

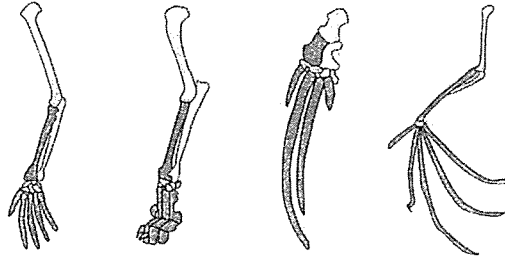
I. Multiple Choice. (Each question has only one best answer. 90%; 2.5 points for each correct answer)

1. A scientist testing the effects of a chemical on apple yield sprays an orchard with the chemical. A second orchard does not receive the chemical. In the fall, the number of apples harvested from each forest is counted. Which of the following is the independent (manipulated) variable in the experiment?  
A. the chemical    B. the orchard    C. the apples    D. the scientist
2. All living things must:  
A. Move    B. Have two parents    C. Maintain homeostasis    D. Eat food
3. The smallest unit capable of carrying out life functions is:  
A. a cell    B. tissue    C. DNA    D. organism
4. Which statement is CORRECT?  
A. All viruses have RNA as their genetic material.  
B. Some viruses live and replicate outside of hosts.  
C. Viral genes are not incorporated into the host's DNA.  
D. Viruses cannot be destroyed with antibiotics.
5. A semi permeable membrane is stretched across a chamber filled with water. The membrane is only permeable to water. 60 mg of salt is added to the left side of the chamber. Which of the following will happen?  
A. water will move toward the right side  
B. salt will move toward the right side  
C. water will move toward the left side  
D. salt will move toward the left side
6. A cell that is missing lysosomes would have difficulty doing what?  
A. digesting food    B. storing energy  
C. packaging proteins    D. moving cytoplasm
7. A person with an injury to her frontal lobe may have difficulty:  
A. remembering past events    B. reasoning and making decisions  
C. keeping balance    D. breathing
8. If carbonic anhydrase is stopped in all red blood cells within your body what is the most likely functional consequence?  
A.  $O_2$  would be less likely to enter red blood cells.  
B. Bicarbonate ( $HCO_3^-$ ) levels in blood plasma would increase.  
C.  $CO_2$  would be less likely to enter red blood cells.  
D. Partial pressure of  $CO_2$  in the blood would drop.
9. Which observation leads to the smallpox vaccine?  
A. small pox had a very short life cycle  
B. boys that got small pox early in life did not get the disease later  
C. dairy maids did not normally get smallpox  
D. cows were immune to small pox
10. The finches on the Galapagos island were similar in form except for variations of their beaks. Darwin observed that these variations were useful for:  
A. attracting a mate    B. defending different predator  
C. adapting to different physical environment    D. gathering food

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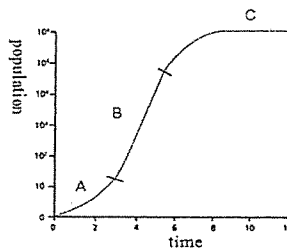
11. Two distinct populations of lizards that originated from a single source population have lived on two different islands for over a thousand generations. After a natural disaster eliminates most of the population on one island, there is a disagreement among biologists about whether to supplement the population with some lizards from the other island. Which of the arguments below provides the best explanation for why the two populations may actually be different species?
- A. Lizards in the two populations react differently to predators.
  - B. Lizards in the two populations are different colors.
  - C. The two lizard populations breed at different times of the year.
  - D. Females on one island lay more eggs on average than females on the other island.

12. The image below illustrates what evolutionary concept?



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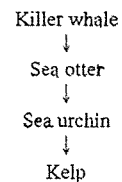
- A. embryological similarities
  - B. homologous structures
  - C. variation among species
  - D. vestigial structures
13. Crocodile and birds are similar in that
- A. They are both ectotherm
  - B. They both care for their young
  - C. They live in the same habitat
  - D. They have similar bone structure
14. Population A has a reproductive rate of 4 per year, Population B has a reproductive rate of 2 per year. Population A has a life span of 4 years, population B has a life span of 10 years. Assuming they are reproductively capable all the years of their life, which has the greater biotic potential?
- A. Population A
  - B. Population B
  - C. Both are equal
  - D. cannot be determined
15. The graph below shows the sigmoid curve for population growth. What happens at C?



- A. The death rate exceeds the reproduction rate
- B. The reproduction rate exceeds the death rate
- C. The death rate and reproduction rates are the same
- D. The death rate and reproduction rates become zero

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16. Apex predators often can often cause a cascade effect on organisms of the lower trophic level. Sea otters are top predators in the kelp forest ecosystem. However, sea otters may also be hunted by killer whales. Which statement correctly describes a consequence of increasing killer whale abundance in the food chain shown to the right?



- A. Kelp will increase.      B. Sea urchin will decrease.      C. Sea otter will increase.  
 D. All three species (sea otter, sea urchin, kelp) will increase.

17. Prokaryotic cells and eukaryotic cells are different in size. What is a plausible explanation?

- A. Prokaryotes have cell walls inhibiting them to grow larger.  
 B. Eukaryotes have compartmentalization, which allows for specialization.  
 C. Prokaryotes have more diverse energy sources.  
 D. Eukaryotes are immobile allowing them to grow larger.

18. Which prokaryotic group is mismatched with its members?

- A. Proteobacteria – diverse gram-negative bacteria.  
 B. Gram-positive bacteria – symbionts in legume root nodules.  
 C. Spirochetes – helical heterotrophs.  
 D. Cyanobacteria – solitary and colonial photoautotrophs.

19. Which of the following is *not* shared by all phyla of vascular plants?

- A. xylem and phloem                      B. dominance of the diploid generation.  
 C. the addition of lignin to cell walls.      D. the development of seeds.

20. In recombinant DNA methods, the term vector can refer to

- A. the sticky end of a DNA fragment.                      B. a RFLP marker.  
 C. a plasmid used to transfer DNA into a living cell.  
 D. a DNA probe used to identify a particular gene.

21. If the DNA content of a diploid cell in the G<sub>1</sub> phase of the cell cycle is  $x$ , then the DNA content of the same cell at metaphase of meiosis I would be

- A.  $0.25x$       B.  $0.5x$       C.  $x$       D.  $2x$

22. A protein that is destined to reach the plasma membrane is making its way through the Golgi. At that moment, a drug was added to cells, blocking trafficking at the trans face of the Golgi. As a result, what would happen to the protein?

- A. The protein would return to the ER via the *cis* face of the Golgi.  
 B. The protein would return to the nucleus via the ER.  
 C. The protein would be stuck in the Golgi.  
 D. The protein would exit the Golgi, but instead be targeted to the cytoplasm.

23. Scientists believe that stimulating growth of algae and other organisms can reduce carbon dioxide amounts in the atmosphere. What is vital to removal of carbon dioxide?
- A. Stroma in chloroplasts                      B. Cellulose in cell wall  
C. Central vacuole                              D. Matrix in mitochondria
24. All fungi share which of the following characteristics?
- A. flagellated.  
B. heterotrophic.  
C. act as decomposers.  
D. pathogenic.
25. The type of mature cell that a particular embryonic plant cell will become appears to be determined mainly by
- A. the cell's final position in a developing organ.                      B. the selective loss of genes.  
C. the cell's pattern of migration.    D. the cell's age.
26. Carnivorous adaptations of plants mainly compensate for soil that has a relatively low content of
- A. potassium.                      B. nitrogen.                      C. calcium.                      D. phosphate.
27. Which of the following is not true of micronutrients in plants?
- A. Overdoses of them can be toxic.  
B. They are required for a plant to grow from a seed and complete its life cycle.  
C. They generally help in catalytic functions in the plant.  
D. They are the essential elements of small size and molecular weight.
28. An early use of indicator plants (plants that tolerate high levels of heavy metals in the soil) was to locate potential profitable areas to mine for those minerals. A current use for such plants is
- A. to help locate suitable sites for toxic waste storage.  
B. bioremediation to help clean up mine spoils.  
C. to minimize soil erosion in arid lands.  
D. to have responsible irrigation.
29. Which of the following is a correct sequence of processes that takes place when a flowering plant reproduces?
- A. meiosis-fertilization-ovulation-germination  
B. fertilization-meiosis-nuclear fusion-formation of embryo and endosperm  
C. growth of pollen tube-pollination-germination-fertilization  
D. meiosis-pollination-nuclear fusion-formation of embryo and endosperm
30. The earliest vascular plants on land had underground stems (rhizomes) but no roots. Water and mineral nutrients were most likely obtained by
- A. absorption by symbiotic fungi.                      B. diffusion across the cuticle of the rhizome.  
C. osmosis through root hairs.                              D. absorption by hairs and trichomes.

31. Which of the following types of plants is not able to self-pollinate?  
A. monoecious    B. dioecious    C. complete    D. wind-pollinated
32. If you wanted to genetically engineer a plant to be more resistant to drought, increasing amounts of which of the following hormones might be a good first attempt?  
A. abscisic acid    B. brassinosteroids    C. gibberellins    D. cytokinins
33. What do results of research on gravitropic responses of roots and stems show?  
A. The effect of a plant hormone can depend on the tissue.  
B. Different tissues have the same response to auxin.  
C. Some responses of plants require no hormones at all.  
D. Cytokinin can only function in the presence of auxin.
34. If the range of a species of plants expands to a higher latitude, which of the following processes is the most likely to be modified by natural selection?  
A. circadian rhythm    B. photoperiodic response  
C. phototropic response    D. thigmomorphogenesis
35. Plants transport water to their leaves through the xylem when water evaporates from the leaves. The evaporating water pulls other water molecules up the xylem through \_\_\_\_ .  
A. Adhesive bonds    B. Covalent bonds    C. Ionic bonds    D. Hydrogen bonds
36. According to the ABC model of floral development, a showy ornamental flower with multiple sepals and petals but no stamens or carpels would express  
A. B genes only.    B. C genes only.    C. A and B genes only.    D. A and C genes only.

II. Match-up quiz: Match each species on the left to the correct phylum on the right. (10%; 2 points each)

- |              |                    |
|--------------|--------------------|
| 1. flatworm  | A. Porifera        |
| 2. sponge    | B. Arthropoda      |
| 3. crab      | C. Platyhelminthes |
| 4. earthworm | D. Mollusca        |
| 5. snail     | E. Annelida        |

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