. There are significant variations in the codon sequences that specify amino acids.
    B. The code is universal in all species except for single-celled organisms.
    C. The code is universal in all species, but there are minor deviations in mitochondria and some single-celled organisms.
    D. The code is completely different in every species.
47. Which technique allows for the amplification of chosen segments of DNA for cloning?
    A. Polymerase chain reaction (PCR) **B.** Edman degradation
    C. Sanger dideoxy method **D.** Oligonucleotide synthesis
48. Which of the following is NOT a signal for termination of translation in bacteria?
    A. UGA **B.** UAG **C.** UAA **D.** AUG
49. What is the primary function of triacylglycerols?
    A. To act as a storage form of energy
    B. To serve as a component of cell membranes
    C. To act as a structural support for cells
    D. To facilitate communication between cells
50. Where does transcription stop in bacteria?
    A. At the terminator sequence **B.** At the complementary sequence
    C. At the promoter sequence **D.** At the signal sequence
51. Which amino acid residues are commonly found at the lipid-water interface of transmembrane proteins?
    A. Arg and Lys **B.** Asp and Glu **C.** Ser and Thr **D.** Tyr and Trp
52. What is the first step of bacterial transcription?
    A. Binding of RNA polymerase to the promoter
    B. Binding of RNA polymerase to the terminator
    C. Elongation of RNA synthesis
    D. Termination of RNA synthesis
53. What is the primary factor that affects the fluidity of biological membranes?
    A. The temperature, fatty acid composition, and sterol content
    B. The presence of integral membrane proteins
    C. The presence of lipid rafts
    D. The size of the membrane vesicles
54. What is the primary fuel for heart muscle to obtain ATP?
    A. Glucose **B.** Fatty acids **C.** Ketone bodies **D.** Phosphocreatine
55. What type of transport is used by the lactose transporter of *E. coli*?
    A. Passive transport **B.** Primary active transport
    C. Symport **D.** Antiport

亞洲大學

112 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	**112.04.29**	**13:30-15:00**

56. What is the end products of purine degradation in human?
A. Uric acid **B.** Creatinine **C.** Ammonia **D.** Lactic acid
57. What is the function of aquaporins?
A. To carry ions across membranes
B. To maintain the differences in cytosolic and extracellular concentrations of Na^+ and K^+
C. To transport glycerol or urea
D. To facilitate the movement of water across membranes
58. How is cholesterol transported in the blood?
A. As free cholesterol
B. As cholesteryl esters
C. As both free cholesterol and cholesteryl esters
D. As cholesterol conjugated with lipoproteins
59. What is the starting material for the citric acid cycle?
A. Succinate **B.** Acetyl-CoA **C.** Fumarate **D.** Malate
60. What is the net gain of ATP molecules during glycolysis?
A. 1 ATP **B.** 2 ATP **C.** 3 ATP **D.** 4 ATP
61. The urea cycle occurs mainly in the liver. How is ammonia formed in other tissues transported to the liver?
A. As the amide nitrogen of aspartate **B.** As the amino group of arginine
C. As the amide nitrogen of glutamine **D.** As the amino group of creatine
62. What key molecule connects the urea cycle with the TCA cycle?
A. Succinate **B.** Acetyl-CoA **C.** Fumarate **D.** Malate
63. Which of the following is a protective enzyme in mitochondria that inactivates reactive oxygen species (ROS)?
A. NAD-linked dehydrogenase **B.** Cytochrome oxidase (Complex IV)
C. Succinate dehydrogenase (Complex II) **D.** Superoxide dismutase (SOD)
64. What is the precursor for nucleotide and nucleic acid synthesis produced by the pentose phosphate pathway (PPP)?
A. Ribose 5-phosphate **B.** Glucose 6-phosphate
C. Pentose phosphates **D.** Hexose phosphates
65. How many molecules of CO_2 are released during each cycle of the citric acid cycle?
A. 1 **B.** 2 **C.** 3 **D.** 4
66. Which electron carriers hold most of the oxidation energy during the citric acid cycle?
A. ATP and GTP **B.** $FADH_2$ and NADH
C. Coenzyme A and oxaloacetate **D.** Nucleoside triphosphates

※ 試題請隨卷繳回

亞洲大學

112 學年度學士後獸醫學系招生考試試題紙

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學士後獸醫學系	生物化學	112.04.29	13:30-15:00

67. Which of the following is NOT true regarding ion channels?
    A. Neurotoxins only inhibit ion channels to disrupt the nervous system.
    B. They can be gated by membrane potential or ligands.
    C. They are important for signaling in neurons and other cells.
    D. Neurotransmitters can activate specific ion channels in the postsynaptic neuron.
68. What is the site of photosynthesis in algae and plants?
    A. Chloroplasts **B.** Mitochondria
    C. Endoplasmic reticulum **D.** Golgi apparatus
69. What is the final stage of the oxidative pathway for fatty acid oxidation?
    A. Citric acid cycle **B.** Glycolysis
    C. Oxidative phosphorylation **D.** Gluconeogenesis
70. What is apoptosis?
    A. Uncontrolled cell division leading to tumor formation
    B. A type of mutation in oncogenes
    C. The programmed and controlled cell death of unnecessary, damaged, or infected cells
    D. A type of mutation in tumor suppressor genes
71. What is the important role of nicotinamide adenine dinucleotide (NAD) in numerous metabolic pathways?
    A. Substrate **B.** Inhibitor **C.** Enzyme **D.** Coenzyme
72. In which type of tissue is electron transfer uncoupled from ATP synthesis, leading to the dissipation of energy as heat?
    A. Brown adipose tissue of newborns **B.** Muscle tissue
    C. Cardiac tissue **D.** White adipose tissue of adults
73. Where does glycolysis occur?
    A. Cytosol **B.** Golgi apparatus **C.** Nucleus **D.** Mitochondria
74. How NADH enters to mitochondria for oxidative phosphorylation?
    A. They diffuse through the inner mitochondrial membrane.
    B. They are moved by the malate-aspartate shuttle or the glycerol 3-phosphate shuttle.
    C. They are converted to NAD^+ in the cytosol and then transported into the matrix.
    D. They are actively transported across the inner mitochondrial membrane.
75. Which of the following organelles carries out β-oxidation in animals?
    A. Mitochondria **B.** Peroxisomes
    C. Endoplasmic reticulum **D.** Golgi apparatus

※ 試題請隨卷繳回

亞洲大學

112 學年度學士後獸醫學系招生考試試題紙

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學士後獸醫學系	生物化學	112.04.29	13:30-15:00

76. How does glycogen enter glycolysis?
A. Directly as glucose 6-phosphate
B. Through direct hydrolysis to form glucose
C. Through conversion to fructose 6-phosphate or fructose 1-phosphate
D. Through phosphorolytic cleavage to form glucose 1-phosphate and subsequent conversion to glucose 6-phosphate

77. How are the urea cycle and the citric acid cycle interconnected?
A. Both cycles share the same enzymes
B. The urea cycle is a branch of the citric acid cycle
C. Both cycles use the same intermediates
D. The urea cycle and the citric acid cycle are not interconnected

78. In which organs does gluconeogenesis primarily occur in mammals?
A. Brain, muscles, and erythrocytes **B.** Liver, kidney, and small intestine
C. Pancreas, lungs, and spleen **D.** Stomach, gallbladder, and bladder

79. Which of the following is responsible for reducing molecular O_2 to H_2O in the respiratory chain of mitochondria?
A. NAD-linked dehydrogenase **B.** Cytochrome oxidase (Complex IV)
C. Succinate dehydrogenase (Complex II) **D.** Superoxide dismutase (SOD)

80. Which of the following metal ions in heme can bind oxygen reversibly?
A. Fe^{2+} **B.** Mg^{2+} **C.** Ca^{2+} **D.** None of above

※ 試題請隨卷繳回

亞洲大學
112 學年度學士後獸醫學系招生筆試科目答案

1. 英文

1. D	21. A	41. B	61. D
2. B	22. A	42. D	62. C
3. A	23. B	43. A	63. B
4. B	24. C	44. A	64. A
5. B	25. A	45. A	65. D
6. D	26. D	46. B	66. B
7. C	27. B	47. A	67. A
8. B	28. B	48. D	68. B
9. C	29. A	49. C	69. C
10. D	30. C	50. D	70. C
11. D	31. B	51. A	71. D
12. A	32. C	52. C	72. B
13. B	33. A	53. B	73. A
14. A	34. D	54. D	74. D
15. B	35. D	55. A	75. A
16. C	36. A	56. D	76. D
17. C	37. C	57. C	77. C
18. D	38. A	58. A	78. B
19. C	39. B	59. D	79. D
20. A	40. C	60. B	80. A

2. 化學(含普通化學、有機化學)

1. B	21. C	41. C	61. C
2. A	22. D	42. B	62. D
3. C	23. D	43. B	63. C
4. C	24. B	44. B	64. C
5. B	25. A	45. B	65. D
6. B	26. D	46. D	66. B
7. D	27. D	47. C	67. A
8. C	28. C	48. A	68. A
9. D	29. B	49. B	69. B
10. D	30. A	50. A	70. B
11. A	31. A	51. A	71. A
12. C	32. B	52. A	72. D
13. C	33. A	53. D	73. A
14. C	34. C	54. C	74. A
15. C	35. B	55. D	75. D
16. A	36. C	56. A	76. C
17. B	37. A	57. B	77. B
18. A	38. A	58. D	78. C
19. B	39. A	59. B	79. C
20. A	40. B	60. C	80. A

亞洲大學
112 學年度學士後獸醫學系招生筆試科目答案

3. 生物化學

1. B	21. D	41. D	61. C
2. A	22. B	42. B	62. C
3. B	23. B	43. B	63. D
4. B	24. B	44. C	64. A
5. B	25. D	45. B	65. B
6. B	26. B	46. B	66. B
7. D	27. A	47. A	67. A
8. D	28. B	48. D	68. A
9. B	29. B	49. A	69. C
10. B	30. D	50. A	70. C
11. A	31. D	51. D	71. D
12. B	32. C	52. A	72. A
13. C	33. B	53. A	73. A
14. C	34. B	54. B	74. B
15. D	35. C	55. C	75. A
16. C	36. D	56. A	76. D
17. D	37. A	57. D	77. C
18. A	38. A	58. D	78. B
19. D	39. C	59. B	79. B
20. D	40. A	60. B	80. A

4. 生物學(含植物學)

1. D	21. B	41. D	61. D
2. A	22. D	42. A	62. D
3. A	23. D	43. B	63. D
4. C	24. C	44. B	64. D
5. B	25. A	45. B	65. C
6. A	26. B	46. C	66. B
7. D	27. C	47. A	67. B
8. B	28. A	48. A	68. D
9. D	29. D	49. D	69. A
10. C	30. A	50. D	70. C
11. D	31. B	51. D	71. A
12. A	32. D	52. D	72. A
13. A	33. C	53. B	73. B
14. D	34. B	54. D	74. A
15. C	35. B	55. B	75. C
16. A	36. B	56. A	76. B
17. B	37. A	57. A	77. D
18. D	38. B	58. B	78. A
19. C	39. B	59. C	79. A
20. D	40. A	60. A	80. B