

- I. Multiple Choice Questions (select the one that is best in each case): (50%) (每小題一分)
- ( ) 1. The concentration of Ca in a cell is 0.3%. The concentration of Ca in the surrounding fluid is 0.1%. How could the cell obtain more Ca? A. passive transport; B. diffusion; C. active transport; D. osmosis; E. any of the above.
- ( ) 2. Sports physiologists at an Olympic training center wanted to monitor athletes to determine at what point their muscles were functioning anaerobically. They could do this by checking for a buildup of A. ATP; B. lactic acid; C. carbon dioxide; D. ADP; E. oxygen.
- ( ) 3. Which of the following might be a strict anaerobe? A. a bacterial cell; B. a yeast cell; C. a human muscle cell; D. a plant cell; E. a human skin cell.
- ( ) 4. Which of the following are produced by reactions that take place in the thylakoids and consumed by reactions in the stroma? A.  $\text{CO}_2$  and  $\text{H}_2\text{O}$ ; B.  $\text{NADP}^+$  and ADP; C. ATP and NADPH; D. glucose and oxygen; E.  $\text{CO}_2$  and ATP.
- ( ) 5. When light strikes chlorophyll molecules, they lose electrons, which are ultimately replaced by A. splitting water; B. breaking down ATP; C. removing them from NADPH; D. fixing carbon.
- ( ) 6. A biochemist measured the amount of DNA in cells growing in the laboratory and found that the quantity of DNA in a cell doubled A. between prophase and anaphase of mitosis; B. between the  $G_1$  and  $G_2$  phases of the cell cycle; C. during the M phase of the cell cycle; D. between prophase I and prophase II of meiosis; E. between anaphase and telophase of mitosis.
- ( ) 7. Cytochalasin B is a chemical that disrupts microfilament formation. This chemical would interfere with A. DNA replication; B. formation of the mitotic spindle; C. cleavage; D. crossing over.
- ( ) 8. The nucleotide sequence of a DNA codon is GTA. A messenger RNA molecule with a complementary codon is transcribed from the DNA. In the process of protein synthesis, a transfer RNA pairs with the mRNA codon. What is the nucleotide sequence of the tRNA anticodon? A. CAT; B. CUT; C. GUA; D. CAU.
- ( ) 9. Your bone cells, muscle cells, and skin cells look different because A. different kinds of genes are present in each kind of cell; B. they are present in different organs; C. different genes are active in each kind of cell; D. they contain different numbers of genes.
- ( ) 10. A microbiologist found that some bacteria infected by phages had developed the ability to make a particular amino acid that they could not make before. This new ability was probably a result of A. transformation; B. natural selection; C. conjugation; D. mutation; E. transduction.
- ( ) 11. A biologist isolated a gene from a human cell, attached it to a plasmid, and inserted the plasmid into a bacterium. The bacterium made a new protein, but it was nothing like the protein normally produced in a human cell. Why? A. The bacterium had undergone transformation. B. The gene did not have sticky ends. C. The gene contained introns. D. The gene did not come from a genomic library.
- ( ) 12. The processes of \_\_\_\_\_ and \_\_\_\_\_ generate variation, and \_\_\_\_\_ produces adaptation to the environment. A. recombination...natural selection...mutation; B. mutation...recombination...genetic drift; C. genetic drift...mutation...recombination; D. mutation...recombination...natural selection.
- ( ) 13. Birds with average-sized wings survived a severe storm more successfully than other birds in the same population with longer or shorter wings. This illustrates A. founder effect; B. stabilizing selection; C. artificial selection; D. gene flow; E. diversifying selection.
- ( ) 14. Two worms in the same class must also be grouped in the same A. order; B. phylum; C. genus D. family; E. species.
- ( ) 15. The bacteria that cause tetanus can be killed only by prolonged heating at temperatures considerably above boiling. This suggests that tetanus bacteria A. have cell walls containing peptidoglycan; B. protect themselves by secreting antibiotics; C. secrete endotoxins; D. are autotrophic; E. produce endospores.
- ( ) 16. Which of the following produce eggs and sperm? A. the fruiting bodies of a fungus; B. fern sporophytes; C. moss gametophytes; D. the anthers of a flower; E. moss sporangia.
- ( ) 17. The eggs of nonflowering seed plants are fertilized within ovules, and the ovules then develop into A. seeds; B. spores; C. gametophytes; D. fruit; E. sporophytes.
- ( ) 18. Reptiles are much more extensively adapted to life on land than amphibians because reptiles A. have a complete digestive tract; B. lay shelled eggs; C. are endothermic; D. go through a larval stage; E. have legs.
- ( ) 19. A lamprey, a shark, a lizard, and a rabbit share all the following characteristics except A. gill structures in the embryo or adult; B. vertebrate; C. hinged jaws; D. a dorsal hollow nerve cord.
- ( ) 20. Which of the following categories includes the largest number of species? A. invertebrates; B. chordates; C. arthropods; D. insects; E. vertebrates.
- ( ) 21. Which of the following body systems primarily regulate the activities of the other systems? A. cardiovascular and muscular systems; B. nervous and endocrine systems; C. lymphatic and integumentary systems; D. endocrine and lymphatic systems; E. integumentary and nervous systems.
- ( ) 22. Which of the following best illustrated homeostasis? A. Most adult human beings are between 5 and 6 feet tall; B. The lungs and intestines have large surface areas for exchange; C. When blood salt concentration goes up, the kidney expels more salt; D. All the cells of the body are about the same size; E. When oxygen in the blood decreases, you may feel light-headed.
- ( ) 23. A human requires hundreds of grams of carbohydrates every day. The daily requirement for most vitamins is in the milligram range. Why are vitamins needed in such small quantities? A. Vitamins are not very important in metabolism; B. The energy content of vitamins is so great that you don't need much. C. The body can store large quantities of most vitamins; D. Vitamins are reusable.
- ( ) 24. Countercurrent exchange in the gills of a fish A. speeds up the flow of water through the gills; B. maintains a concentration gradient that enhances diffusion; C. enables the fish to obtain oxygen while swimming backward; D. means that blood and water flow in the same direction; E. interferes with the efficient absorption of oxygen.

(背面仍有題目,請繼續作答)

- ( ) 25. In \_\_\_\_\_, oxygen diffuses directly from the air through a moist surface to cells, without being carried by the blood. A. an ant; B. a whale; C. an earthworm; D. a sparrow; E. a mouse.
- ( ) 26. Which of the following has an open circulatory system? A. trout; B. monkey; C. ant; D. frog.
- ( ) 27. When the doctor listened to Janet's heart, he heard "lub-hiss," "lub-hiss" instead of the normal "lub-dupp" sounds. The hiss is most likely due to A. a clogged coronary artery; B. a defective atrioventricular (AV) valve; C. a damaged pacemaker; D. a defective semilunar valve; E. high blood pressure.
- ( ) 28. Paul's blood pressure is 125/80. The 125 indicates \_\_\_\_\_, and the 80 indicates \_\_\_\_\_. sure  
A. pressure in the left ventricle...pressure in the right ventricle; B. arterial pressure...heart rate;  
C. pressure during ventricular contraction...pressure during heart relaxation; D. systemic circuit pressure...pulmonary circuit pressure; E. pressure in the arteries...pressure in the veins.
- ( ) 29. Which of the following is not part of the body's nonspecific defense system? A. natural killer cells; B. antibodies; C. interferons; D. complement; E. inflammation.
- ( ) 30. Researchers suspect that cytotoxic T cells are usually able to find and attack cancer cells because A. cancer changes the surfaces of cancerous cells; B. suppressor T cells help them; C. cancer is a bacterial infection; D. cancer cells release antibodies into the blood.
- ( ) 31. As filtrate passes through the loop of Henle, salt is removed and concentrated in the interstitial fluid of the kidney medulla. Because of this high salt concentration, the nephron is able to A. excrete the maximum amount of salt; B. neutralize toxins that might accumulate in the kidney; C. control the pH of the interstitial fluid; D. excrete a large amount of water; E. reabsorb water most efficiently.
- ( ) 32. Birds and insects excrete uric acid, while mammals and amphibians excrete mainly urea. What is the chief advantage of uric acid over urea as a waste product? A. Uric acid is more soluble in water; B. Uric acid is a much simpler molecule; C. It takes less energy to make uric acid; D. Less water is lost excreting uric acid; E. More solutes are lost excreting uric acid.
- ( ) 33. Which of the following controls the activity of all the others? A. thyroid gland; B. pituitary gland; C. adrenal cortex; D. hypothalamus; E. ovaries.
- ( ) 34. Which of the following hormones has the broadest range of targets? A. ADH; B. prolactin; C. TSH; D. epinephrine; E. ACTH.
- ( ) 35. Several kinds of chemicals act as hormones in the human body. Which of the following is not one of them? A. proteins; B. steroids; C. amines; D. peptides; E. carbohydrates.
- ( ) 36. After a sperm penetrates an egg, a fertilization membrane forms. This membrane A. secretes important hormones; B. enables the fertilized egg to implant in the wall of the uterus; C. prevents more than one sperm from entering the egg; D. attracts additional sperm to the egg.
- ( ) 37. A woman had several miscarriages. Her doctor suspected that a hormonal insufficiency was causing the lining of the uterus to break down, as it does during menstruation, terminating her pregnancies. Treatment with which of the following might help her remain pregnant? A. oxytocin; B. follicle stimulating hormone; C. testosterone; D. luteinizing hormone; E. prolactin.
- ( ) 38. A man suffered a head injury in a car accident. He subsequently suffered from uncontrollable mood changes, emotional outbursts, and a curious form of amnesia. Although he could remember incidents before the accident in detail, he was not able to form new memories. Which part of the brain did his doctor conclude had been damaged? A. cerebellum; B. medulla oblongata; C. limbic system; D. corpus callosum; E. hypothalamus.
- ( ) 39. Which of the following correctly traces the path of light into your eye? A. lens, cornea, pupil, retina; B. cornea, pupil, lens, retina; C. cornea, lens, pupil, retina; D. pupil, cornea, lens, retina.
- ( ) 40. If you look away from this book and focus your eyes on a distant object, the eye muscles \_\_\_\_\_ and the lenses \_\_\_\_\_ to focus images on the retinas. A. relax...flatten; B. relax...become more rounded; C. contract...flatten; D. contract...become more rounded.
- ( ) 41. Which of the following receptors are not present in human skin? A. thermoreceptors; B. chemoreceptors; C. touch receptors; D. pressure receptors; E. pain receptors
- ( ) 42. What is the role of acetylcholine in muscle contraction? A. It makes up part of the thin filaments inside a muscle fiber; B. It provides energy for contraction; C. It blocks contraction when the muscle relaxes; D. It signals a muscle fiber to contract; E. It forms the head of myosin.
- ( ) 43. A pea pod is formed from \_\_\_\_\_. A pea inside the pod formed from \_\_\_\_\_. A. an ovule...a carpel; B. an ovary...an ovule; C. an ovary...a pollen grain; D. an anther...an ovule; E. endosperm...an ovary.
- ( ) 44. In angiosperms, each pollen grain produces two sperm. What do these sperm do? A. Each one fertilizes a separate egg cell; B. One fertilizes an egg, and the other fertilizes the fruit; C. One fertilizes an egg, and the other is kept in reserve; D. Both fertilize a single egg cell.
- ( ) 45. Houseplants require the smallest amount of which of the following nutrients? A. oxygen; B. phosphorus; C. carbon; D. iron; E. hydrogen.
- ( ) 46. By trapping insects, carnivorous plants obtain \_\_\_\_\_, which they need \_\_\_\_\_. A. water...because they live in dry soil; B. nitrogen...to make sugar; C. phosphorus...to make protein; D. sugars...because they can not make enough in photosynthesis; E. nitrogen...to make protein.
- ( ) 47. During winter or periods of drought, which of the following plant hormones inhibits growth and seed germination? A. ethylene; B. abscisic acid; C. gibberellin; D. auxin; E. cytokinin.
- ( ) 48. Plant hormones act by affecting the activities of A. genes; B. membranes; C. enzymes; D. genes, membranes, and enzymes; E. genes and enzymes.
- ( ) 49. A bat locates insect prey in the dark by bouncing high-pitched sounds off them. One species of moth escapes predation by diving to the ground when it hears "sonar" of a particular bat species. This illustrates \_\_\_\_\_ between the bat and moth. A. mutation; B. coevolution; C. ecological succession; D. competitive exclusion; E. commensalism.
- ( ) 50. Which of the following is true of animals that use the sun to navigate? A. They cannot travel long distances; B. Most live in the sea, where there are few landmarks; C. They must have accurate biological clocks; D. Most migrate in large schools, flocks; E. They more easily travel east than west.

(背面仍有題目,請繼續作答)

II. Matching Questions( match each statement in left-hand column with special term in right-hand column): (37.5 %) (每小題 1.5 分)

- |   |                                 |
|---|---------------------------------|
| 1.( )Bending of a shoot toward light  | A. sleep movement               |
| 2.( )Where a leaf separates from the stem   | B. cerebral cortex              |
| 3.( )Produced by anterior pituitary and stimulates ovary                                    | C. melatonin                    |
| 4.( )Cell most commonly attacked by HIV   | D. hydrogen ion                 |
| 5.( )Animals that body cavity is a pseudocoelom   | E. phototropism                 |
| 6.( )Human gestation occurs here in   | F. flatworms                    |
| 7.( )Assists the cerebrum in coordinating movements   | G. helper T cell                |
| 8.( )Site of fertilization in humans  | H. photoperiod                  |
| 9.( )Carries out the secondary immune response  | I. mast cell                    |
| 10.( )Component of blood that passes into filtrate, partially reabsorbed, excreted in urine | J. cerebellum                   |
| 11.( )Pigment that helps control flowering  | K. urea                         |
| 12.( )Controls breathing and heart rate   | L. ovary follicle               |
| 13.( )Carries out humoral immunity  | M. abscission layer             |
| 14.( )Turns into the corpus luteum  | N. B-cell                       |
| 15.( )Folding of plant leaves at night  | O. hypothalamus                 |
| 16.( )Produced by pineal gland and related to daily rhythm                                  | P. Nematodes                    |
| 17.( )The simplest bilateral animals  | Q. follicle stimulating hormone |
| 18.( )Relative lengths of night and day   | R. thigmotropism                |
| 19.( )Regulates temperature, hunger, thirst   | S. oviduct                      |
| 20.( )Component of blood that passes into filtrate, also secreted, excreted in urine        | T. mollusk                      |
| 21.( )Animals have a muscular foot and a mantle   | U. phytochrome                  |
| 22.( )Handles language, judgment, and reasoning   | V. memory cell                  |
| 23.( )Growth response to touch  | W. uterus                       |
| 24.( )Triggers allergy symptoms   | X. gravitropism                 |
| 25.( )Growth response to gravity  | Y. medulla oblongata            |

III. Describes with plots the rise and fall of pituitary and ovarian hormones during the monthly ovarian cycle in human being. (12.5%)

- 說明： 1. 答案一律寫在試卷上，否則不予計分。  
2. 請依序作答、並標明題號，但不必抄題。