

(一) 選擇題 (單選，每題 2 分，共 45 題) ※ 本大題請於試卷內之「選擇題作答區」依序作答。

1. Why are most animal cells, regardless of species, relatively small and about the same size?  
A. Small cells avoid excessive osmosis.      B. Small cells have a small surface-to-volume ratio.  
C. Small cells have a large surface-to-volume ratio.      D. Small cells require less energy.
2. The lowest level of biological organization that can survive and reproduce is the  
A. DNA.      B. nucleus.      C. cell.      D. tissue.
3. Which of the following sequence best describes the flow of information within the cell?  
A. RNA → DNA → protein → trait.      B. RNA → DNA → glycoprotein → trait.  
C. DNA → RNA → trait → protein.      D. DNA → RNA → polypeptide → trait.
4. Emergent properties are  
A. characteristics of nonliving matter.      B. exclusive to atoms but not molecules.  
C. neither exclusive to molecules nor compounds.  
D. characteristics that depend on the level of organization of matter but do not exist at lower levels of organization.
5. Which of the following is NOT matched correctly?  
A. Plant—primary producer.      B. Animal—consumer.  
C. Cyanobacteria—decomposer.      D. Fungus—decomposer.
6. A series of programmed changes encoded in DNA, through which a fertilized egg divides into many cells that ultimately are transformed into an adult organism, is known as  
A. inheritance.      B. compensation.  
C. development.      D. homeostasis.
7. Most of the dry mass of a plant is derived from  
A. carbon from the atmosphere.      B. oxygen from the atmosphere.  
C. minerals from the soil.      D. carbon from the soil.
8. Which of the following would be LEAST suitable as a source of material for DNA fingerprinting?  
A. Saliva.      B. Red blood cells.  
C. Hair follicles.      D. White blood cells.
9. The amount of genotypic variation in a natural population can be increased by all of the following EXCEPT  
A. mutation.      B. Recombination.  
C. immigration.      D. inbreeding.
10. Which of the following is true about evolution?  
A. Natural selection is random.      B. Natural selection is survival of the strongest.  
C. Natural selection occurs when individuals compete for survival.  
D. Individuals evolve when environmental pressures are strong.
11. A recessive trait appears in 81% of the individuals in a population that is in Hardy-Weinberg equilibrium. What percent of the population in the next generation is expected to be homozygous dominant?  
A. 1%.      B. 18%.  
C. 19%.      D. 81%.
12. A major function of the skin in frogs and other amphibians most closely supplements the function of which of the following organs?  
A. gall bladder.      B. intestines.  
C. lungs.      D. kidneys.

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13. Which of the following has an open circulatory system?  
 A. sponge. B. grasshopper.  
 C. jellyfish. D. earthworm.
14. Body temperature can be increased by all of the following EXCEPT  
 A. muscle contractions. B. drinking alcohol, which results in vasodilation.  
 C. increasing metabolic activity. D. puffing up feathers or hair.
15. All of the following are involved in the regulation of blood glucose concentration EXCEPT  
 A. glucagon. B. insulin.  
 C. the pancreas. D. melatonin.
16. In humans, digestion occurs in all of the following locations EXCEPT  
 A. the duodenum. B. the stomach.  
 C. the pancreas. D. the small intestine.
17. All of the following are effective in lowering body temperature in mammals EXCEPT  
 A. large ears. B. sweating.  
 C. decreased muscular activity. D. decreased blood flow to extremities.
18. Why have scientists developed classification systems?  
 A. To arrange living and dead organisms into groups that reflect their relationships and evolutionary origins.  
 B. To make sense of the past and present diversity of life on Earth.  
 C. a & b only. D. none of the above.
19. If dogs, cows and whales are classified in different orders, they must also be in different  
 A. classes. B. phyla.  
 C. kingdoms. D. families.
20. Which of the following taxa contains organisms that are most distantly related?  
 A. Family. B. Genus.  
 C. Class. D. Order.
21. In species that form dominance hierarchies, subordinate animals may lack access to the best selection of food and mates. Why would they remain in the group?  
 A. They are exhibiting altruistic behavior.  
 B. Their chances of survival and reproduction are still better in the group.  
 C. They are ambitious and plan on becoming dominant in the future.  
 D. They are not aware that they would be more successful alone.
22. Young seagull chicks crouch in their nest when any bird flies overhead. Older chicks crouch only when an unfamiliar bird flies overhead. What kind of behavior is this?  
 A. Insight. B. Maturation.  
 C. Habituation. D. Imprinting.
23. Animal behaviors acquired through imprinting require  
 A. habituation. B. a sensitive or critical period.  
 C. insight. D. conditioning.
24. All of the following are associated with members of a species with a K-selected life history strategy EXCEPT  
 A. They have few offspring. B. They have a long life.  
 C. They require a long period of time to reach reproductive maturity.  
 D. There is little or no parental care.

25. The transition from a tropical rain forest to a savanna is marked by fewer and fewer trees. This is most likely caused by changes in
- A. rainfall. B. temperature.  
C. the length of the growing season. D. CO<sub>2</sub> concentration.
26. Which of the following is NOT a stage of respiration?
- A. Citric acid cycle. B. Formation of acetyl CoA.  
C. Glycolysis. D. Hydrolysis of starch to glucose.
27. Which of the following is most likely to occur in a leaf cell of a CAM plant during the day?
- A. Entry of CO<sub>2</sub> through stomata. B. Exit of water through stomata.  
C. Decarboxylation of malic acid. D. fixation of CO<sub>2</sub> by PEP carboxylase.
28. The earliest known fossils of angiosperms are approximately \_\_\_\_\_ years old.
- A. 130,000. B. 1.3 million.  
C. 13 million. D. 130 million.
29. In the evolution of vascular plants, there is a trend toward the:
- A. above-ground parts becoming structurally similar to the below-ground parts.  
B. progressive reduction of the sporophyte.  
C. sporophyte becoming nutritionally dependent on the gametophyte.  
D. increased protection of the gametophyte by the sporophyte.
30. Which of the following statements about pine seeds is FALSE?
- A. They are often shed from the cones during the first year following pollination.  
B. They are often dispersed by the wind. C. Some are winged.  
D. Some are dispersed only after the cones are scorched by fire.
31. Which of the following was NOT an evolutionary adaptation of angiosperms in response to insects?
- A. Inferior ovary. B. Edible flower parts.  
C. Unisexual flowers. D. Floral nectaries.
32. Some phytoplankton reduce atmospheric levels of carbon dioxide by favoring formation of \_\_\_\_\_ during photosynthetic carbon fixation.
- A. carbohydrate. B. calcium carbonate.  
C. calcium nitrate. D. sulfur-containing compounds.
33. Which of the following is NOT an example of a symbiotic relationship involving a fungus?
- A. Lichens. B. Mycorrhizae.  
C. Root nodules. D. Endophytes.
34. The first eukaryote whose genome has been completed sequenced is:
- A. *Penicillium*. B. *Cryptococcus neoformans*.  
C. *Candida albicans*. D. *Saccharomyces cerevisiae*.
35. Which of the following lists the correct sequence of cell wall layers, beginning with the outermost layer and progressing inward?
- A. Middle lamella, primary wall, secondary wall. B. Secondary wall, primary wall, middle lamella.  
C. Primary wall, middle lamella, secondary wall. D. Middle lamella, secondary wall, primary wall.
36. The red and blue pigments stored in vacuoles in flowers are:
- A. anthocyanins. B. flavonols.  
C. carotenoids. D. betacyanins.

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37. A plant's body plan consists of a(n) \_\_\_\_\_ and a(n) \_\_\_\_\_ pattern.  
 A. apical-radial; basal. B. apical-basal; radial.  
 C. apical; basal. D. radial; apical.
38. You are performing an experiment to determine the nutrient requirements for a newly discovered plant and find that for some reason your plants die if you leave boron out of the growth medium but do fine with 5 parts per million in solution. This suggests that boron is  
 A. an essential macronutrient. B. a nonessential micronutrient.  
 C. an essential micronutrient. D. a nonessential macronutrient.
39. Which of the following statements about sources and sinks in assimilate movement of plant body is FALSE?  
 A. A plant part unable to meet its nutritional needs functions as a sink.  
 B. In seedlings, the cotyledons commonly act as the major sinks.  
 C. In mature plants, the upper leaves commonly act as sources for the shoot apex.  
 D. Developing fruits are highly competitive sinks.
40. Which of the following statements about xylem and phloem is FALSE?  
 A. They are closely associated spatially. B. They are closely associated functionally.  
 C. They form a continuous vascular system.  
 D. Xylem transports only water and phloem transports only nutrients.
41. Studies of *Arabidopsis* mutants have shown three classes of \_\_\_\_\_ that affect the identity of floral organs.  
 A. meristematic activity. B. homeotic genes.  
 C. hormones. D. tunica-carpel organization.
42. Which of the following is NOT a finding from experiments on the role of auxin in phototropism of coleoptile tips?  
 A. Light does not affect the total amount of auxin. B. Auxin migrates from the lighted side to the shaded side.  
 C. More auxin can be isolated from the shaded side of an intact tip than from the lighted side.  
 D. If the tip is split and the two halves separated by a barrier, more auxin can be isolated from the shaded side than from the lighted side.
43. When tobacco pith callus is treated with higher concentrations of auxin than kinetin, \_\_\_\_\_ is(are) formed.  
 A. more callus. B. roots.  
 C. leaves. D. vascular tissue.
44. Which type(s) of plants, when grown under noninductive conditions, can be induced to flower if the light period is interrupted by darkness?  
 A. Only long-day plants. B. Only short-day plants.  
 C. Long-day and short-day plants. D. Short-day and day-neutral plants.
45. Compared with similar plants growing in full sunlight, plants growing in the shade of other vegetation:  
 A. receive more red light and less far-red light. B. are usually shorter.  
 C. receive more wavelengths below 700 nanometers than above.  
 D. have a higher equilibrium ratio of  $P_r$  to  $P_{fr}$ .

(二) 問答題：(10%) ※ 本大題請於試卷內之「非選擇題作答區」標明題號依序作答。

- 試指出植物各種毛茸 (trichome) 之構造與相關功能。(3%)
- 試指出植物促進外交 (outcrossing) 的不同機制。(3%)
- 試重點說明造成種子休眠的成因與突破種子休眠的方式。(4%)

試題隨卷繳回