一、單選題 (每題 2 分)※注意：請於試卷「選擇題作答區」依題號作答。※

1. Many mammals control their body temperature by sweating. Which property of water is most directly responsible for the ability of sweat to lower body temperature?
   (A) water's change in density when it condenses
   (B) water's ability to dissolve molecules in the air
   (C) the release of heat by the formation of hydrogen bonds
   (D) the absorption of heat by the breaking of hydrogen bonds
   (E) water's high surface tension

2. What is a triacylglycerol?
   (A) a protein with tertiary structure
   (B) a lipid made with three fatty acids and glycerol
   (C) a lipid that makes up much of the plasma membrane
   (D) a molecule formed from three alcohols by dehydration reactions
   (E) a carbohydrate with three sugars joined together by glycosidic linkages

3. Cells can be described as having a cytoskeleton of internal structures that contribute to the shape, organization, and movement of the cell. Which of the following are parts of the cytoskeleton?
   (A) the nuclear envelope (B) mitochondria (C) microfilaments (D) lysosomes (E) nucleoli

4. When a membrane is freeze-fractured, the bilayer splits down the middle between the two layers of phospholipids. In an electron micrograph of a freeze-fractured membrane, the bumps seen on the fractured surface of the membrane are _____.
   (A) peripheral membrane proteins (B) phospholipids (C) carbohydrates
   (D) cholesterol molecules (E) integral membrane proteins

5. Which of the following types of reactions would decrease the entropy within a cell?
   (A) dehydration reactions (B) hydrolysis (C) respiration (D) digestion (E) catabolism

6. When oxygen is released as a result of photosynthesis, it is a by-product of which of the following?
   (A) reducing $NADP^+$ (B) splitting the water molecules (C) chemiosmosis
   (D) the electron transfer system of photosystem I (E) the electron transfer system of photosystem II

7. Of the following, a receptor protein in a membrane that recognizes a chemical signal is most similar to _____.
   (A) the active site of an allosteric enzyme in the cytoplasm that binds to a specific substrate
   (B) RNA specifying the amino acids in a polypeptide
   (C) a particular metabolic pathway operating within a specific organelle
   (D) an enzyme with an optimum pH and temperature for activity
   (E) genes making up a chromosome

8. Which of the following is true of a species that has a chromosome number of $2n = 16$?
   (A) The species is diploid with 32 chromosomes per cell.
   (B) The species has 16 sets of chromosomes per cell.
   (C) Each cell has 8 homologous pairs.
   (D) During the S phase of the cell cycle there will be 32 separate chromosomes.
   (E) A gamete from this species has 4 chromosomes.

9. The DNA of telomeres has been found to be highly conserved throughout the evolution of eukaryotes. What does this most probably reflect?
   (A) the inactivity of this DNA (B) the low frequency of mutations occurring in this DNA
   (C) that new evolution of telomeres continues (D) that mutations in telomeres are relatively advantageous
   (E) that the critical function of telomeres must be maintained

接　背　面

10. In eukaryotes there are several different types of RNA polymerase. Which type is involved in transcription of mRNA for a globin protein?
(A) ligase (B) primase (C) RNA polymerase I (D) RNA polymerase II (E) RNA polymerase III

11. Members of which kingdom have cell walls and are all heterotrophic?
(A) Protista (B) Animalia (C) Fungi (D) Plantae (E) Archea

12. The most important feature that permits a gene to act as a molecular clock is
(A) having a reliable average rate of mutation. (B) its recent origin by a gene-duplication event.
(C) having a large number of base pairs. (D) its being acted upon by natural selection.
(E) having a larger proportion of exonic DNA than of intronic DNA.

13. To apply parsimony to constructing a phylogenetic tree,
(A) choose the tree in which the branch points are based on as many shared derived characters as possible.
(B) choose the tree with the fewest branch points.
(C) choose the tree that represents the fewest evolutionary changes, either in DNA sequences or morphology.
(D) choose the tree that assumes all evolutionary changes are most likely.
(E) base phylogenetic trees only on the fossil record, as this provides the simplest explanation for evolution.

14. If you were using cladistics to build a phylogenetic tree of cats, which of the following would be the best closely related outgroup?
(A) bird (B) lion (C) wolf (D) domestic cat (E) frog

15. The recessive allele that causes phenylketonuria (PKU) is harmful, except when an infant's diet lacks the amino acid phenylalanine. What maintains the presence of this harmful allele in a population's gene pool?
(A) stabilizing selection (B) balancing selection (C) diploidy
(D) heterozygote advantage (E) neutral selection

16. In general, what is the primary ecological role of prokaryotes?
(A) serving as primary producers in terrestrial environments (B) breaking down organic matter
(C) parasitizing eukaryotes, thus causing diseases (D) metabolizing materials in extreme environments
(E) adding methane to the atmosphere

17. To reduce the need for fertilizers, some citrus growers
(A) eliminate harmful soil bacteria. (B) eliminate harmful soil fungi. (C) use fungicides.
(D) add mycorrhizal fungi such as Glomeromycetes to the soil. (E) add mycorrhizal bacteria such as Agrobacteria.

18. In addition to seeds, which of the following characteristics are unique to the seed-producing plants?
(A) pollen (B) lignin present in cell walls (C) megaphylls (D) sporopollenin
(E) use of air currents as a dispersal agent

19. Angiosperm double fertilization is so-called because it features the formation of
(A) one embryo from one egg fertilized by two sperm cells.
(B) two embryos from two sperm cells and two eggs.
(C) one embryo involving one sperm cell and an endosperm involving a second sperm cell.
(D) one embryo from two eggs fertilized by a single sperm cell.
(E) two embryos from one egg and two sperm cells.

20. Among the organisms listed here, which are thought to be the closest relatives of fungi?
(A) brown algae (B) animals (C) slime molds (D) vascular plants (E) mosses

21. Which of the following was not a challenge for survival of the first land plants?
(A) sources of water (B) animal predation (C) sperm transfer (D) absorbing enough light (E) desiccation

22. Although each of the following has a better chance of influencing gene frequencies in small populations than in large populations, which one most consistently requires a small population as a precondition for its occurrence?
(A) natural selection (B) gene flow (C) nonrandom mating (D) mutation (E) genetic drift

接　次　頁

23. Protists include
(A) a single clade of eukaryotes that are distantly related to animals.
(B) two clades of eukaryotes: one that is related to animals, and another that is related to fungi and plants.
(C) a diverse mix of eukaryotes that formed through multiple origins of the eukaryotic cell.
(D) two clades of eukaryotes: algae and protozoans.
(E) multiple clades of eukaryotes: some that are closely related to plants, and others that are closely related to animals and fungi.

24. Which of the following would a biologist describe as microevolution?
(A) the formation of new species (B) the extinction of species
(C) dramatic biological changes, such as the origin of flight, within a taxon
(D) the generation of biodiversity (E) a change in allele frequencies within the gene pool of a population

25. The sickle-cell allele produces a serious blood disease in homozygotes. Why doesn't natural selection eliminate this allele from all human populations?
(A) Natural selection is a positive force, so it does not eliminate alleles.
(B) In populations where endemic malaria is present, heterozygotes have an important advantage: They are resistant to malaria and therefore are more likely to survive and produce offspring that carry the allele.
(C) Genetic drift tends to keep the allele present in human populations.
(D) Mutations keep bringing the allele back into circulation.
(E) Natural selection occurs very slowly, but elimination of the sickle-cell allele is expected to occur soon.

26. Genetic differences between populations tend to be reduced by
(A) gene flow. (B) mutation. (C) the founder effect. (D) the bottleneck effect. (E) natural selection.

27. Which of the following statements describes the lysogenic cycle of lambda (λ) phage?
(A) The phage DNA is copied and exits the cell as a phage.
(B) After infection, the viral genes immediately turn the host cell into a lambda-producing factory, and the host cell then lyses.
(C) Most of the prophage genes are activated by the product of a particular prophage gene.
(D) Viral DNA is incorporated into the host genome.
(E) The virus-host relationship usually lasts for generations.

28. The host range of a virus is determined by _____.
(A) whether its nucleic acid is DNA or RNA (B) the enzymes carried by the virus
(C) the proteins in the host's cytoplasm (D) the proteins on its surface and that of the host
(E) Both the virus surface proteins and the viral DNA

29. HIV is inactivated in the laboratory after a few minutes of sitting at room temperature, but the flu virus is still active after sitting for several hours. What can you conclude from these findings?
(A) Disinfecting surfaces is more important to reduce the spread of HIV than the flu
(B) This property of HIV makes it more likely to be a pandemic than the flu virus
(C) HIV can be transmitted more easily from person to person than the flu virus
(D) The flu virus can be transmitted more easily from person to person than HIV
(E) This implies HIV must evolve faster than flu virus so the curing of HIV is difficult

30. Which of these is a major trend we observed in angiosperm evolution?
(A) the trend toward pathogen resistance (B) the trend toward a gametophyte-dominated life cycle
(C) the trend toward bilateral symmetry flowers (D) the trend toward smaller size
(E) the trend toward dry tolerance

31. Which of the following anatomical feature is a symplesiomorphic (shared ancestral) character for mammals?
(A) Hairs. (B) A two-chamber heart. (C) Jaws. (D) Placenta. (E) Feathers.

32. Among the groups of organisms listed below, which is the most inappropriate outgroup for studying animal evolution?
(A) Fungi. (B) Choanoflagellates. (C) Bacteria. (D) Plants. (E) Cnidarians.

33. A flatworm is in common with a cnidarian in that
(A) they are both diploblastic. (B) they both have a single-opening gastrovascular cavity.
(C) they are both exclusively aquatic. (D) they both have a bilaterally symmetric body plan.
(E) they both have a centralized nervous system.

34. Among the vertebrate groups listed below, which is the most inclusive?
(A) Tetrapods. (B) Gnathostomes. (C) Amniotes. (D) Reptilians. (E) Sarcopterygians.

35. Please identify the incorrect pairing between the taxon name and its unique character.
(A) Mammalia – the three ear bones. (B) Echinodermata – water vascular system.
(C) Primates – opposable thumbs. (D) Cnidaria – nematocysts. (E) Annelida – radula.

36. Members of _____ live exclusively in marine environment.
(A) Brachiopoda (B) Arthropoda (C) Cnidaria (D) Nematoda (E) Eutheria

37. Many cnidarian taxa have a biphasic life cycle, but ___ is an exception because the __ stage is the only life history stage found in this taxon.
(A) Scyphozoa; medusa (B) Scyphozoa; polyp (C) Anthozoa; medusa
(D) Anthozoa; polyp (E) Hydrozoa; mesusa

38. Which of the following descriptions provides the best support for that animals are heterotrophic?
(A) Animals undergo embryonic development. (B) Animals have neurons and muscles.
(C) Animals ingest foods for constructing their own organic molecules.
(D) Animals lack cell wall. (E) Cells of animal are organized into tissues.

39. Which of the following statements best describes the phylogenetic relationship between birds and reptiles?
(A) Birds are a monophyletic group arising from within the paraphyletic reptiles.
(B) Birds are a polyphyletic group arising from within the paraphyletic reptiles.
(C) Birds are a paraphyletic group giving rise to the monophyletic reptiles.
(D) Birds are a paraphyletic group giving rise to the polyphyletic reptiles.
(E) Birds are a monophyletic group arising independently from the monophyletic reptiles.

40. Which of the following invertebrate phyla features a closed circulation system?
(A) Arthropods. (B) Molluscs. (C) Cnidarians. (D) Annelids. (E) Flatworms

41. What is the best statement to define ecology?
(A) the study of relationships among organisms or between organisms and the environment
(B) the study of animal and plant population interactions (C) the study of the biosphere
(D) the study of abiotic factors of the environment (E) the study of environmental change

42. A biome is characterized primarily by
(A) flora and fauna. (B) temperature and moisture. (C) climate and dominant plant types.
(D) global weather and fauna. (E) None of the above.

43. The native cycads (蘇鐵) in Taiwan is threatened by exotic cycads. What is a major reason?
(A) Exotic cycads invade the native one's habitat (i.e. 台東).
(B) Exotic cycads secrete chemical to soil and then kill the native one.
(C) Exotic cycads attract pollinators away from the native one.
(D) Exotic cycads support high populations of herbivores, which hurt the native cycad.
(E) None of the above.

接　次　頁

44. Which statement can appropriately describe the current status of global agriculture?
(A) Coffee and tea are among the most important drinks in the world.
(B) Six major food crops include wheat, rice, corn, potatoes, sweet potatoes, and manioc.
(C) When we face global environmental change, it is important to preserve the genetic diversity of crop plants.
(D) About 90% of soybeans produced in the U.S. are genetically modified.
(E) All of the above.

45. The Hardy-Weinberg principle states that
(A) genotypic changes will result in phenotypic changes.
(B) phenotypic changes will result in genotypic changes.
(C) allelic frequencies within a population will not change unless certain conditions are met.
(D) allelic frequencies within a population will change unless certain conditions are met.
(E) None of the above.

46. Type III survivorship curve indicates
(A) low juvenile mortality and high mortality in older adults.
(B) high juvenile mortality and low mortality in older adults.
(C) low juvenile mortality and low mortality in older adults.
(D) high juvenile mortality and high mortality in older adults.
(E) equal chance of dying at any age.

47. Competition between members of a single species is called
(A) scramble competition. (B) species specific competition. (C) interspecific competition.
(D) intraspecific competition. (E) apparent competition.

48. Which factor below may stabilize predator-prey relationships by providing a prey refuge?
(A) An area of prey habitat that is isolated and difficult for predators to access.
(B) The occurrence of prey in numbers too large for predators to attack effectively
(C) The ability of prey to grow to a size invulnerable to predation
(D) All of the above.
(E) None of the above.

49. Robert MacArthur's study of forest warblers suggested that
(A) fewer warbler species can survive in more complex habitats.
(B) warbler species diversity increases with habitat complexity.
(C) warbler species diversity decreases with habitat complexity.
(D) most warblers have rather similar foraging niches.
(E) None of the choices are correct.

50. A keystone species is one
(A) that makes up a very large proportion of total community biomass.
(B) that feeds on a very large fraction of all available prey species.
(C) that is fed on by a very large fraction of all predators in its community.
(D) whose activities have a disproportionate effect on the structure of its community.
(E) that occupies the lowest level (the base) of the food web.

51. Which one below is correct?
(A) Mycorrhizae are parasitic fungi that are killing many tropical trees.
(B) Biogeography suggests that species interactions usually increase toward higher latitude.
(C) Species in lower latitude often have a narrower thermal range compared to those in higher latitude.
(D) Phenotypic changes in the field across geographic regions provide a sound evidence of genotypic changes.
(E) Climate warming should have no significant impact on the ecosystems in Taiwan.

接　背　面

52. A major perturbation of the carbon cycle by human activity is associated with
(A) release of carbon from farming activity.　(B) release of carbon from fossil fuel burning.
(C) removal of carbon from the atmosphere in the industrial production of fertilizers.
(D) accelerated removal of carbon from the atmosphere by forests.
(E) respiratory production of CO2 by the large human population.

53. If you become a leader in Taiwan, what information about global ecology/climate change can you tell your people?
(A) Taiwan is lucky because land at similar latitudes around the world is often covered by desert or savannas.
(B) Taiwan's ecosystems have very high biodiversity, compared to the majority of countries in the world.
(C) Species under climate change (i.e. warming) may have to move to higher altitude in Taiwan.
(D) All of the above

※下列題目請標明題號，依序作答於試卷內「非選擇題作答區」。※

二、單選題 (每題 1 分)

54. Which of the following statements is a correct distinction between autotrophs and heterotrophs?
(A) Cellular respiration is unique to heterotrophs.
(B) Only heterotrophs have mitochondria.
(C) Autotrophs, but not heterotrophs, can nourish themselves beginning with CO_2 and other nutrients that are inorganic.
(D) Only heterotrophs require oxygen.

55. If photosynthesizing green algae are provided with CO_2 containing heavy oxygen (^{18}O), later analysis will show that all of the following molecules produced by the algae contain ^{18}O EXCEPT _____.
(A) glyceraldehyde 3-phosphate (G3P)　(B) glucose　(C) ribulose bisphosphate (RuBP)　(D) O_2

56. In photosynthesis, the final electron acceptor of linear electron transport is _____.
(A) oxygen　(B) water　(C) NADP　(D) NADPH　(E) CO_2

57. In mitochondria, chemiosmosis moves protons from the matrix into the intermembrane space, whereas in chloroplasts, chemiosmosis moves protons from the _____.
(A) matrix to the stroma　(B) stroma to the thylakoid space
(C) intermembrane space to the matrix　(D) thylakoid space to the stroma

58. In the process of carbon fixation, RuBP attaches a CO_2 to produce a six-carbon molecule, which is then split to produce two molecules of 3-phosphoglycerate. After phosphorylation and reduction produces glyceraldehyde 3-phosphate (G3P), what more needs to happen to complete the Calvin cycle?
(A) addition of a pair of electrons from NADPH　(B) regeneration of ATP from ADP
(C) regeneration of RuBP　(D) regeneration of $NADP^+$

59. CAM plants keep stomata closed in the daytime, thus reducing loss of water. They can do this because they _____.
(A) fix CO_2 into organic acids and store in vacuole during the night
(B) fix CO_2 into sugars in the bundle-sheath cells　(C) fix CO_2 into pyruvate in the mesophyll cells
(D) use photosystem I and photosystem II at night

60. Which of the following would be the most effective strategy to remove toxic heavy metals from a soil?
(A) heavy irrigation to leach out the heavy metals
(B) application of sulfur to lower the soil pH and precipitate the heavy metals
(C) adding plant species that have the ability to take up and accumulate heavy metals
(D) inoculating soil with mycorrhizae to avoid heavy-metal uptake

61. A major function of magnesium (Mg) in plants is to be _____.
(A) required to regenerate phosphoenolpyruvate in C4 and CAM plants
(B) a component of DNA and RNA　(C) a component of chlorophyll
(D) active in amino acid formation

接　次　頁

62. Which of the following statements about essential nutrients of plants are true? Essential nutrients _____.
I) are necessary for plant growth and reproduction
II) are required for a specific structure or metabolic function
III) cannot be synthesized by a plant
IV) are produced by symbiotic bacteria
(A) I and IV (B) II, III, and IV (C) I, II, and III (D) I, II, III, and IV

63. Which of the following are characteristic of both rhizobia and mycorrhizae?
I) They both benefit by receiving sugars from the plant.
II) They both become parasitic in nutrient-rich environments.
III) They both enhance the growth of most plants.
IV) They both are found in most ecosystems of the world.
(A) only I and II (B) only I, III, and IV (C) only III and IV (D) I, II, III, and IV

64. What major benefits do plants and mycorrhizal fungi receive from their symbiotic relationship?
(A) Plants receive enzymes, and fungi receive nitrogen and phosphorus.
(B) Plants receive increased root surface area, and fungi receive digestive enzymes.
(C) Fungi receive photosynthetic products in exchange for living in plant root nodules.
(D) Plants receive nitrogen and phosphorus, and fungi receive photosynthetic products.

65. Which of the following is a primary difference between ectomycorrhizae and endomycorrhizae?
(A) Endomycorrhizae have thicker, shorter hyphae than ectomycorrhizae.
(B) Ectomycorrhizae do not penetrate root cells, whereas endomycorrhizae grow into invaginations of the root cell membranes.
(C) Endomycorrhizae are more common than ectomycorrhizae.
(D) There are no significant differences between ectomycorrhizae and endomycorrhizae.

66. Which of these is a major trend in land plant evolution?
(A) the trend toward smaller size (B) the trend toward a gametophyte-dominated life cycle
(C) the trend toward a sporophyte-dominated life cycle (D) the trend toward larger gametophytes

67. Arrange the following structures from largest to smallest, assuming that they belong to two generations of the same angiosperm.
1. Ovary; 2. Ovule; 3. Egg; 4. Carpel; 5. Embryo sac
(A) 4, 2, 1, 5, 3 (B) 5, 4, 3, 1, 2 (C) 5, 1, 4, 2, 3 (D) 4, 1, 2, 5, 3

68. It is estimated that animal-pollinated or insect-pollinated plants produce 1000 pollen grains for each ovule; wind-pollinated plants produce 1,000,000 pollen grains for each ovule. What does that indicate about pollination systems?
(A) Wind-pollinated plants rarely produce seeds.
(B) Wind pollination is more efficient than animal-assisted pollination.
(C) Wind pollination is less efficient than animal-assisted pollination.
(D) Wind pollination is costlier to the plant than animal-assisted pollination.

69. Which of the following could be considered an evolutionary advantage of asexual reproduction in plants?
(A) increased success of progeny in a stable environment.
(B) increased agricultural productivity in a rapidly changing environment.
(C) maintenance and expansion of a large genome.
(D) increased ability to adapt to a change in the environment.

70. A plant has the following characteristics: a taproot system, several growth rings evident in a cross section of the stem, and a layer of bark around the outside. Which of the following best describes the plant?
(A) herbaceous eudicot (B) woody eudicot (C) woody monocot (D) herbaceous monocot

接　背　面

71. In plants, which of the following is correctly paired with its structure and function?
(A) sclerenchyma — supporting cells with thick secondary walls
(B) ground meristem — protective coat of woody stems and roots
(C) guard cells — waterproof ring of cells surrounding the central stele in roots
(D) periderm — parenchyma cells functioning in photosynthesis in leaves

72. The driving force that pushes the plant root tip through the soil is primarily _____.
(A) continuous cell division in the root cap at the tip of the root
(B) continuous cell division just behind the root cap in the center of the apical meristem
(C) elongation of cells behind the root apical meristem
(D) continuous cell division of root cap cells

73. The polarity of a plant is established when _____.
(A) cotyledons form at the shoot end of the embryo (B) the shoot-root axis is established in the embryo
(C) the primary root breaks through the seed coat
(D) the shoot first breaks through the soil into the light as the seed germinates

74. What is the function of proton pumps localized in the plant plasma membrane?
(A) to transfer phosphorus groups from ATP to proteins (B) to transfer anions across the plasma membrane
(C) to transfer metal ions across the plasma membrane (D) to create a membrane potential

75. If isolated plant cells with a water potential averaging -0.56 MPa are placed into a solution with a water potential of -0.45 MPa, which of the following would be the most likely outcome?
(A) The pressure potential of the cells would increase. (B) Water would move out of the cells.
(C) The cell walls would rupture, killing the cells. (D) Solutes would move out of the cells.

76. A water molecule could move all the way through a plant from soil to root to leaf to air and pass through a living cell only once. This living cell would be a part of which structure?
(A) a guard cell (B) the root epidermis (C) the endodermis (D) the root cortex

77. Compared to a cell with few aquaporins in its membrane, a cell containing many aquaporins will _____.
(A) have a faster rate of osmosis (B) have a lower water potential
(C) have a higher water potential (D) have a faster rate of active transport

78. As an undergraduate research assistant, your duties involve measuring water potential in experimental soil-plant-atmosphere systems. Assume you make a series of measurements in a system under normal daylight conditions, with stomata open and photosynthesis occurring. Which of the following correctly depicts the trend your measurement data should follow if the cohesion-tension mechanism is operating?
(A) $\psi_{soil} < \psi_{roots} = \psi_{leaves} < \psi_{atmosphere}$ (B) $\psi_{atmosphere} < \psi_{leaves} = \psi_{roots} < \psi_{soil}$
(C) $\psi_{soil} < \psi_{roots} < \psi_{leaves} < \psi_{atmosphere}$ (D) $\psi_{atmosphere} < \psi_{leaves} < \psi_{roots} < \psi_{soil}$

79. The detector of light during de-etiolation (greening) of a tomato plant is (are) _____.
(A) carotenoids (B) xanthophylls (C) phytochrome (D) auxin

80. Experiments on the positive phototropic response of plants indicate that _____.
(A) light destroys auxin (B) auxin is synthesized in the area where the stem bends
(C) auxin moves down the plant apoplastically (D) auxin can move to the shady side of the stem

81. Plants often use changes in day length (photoperiod) to trigger events such as dormancy and flowering. It is logical that plants have evolved this mechanism because photoperiod changes _____.
(A) are more predictable than air temperature changes (B) predict moisture availability
(C) are modified by soil temperature changes (D) can reset the biological clock

82. Shoots that grow vertically toward the sun can be characterized as _____.
(A) positive for phototropism and negative for gravitropism
(B) neutral for phototropism and positive for gravitropism

接　次　頁

(C) negative for phototropism and positive for gravitropism
(D) positive for phototropism and neutral for gravitropism

83. A certain bacterium infects a plant's upper leaves. A few days later, bacteria of the same species attempt to infect the same plant's roots but are unsuccessful. What process is responsible for the plant's ability to prevent this infection?
(A) antivirulence response　　(B) pathogenesis resistance
(C) systemic acquired resistance　　(D) sequential immunity

三、配合題 (每題 1 分):請由 A~Z 選項中選擇一個最適當的答案。
(注意：選項可能不只使用一次)

1. _____ attached to bones by tendon
2. After nutrients are absorbed, the blood carries them first to the _____ (an organ).
3. A drop in blood pH will _____ your rate of breathing.
4. Blood pressure and speed drop the most in _____ (a type of vessels).
5. Blood velocity is lowest in _____ (a type of vessels).
6. _____ attacks infected body cells.
7. The thermostat in vertebrates is located in the _____ (a brain area).
8. The cardiovascular control centers are located in the _____ (a brain area).
9. The reticular activating system is composed of neurons that distribute in _____.
10. A fall in blood pressure will _____ the heart rate via the baroreceptor reflex.

A) smooth muscles **B)** skeletal muscles **C)** cardiac muscles **D)** brain stem **E)** pancreas
F) kidney **G)** liver **H)** large intestine **I)** speed up **J)** slow down **K)** aorta **L)** arteries
M) arterioles **N)** capillaries **O)** venules **P)** veins **Q)** vena cava **R)** macrophage
S) cytotoxic T cell **T)** plasma cell **U)** helper T cell **V)** cerebellum **W)** hippocampus
X) hypothalamus **Y)** pons **Z)** medulla oblongata

四、選出一個最適合的答案選項，並說明你選擇的理由。(每題 3 分) (可用中文回答)

1. The brain determines the loudness of a sound from
(A) the part of the organ of Corti stimulated by the sound. (B) the size of the action potentials received.
(C) the size of air pressure changes in the middle ear. (D) the frequency of action potentials received.
(E) the part of the brain receiving action potentials.

2. Which of the following ion and structure link the action potential and muscle contraction, so called excitation–contraction coupling?
(A) Na^+/ T-tubule (B) Na^+/sarcomere (C) Ca^{2+}/sarcoplasmic reticulum
(D) Ca^{2+}/acetylcholine (E) Ca^{2+}/mitochondria

3. Taking vaccine help a person resists infection by a pathogen, it is because of
(A) immunological memory (B) an allergy (C) innate immunity
(D) an autoimmune response (E) immunological tolerance

接　背　面

4. In correct chronological order, the three phases of the human ovarian cycle are
(A) menstrual → ovulation → luteal. (B) follicular → luteal → secretory.
(C) menstrual → proliferative → secretory. (D) follicular → ovulation → luteal.
(E) proliferative → ovulation → secretory.

5. Which of the following would you be least likely to find in an herbivore?
(A) a rumen or cecum (B) molars (C) canine teeth (D) bacteria in the gut (E) a large intestine

6. Muscle X and muscle Y have the same number of fibers, but muscle X is capable of more precise control than muscle Y. Which of the following is likely to be true of muscle X?
(A) It has larger sarcomeres than muscle Y. (B) It contains fewer motor units than muscle Y.
(C) It is controlled by fewer neurons than muscle Y. (D) It is controlled by more neurons than muscle Y.
(E) Each of its motor units consists of more cells than the motor units of muscle Y.

7. In comparing the kidneys of marine and freshwater fish which of the following is not true?
(A) marine fish drink greater quantities of water (B) the flow of the filtrate is faster in marine fish
(C) freshwater fish have larger glomeruli (D) the urine is less concentrated in freshwater fish
(E) marine fish excrete many of the divalent cations through the urine

8. Different body cells can respond differently to the same peptide hormones because
(A) different target cells have different sets of genes.
(B) each cell converts that hormone to a different metabolite.
(C) a target cell's response is determined by the components of its signal transduction pathways.
(D) the circulatory system regulates responses to hormones by routing the hormones to specific targets.
(E) the hormone is chemically altered in different ways as it travels through the circulatory system.

五、名詞解釋 (每題 4 分) (可用中文回答)

1. Substrate-level phosphorylation
2. Kinetochore
3. Okazaki fragments
4. Transcription factor
5. Polysome

六、問答題 (每題 5 分) (可用中文回答)

1. Why are bird lungs more efficient than human lungs?
2. Birth control pills contain synthetic estrogen and progesterone. How might these hormones prevent pregnancy?

試題必須隨卷繳回