

國立中山大學 102 學年度轉學考招生考試試題

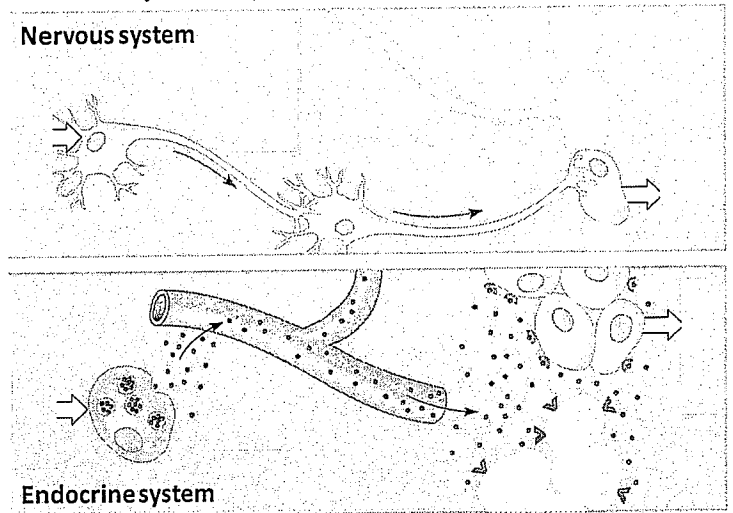
科目名稱：普通生物學【生科系三年級】

題號：721003

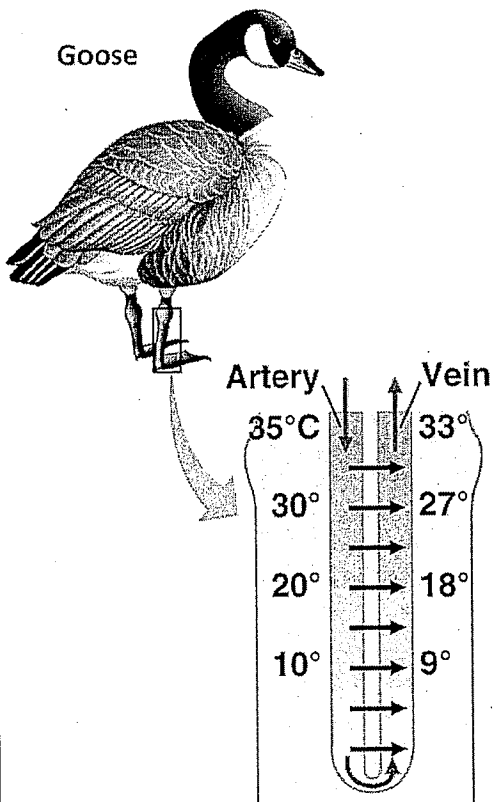
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1. Please compare the following three types of bulk transport. (15 %) (Phagocytosis, Pinocytosis and Receptor-mediated endocytosis)
2. The figure shows signaling in the endocrine and nervous system. Please compare differences between these two systems. (15 %)



3. Please explain the “countercurrent heat exchange” in detail after reading the following paragraph. (20 %)



1. Arteries carrying warm blood to the animal's extremities are in close contact with veins conveying cool blood in the opposite direction, back toward the trunk of the body. This arrangement facilitates heat transfer from arteries to veins along the entire length of the blood vessels.

2. Near the end of the leg, where arterial blood has been cooled to far below the animal's core temperature, the artery can still transfer heat to the even colder blood in an adjacent vein. The blood in the veins continues to absorb heat as it passes warmer and warmer blood traveling in the opposite direction in the arteries.

3. As the blood in the veins approaches the center of the body, it is almost as warm as the body core, minimizing the heat loss that results from supplying blood to body parts immersed in cold water.

Key

Warm blood \longrightarrow Blood flow
 Cool blood \longrightarrow Heat transfer

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4. What is a species? List species concepts you know and compare their differences. (20%)
5. There are three models of ecological succession to explain how community changes. In these three models, how early-arriving species affect later-arriving species? (15 %)
6. Describe the life cycle of any fern species. You may use illustrations to enhance your descriptions. (15 %)

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單選題 (40 題, 每題 1.5 分共 60 分)

- The absolute configuration of amino acids is denoted by its relationship to the L- or D- forms of _____.
(A) glyceraldehyde (B) glucose (C) glycerol (D) pyruvate
- Which group consists only of amino acids with polar side chains?
(A) Ser, Thr and Leu (B) Ser, Thr and Cys (C) Ser, Thr and Val (D) Ser, Thr and Ile
- Which group consists only of amino acids with carboxylate side chains?
(A) Glu and Cys (B) Asp and Gly (C) Glu and Lys (D) Glu and Asp
- Which group consists only of amino acids with basic side chains?
(A) Leu and Lys (B) Arg and Met (C) Lys and Arg (D) Arg and Ile
- Which of the following amino acids have aromatic groups in their side chains?
(A) Phe, Tyr and Trp (B) Ala, Tyr and Trp (C) Phe, Lys and Tyr (D) Phe, Tyr and Met
- Which of the following amino acids is not found in proteins?
(A) asparagine (B) ornithine (C) isoleucine (D) proline
- The order in which amino acids are linked in peptides is given _____.
(A) from the C-terminal to the N-terminal end (B) from the N-terminal to the C-terminal end
(C) in alphabetical order
(D) in order of increasing molecular weights of the amino acid residues
- The tertiary structure of a protein is usually a result of which of the following interactions?
(A) intramolecular hydrogen bonds (H bonds) (B) electrostatic interactions
(C) hydrophobic interactions (D) all of the above
- The information needed for the structure of a protein is contained in the _____.
(A) amino acid composition (B) primary structure (C) secondary structure (D) tertiary structure
- H bonds are most important in the _____ of proteins.
(A) primary structure (B) secondary structure (C) tertiary structure (D) quaternary structure
- The overall folding of a single protein subunit is called the _____.
(A) primary structure (B) secondary structure (C) tertiary structure (D) quaternary structure
- _____ are the two amino acids frequently found in reverse turns.
(A) Tyr and Trp (B) Ser and Thr (C) Gly and Pro (D) Leu and Ile
- Which interaction does not directly influence the overall conformation of the proteins?
(A) covalent bonds (B) ionic interactions (C) H bonds (D) hydrophobic interactions
- The binding of O₂ to hemoglobin differs from the O₂-binding behavior of myoglobin because
(A) O₂ binding to hemoglobin is cooperative (B) O₂ binding to myoglobin is cooperative
(C) hemoglobin is not an allosteric protein (D) the O₂-binding curve of hemoglobin is hyperbolic
- Molecular sieve chromatography is used to separate molecules on the basis of _____.
(A) melting point (B) charge (C) polarity (D) size

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16. Which would be best to separate a protein that binds strongly to its substrate?
(A) gel filtration (B) affinity chromatography (C) ion exchange (D) salting out
17. The isoelectric point is _____.
(A) the pH at which a substance has no net charge
(B) the pH at which a substance has a net positive charge
(C) the pH at which a substance has a net negative charge
(D) the pH at which a substance has no charge groups of any kind
18. Determination of the sequence of amino acids in peptide is done by _____.
(A) X-ray crystallography (B) Edman degradation (C) treatment with CNBr (D) trypsin hydrolysis
19. The primary control mechanism in blood clotting is
(A) proteolytic cleavage of zymogen (B) allosteric feedback control
(C) modification of side chains (D) all of the above
20. A comparison of reactions catalyzed by allosteric enzymes with those catalyzed by non-allosteric enzymes always indicates that
(A) allosteric enzymes are less efficient as catalysts than non-allosteric enzymes
(B) allosteric enzymes do not display cooperative effects, whereas non-allosteric enzymes do so
(C) the same control mechanisms apply to both
(D) the plot of reaction rate against substrate concentration differs
21. Which groups of amino acids are likely to be found in the active site of an enzyme?
(A) Leu, Lys, Ala (B) Cys, Ile, Phe (C) Tyr, Thr, Leu (D) Ser, His, Asp
22. Phosphorylation of enzymes
(A) has no effect on their catalytic activity (B) does not require ATP
(C) takes place on serine, threonine and tyrosine residues (D) is not easily characterized
23. Abzymes
(A) invariably bind to pyridoxal phosphate (PLP)
(B) are antibodies with catalytic activity
(C) have praline as part of their structure
(D) differ markedly from transition states in enzymatic reactions
24. Which of these characteristics is not found in naturally occurring fatty acids in mammals?
(A) they are found free and unassociated with other molecules
(B) virtually all the fatty acids contain an even number of carbon atoms
(C) if unsaturated, they occur in the "cis" configuration
(D) they are linear
25. Membrane lipids in a lipid bilayer are held together by
(A) hydrophobic interactions (B) H bonds (C) electrostatic interactions (D) covalent bonds
26. In the fluid mosaic model of membrane structure
(A) the proteins are specifically bonded to the lipids
(B) the proteins "float" in the lipid bilayer
(C) the proteins are sandwiched between the lipid molecules
(D) the lipids are sandwiched between the protein molecules

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27. The difference between active transport and passive transport is that
(A) concentration gradients are involved in one and not in the other
(B) glycolipids play a role in one and not in the other
(C) one requires expenditure of energy by the cell and the other does not
(D) ions are transported into and out of the cell by one process and not by the other
28. An important factor in controlling the level of cholesterol in the bloodstream is the presence of membrane receptors for
(A) cholesterol (B) cholesterol esters (C) atherosclerosis (D) LDL
29. Aspirin produces most of its analgesic effects by _____.
(A) binding to the plasma membrane of nerve cells (B) inhibiting the synthesis of vitamin A
(C) inhibiting the synthesis of phospholipids (D) inhibiting the synthesis of prostaglandins
30. The A and B forms of DNA
(A) are both right-handed helices (B) are both left-handed helices
(C) both have 10 base pairs per turn of the helix (D) both have 11 base pairs per turn of the helix
31. In a melting profile for DNA, the absorbance at 260 nm increases as result of the disruption of the DNA structure. What is the fundamental physical basis for the absorbance increase?
(A) the effective concentration of DNA changes
(B) denatured DNA absorbs light more strongly than native DNA because the bases are un-stacked
(C) native DNA absorbs light more strongly than denatured DNA because the bases are stacked
(D) the absorbance of DNA is highly sensitive to temperature
32. The standard state usually used in biochemistry includes
(A) all concentrations are 1 M (B) all concentrations are 1 M, except for $[H^+]$, which is 10^{-7} M
(C) the same as (A) but at $25^{\circ}C$ (D) the same as (B) but at $25^{\circ}C$
33. There are two forms of starch:
(A) amylose and glycogen, both of which are highly branched polysaccharides
(B) glycogen and chitin, both of which are linear polysaccharides
(C) amylopectin and glycogen, both of which are linear polysaccharides
(D) amylase, which is a linear polysaccharide, and amylopectin, which is highly branched
34. Glycolysis
(A) does not require O_2 to generate energy (B) requires O_2 to generate energy
(C) is inhibited by O_2 (D) rate is increased in the presence of O_2
35. In humans, pyruvate can be converted to
(A) acetyl-CoA only (B) lactate only (C) ethanol only (D) acetyl-CoA and lactate
36. An enzyme not involved in the control of glycolysis is
(A) hexokinase (B) triose phosphate isomerase
(C) pyruvate kinase (D) phosphofructokinase
37. Gluconeogenesis is the synthesis of
(A) glucose from noncarbohydrate precursors (B) glycogen from glucose
(C) pyruvate from glucose (D) fatty acids from glucose

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38. The primary function of the pentose phosphate pathway is
(A) to synthesize NAD^+ and pentose phosphates
(B) to synthesize NADPH and pentose phosphate
(C) to produce NADH
(D) to convert pentose phosphates to hexose phosphates
39. The committed step in cholesterol biosynthesis is catalyzed by
(A) HMG-CoA synthase (B) HMG-CoA reductase
(C) mevalonate kinase (D) squalene monooxygenase
40. Chemiosmotic coupling involves this process of
(A) using a proton gradient to synthesize ATP (B) using an electron gradient to synthesize ATP
(C) using the flow of O_2 to synthesize ATP (D) using a proton gradient to make H_2O from O_2

問答題 (40 分)

1. Describe the common three distinctive features of enzymes. (9 分)
2. The Michaelis-Menten equation is the fundamental equation of enzyme kinetics: (9 分)
 - (1) Write out the equation.
 - (2) Describe the major assumption to derive the equation.
 - (3) Discuss the significance of the equation.
3. Using specific examples to describe the substrate-level phosphorylation and the oxidative phosphorylation in the synthesis of ATP. (12 分)
4. Describe the chemical differences between DNA and RNA and discuss the biological significance of the differences. (10 分)

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