

# 生 物

- (A) 1. Which of the following describes the sequence of events that might occur in a long-day plant when a stem begins to produce flower parts?
- A. CONSTANS(CO)protein, flowering gene(FT), messenger RNA, phloem transport to the meristem
  - B. flowering gene(FT), CONSTANS (CO) protein, messenger RNA, phloem transport to the meristem
  - C. messenger RNA, phloem transport to the meristem, CONSTANS (CO) protein, flowering gene(FT)
  - D. messenger RNA, phloem transport to the meristem, CONSTANS (CO) protein, flowering gene(FT), phloem transport to the meristem
  - E. phloem transport to the meristem, CONSTANS (CO) protein, flowering gene (FT), messenger RNA
- (B) 2. The single most important difference between long-day and short-day plants would be the accumulation of which of the following?
- A. phloem transporting genes
  - B. CONSTANS (CO) proteins
  - C. florigen
  - D. messenger RNA
  - E. flowering time genes (FT)
- (A) 3. Which of these patterns would the intermediate disturbance hypothesis **NOT** explain?
- A. high diversity in areas with frequent disturbance
  - B. low diversity where disturbance is rare
  - C. low diversity where disturbance is extremely frequent
  - D. similar diversity in areas of very high and very low disturbance
  - E. high diversity in areas with frequent disturbance and low diversity where disturbance is rare
- (E) 4. Which of these is **NOT** an example of secondary succession?
- A. colonization of a forest after farming
  - B. recovery of a forest after clear-cutting
  - C. recovery of a forest after a hurricane
  - D. colonization of a grassland after fire
  - E. colonization of rubble after the retreat of glaciers
- (D) 5. Shannon diversity (Hs)
- A. goes up with increases in the number of species sampled.
  - B. is higher when individuals are more equitably distributed among species.
  - C. is independent of abundance.
  - D. goes up with increases in the number of species sampled and is higher when individuals are more equitably distributed among species
  - E. is higher when individuals are more equitably distributed among species and is independent of abundance
- (A) 6. Shannon diversity tends to be
- A. lower in logged sites.
  - B. higher in logged sites.
  - C. uninfluenced by logging.
  - D. less sensitive to logging than is species richness.
  - E. lower in logged sites and less sensitive to logging than is species richness
- (E) 7. In the Ames test, mutagenicity is normally tested on a strain of bacterium (*Salmonella typhimurium*) that cannot synthesize the amino acid histidine. Therefore, these bacteria require histidine in the growth plate to survive. A researcher performs the Ames test to evaluate the mutagenicity of a newly synthesized compound and notices that *Salmonella typhimurium* is living on a histidine-free growth plate. What can be assumed from these results?
- A. The newly synthesized compound induces a mutation in the bacteria.
  - B. The bacteria no longer produce histidine.
  - C. The bacteria produce histidine.
  - D. The newly synthesized compound induces a mutation in the bacteria and the bacteria no longer produce histidine.
  - E. The newly synthesized compound induces a mutation in the bacteria and the bacteria produce histidine.

- (B) 8. A repair enzyme recognizes an incorrect structure in the DNA and directly converts it back to a correct structure. Which of the following DNA repair systems is responsible for the correction?  
A. base excision repair B. direct repair C. indirect repair  
D. nucleotide excision repair E. methyl-directed mismatch repair
- (D) 9. Which of the following **CANNOT** be repaired by nucleotide excision repair (NER)?  
A. ultraviolet-induced damage B. chemically modified bases C. missing bases  
D. mismatched bases E. pyrimidine dimers
- (D) 10. The secretory systems of Type III and Type IV pathogenic bacteria differ in their mode of attacking cells in which of the following ways?  
A. Type III systems bind to the cellular membrane by slimy mucilage and toxins diffuse across the membrane whereas Type IV systems infect materials using pili as transfer tubes.  
B. Type IV systems bind to the cellular membrane by slimy mucilage and toxins diffuse across the membrane whereas Type III systems infect materials using pili as transfer tubes.  
C. Both systems attach to cells in the same way but they differ merely in the chemicals that they inject into the host cell.  
D. Type III systems use flagella modified as “syringes” to inject materials into cells they are infecting whereas Type IV systems use modified pili as transfer tubes.  
E. Type IV systems use flagella modified as “syringes” to inject materials into cells they are infecting whereas Type III systems use modified pili as transfer tubes.
- (E) 11. Which of the following is **NOT** a way that bacteria benefit humans?  
A. produce foodstuffs such as cheese  
B. produce antibiotics  
C. break down substances harmful to humans, such as wastes, toxins, explosives, and petrochemicals  
D. kill harmful insects  
E. transfer nutrients across intestinal membranes
- (B) 12. Bioremediation is:  
A. the use of microorganisms to treat open wounds  
B. the use of microorganisms to break down harmful substances such as sewage, pesticides, petrochemicals, and explosives  
C. the use of bacteria to attack cancer cells  
D. the use of microorganisms to attack pathogenic bacteria  
E. none of the other options presented
- (B) 13. The phloem:  
A. transports water from the roots to the stems and leaves  
B. transports food between the leaves and the roots  
C. transports minerals from the roots to the stems and leaves  
D. transports carbon dioxide from the leaves to the stems and roots  
E. All of the other choices provided are correct.
- (D) 14. Which of the following statements best describes the function of the xylem?  
A. It transports water from the roots to the stems and leaves.  
B. It transports food between the leaves and the roots.  
C. It transports minerals from the roots to the stems and leaves.  
D. It transports both water and minerals from the roots to the stems and leaves.  
E. It transports water from roots to leaves and food from leaves to roots
- (E) 15. Which of the following statements is **NOT** true of the stomata on the leaves of vascular plants?  
A. They regulate intake of carbon dioxide needed for photosynthesis.  
B. They regulate release of oxygen to the air.  
C. They regulate loss of water.  
D. They are open or closed depending on environmental conditions.  
E. They regulate the absorption of light by the chlorophyll.

- (D) 16. What would result from a single nucleotide deletion (point mutation) within the coding sequence of a structural gene?
- A. a silent point mutation with no deleterious effects
  - B. a missense point mutation resulting in the change of one amino acid
  - C. a nonsense point mutation resulting in the generation of a premature stop codon
  - D. a frameshift mutation, producing a different amino acid sequence altogether
  - E. All of the choices are possible.
- (E) 17. Which of the following would occur from a mutation in the gene's promoter region?
- A. The sequence of the mature mRNA would change.
  - B. The ability of pre-mRNA to be properly spliced would change.
  - C. The ability of mRNA to be translationally regulated would change.
  - D. The amino acid sequence of the translated protein would be altered.
  - E. The rate of transcription may increase or decrease.
- (A) 18. A researcher determined that a strain of *E. coli* is producing a shortened version of a protein required for glucose metabolism. What type of mutation could be responsible for this shorter than normal protein ?
- A. nonsense mutation
  - B. missense mutation
  - C. silent mutation
  - D. sense mutation
  - E. frameshift mutation
- (B) 19. Type S *Streptococcus pneumoniae* bacterium is lethal and will kill its host. If heat inactivated the S strain becomes nonlethal. Type R *Streptococcus pneumoniae* is a nonvirulent strain of bacteria. What would occur if one were to inject both the R strain and heat-killed S strains into a host organism such as the mouse?
- A. The S strain would be transformed into the nonvirulent R strain and kill the host.
  - B. The R strain would be transformed into the virulent S strain and kill the host.
  - C. The S strain would be transformed into the nonvirulent R strain and not affect the host.
  - D. The R strain would be transformed into the virulent S strain and not affect the host.
  - E. Neither the S nor the R strain would change.
- (D) 20. Which of the following is **NOT** a criterion for an organism's genetic material?
- A. The genetic material must contain information necessary to construct a whole organism.
  - B. The genetic material must be transmitted from parent to offspring.
  - C. To transmit information the genetic material must be replicated.
  - D. The genetic material must be dynamic, changing rapidly in response to changes in the environment.
  - E. Genetic material must account for the known variation within each species and among different species.
- (C) 21. Who discovered that DNA was the genetic material or transforming factor that could convert nonvirulent R-type *Streptococcus pneumoniae* bacterium to the virulent S-type?
- A. Weismann and Nageli
  - B. Griffith
  - C. Avery, MacLeod, and McCarty
  - D. Hershey and Chase
  - E. Watson, Crick, Wilkins, and Franklin
- (C) 22. Most allergy medicines contain antihistamines that block the actions of histamine. These drugs reduce cold symptoms by directly
- A. lysing virus-infected cells and preventing further propagation of the pathogen.
  - B. stimulating components of the immune system through the release of cytokines.
  - C. blocking or reducing the inflammation response in mucous membranes.
  - D. stimulating the production of specific antibodies.
  - E. recruiting macrophages to the nasal epithelium.
- (E) 23. Your patient becomes sick due to an infection by the influenza virus and now has the flu. The cells which would most directly lyse virally infected host cells in this case are \_\_\_\_\_. These cells mature in the \_\_\_\_\_.
- A. T cells, bone marrow
  - B. B cells, thymus
  - C. T cells, lymph nodes
  - D. B cells, spleen
  - E. T cells, thymus

- (B) 24. Which of the following best characterizes the process of clonal selection that occurs after exposure to a particular pathogen?
- A. B cells show the ability to adapt the specific type of receptors they produce and so all B cells in the body undergo an alteration to respond to a particular infection.
  - B. Only a small subset of B cells will have receptors that bind a particular pathogen and it is specifically these cells that are stimulated to multiply to fight the infection.
  - C. Pathogens typically reproduce clonally and "clonal selection" refers to the process of selection among pathogen lines to determine which are successful during host infection.
  - D. All of the statements are accurate characterizations of the process of clonal selection.
- (A) 25. Temporal variation in community biomass
- A. decreases with increases in species richness.
  - B. increases with increases in species richness.
  - C. does not vary with species richness.
  - D. decreases with increases in species richness and increases with increases in species richness
  - E. does not vary with species richness, decreases with increases in species richness, and increases with increases in species richness
- (B) 26. The intermediate disturbance hypothesis argues that diversity is greatest where
- A. there is no disturbance. B. disturbance is intermediate. C. disturbance is frequent.
  - D. disturbances are always small. E. there is no disturbance and disturbance is intermediate.
- (B) 27. Clements's view was that the early successional species helped make the way for later successional species, a phenomenon known as
- A. secondary succession. B. facilitation. C. seral accumulation.
  - D. climaxation. E. faclitation and seral accumulation.
- (B) 28. The idea that areas that have been undisturbed for more time have more species is termed the
- A. area hypothesis. B. time hypothesis. C. productivity hypothesis.
  - D. MTE. E. MDE.
- (C) 29. The frequency of occurrence of individuals of a species in a community is its
- A. raw abundance. B. richness. C. relative abundance.
  - D. biomass. E. raw abundance and relative abundance.
- (A) 30. Metagenomics seeks to understand
- A. microbial diversity for communities not easily cultured.
  - B. how to clone animals.
  - C. how to clone plants.
  - D. microbial diversity for communities not easily cultured and how to clone plants.
  - E. microbial diversity for communities not easily cultured and how to clone animals.
- (A) 31. The greenhouse effect is when \_\_\_\_\_ energy is trapped by atmospheric gases and reradiated back to the Earth
- A. long-wave B. short-wave C. biological D. biochemical E. biological and biochemical
- (E) 32. Greenhouse gases are
- A. leading to a potential environmental disaster.
  - B. necessary for life on Earth in moderation.
  - C. not proven to exist.
  - D. leading to a potential environmental disaster and not proven to exist.
  - E. necessary for life on Earth in moderation and leading to a potential environmental disaster.
- (B) 33. The most important cause of global warning is production of anthropogenic
- A. carbon monoxide. B. CO<sub>2</sub> C. oxygen. D. phosphorus. E. NO<sub>3</sub>.
- (C) 34. Which of the following LEAST belongs with the others?
- A. thymine dimmer B. UvrA protein C. direct repair
  - D. nucleotide excision repair E. UvrC protein
- (C) 35. Which of the following diseases affect DNA repair?
- A. Alzheimer's disease B. diabetes C. xeroderma pigmentosum
  - D. diabetes and xeroderma pigmentosum E. Alzheimer's disease and diabetes

- (B) 36. What is the function of the MutS protein in methyl-directed mismatch repair?  
A. To excise the mismatched basepair. B. To find mismatches.  
C. To directly bind the DNA polymerase. D. To make a cut in the nonmethylated DNA strand.  
E. To digest the nonmethylated DNA strand.
- (A) 37. Double fertilization is important to the reproductive process because it produces :  
A. both the zygote and the endosperm B. a reaction that keeps the plant from dying  
C. a double portion of endosperm D. nutrition for the seed E. None of these is true.
- (C) 38. If a pollen grain lands on the stigma of a plant that is not related to that plant then the following would happen:  
A. The pollen grain would be too large or too small to enter the stigma.  
B. The pollen would likely not attach to the stigma.  
C. The pollen grain would be unable to grow through the stigma.  
D. The pollen grain would be unable to form sperm nuclei.  
E. The pollen grain would be ejected from the stigma.
- (E) 39. One advantage of cross-pollination in plants would be to provide :  
A. different forms of double fertilization B. more healthy seeds  
C. better embryos for the seed to grow D. a better chance for germination on the stigma  
E. more exchange of genetic information
- (D) 40. Which of the following are environmental stimuli that influence plant responses ?  
A. rocks, light, touch, music B. water, gravity, temperature, soil minerals, microorganisms  
C. wind, temperature, fungi D. CO<sub>2</sub>, light, water vapor, gravity  
E. touch gravity, herbivores, pathogens
- (E) 41. Which one of the following is not a major plant hormone?  
A. auxins B. brassino-steroids C. ethylene D. cytokinins E. ethanol
- (D) 42. One application of auxins is its use in the production of :  
A. fruit overgrowth B. fruit size increase C. fruit ripening  
D. fruit lacking seeds E. None of these is correct.
- (E) 43. Which of the following are arranged in the sequence in which the various taxa first appeared in time ?  
A. bacteria, protists, charophyceans, liverworts, lycophytes, gnetophytes, angiosperms  
B. Archaea, protists, charophyceans, mosses, ferns, conifers, flowering plants  
C. bacteria, protists, charophyceans, mosses, cycads, angiosperms  
D. prokaryotes, protists, charophyceans, mosses, ferns, conifers, flowering plants  
E. All the other choices provided are correct.
- (A) 44. Which of the following statements best describes the life cycles of charophyceans and mosses?  
A. The diploid generation of charophyceans consists of only one cell whereas the diploid generation of mosses is multicellular.  
B. The haploid generation of charophyceans consists of only one cell whereas the haploid generation of mosses is multicellular.  
C. The haploid and diploid generations of charophyceans both consist of only one cell whereas both generations of mosses are multicellular.  
D. The haploid and diploid generations of both charophyceans and mosses are unicellular.  
E. All of the choices provided are incorrect.
- (C) 45. Alternation of generations means:  
A. One phase of the life cycle takes place on land and the other in water.  
B. One phase of the life cycle is photosynthetic and the other is heterotrophic  
C. One phase of the life cycle is diploid and the other is haploid.  
D. One phase of the life cycle is unicellular and the other is multicellular.  
E. One phase of the life cycle is motile and the other is stationary.
- (E) 46. Secondary metabolites are:  
A. sugars B. lipids C. proteins D. nucleic acids E. All of the choices provided are incorrect.

- (D) 47. Humans suffer from dementia (similar to Alzheimer's disease) if they eat flour made from cycad seeds because:
- A. The seeds have high levels of manganese that is a cause of dementia.
  - B. The seeds contain hallucinogenic drugs similar to LSD that causes dementia.
  - C. The seeds have enzymes that break down brain tissue causing dementia.
  - D. The seeds contain the amino acid BMAA that causes dementia.
  - E. The seeds have enzymes that inhibit absorption of nutrients that are essential for the transmission of nervous impulses in brain cells.
- (C) 48. The clonal selection theory is an explanation for
- A. how a single type of stem cell can produce both red blood cells and white blood cells.
  - B. how antibody proteins can be molded to fit antigens after the antigen interacts with the antibody-producing type of cell.
  - C. how an antigen can induce the multiplication of very few cells to result in production of high levels of specific antibodies.
  - D. how HIV can disrupt the immune system.
  - E. how macrophages can recognize specific T cells and B cells.
- (B) 49. The reason(s) that the body has such difficulty combating HIV infection and preventing progression to AIDS is because
- A. HIV mutates slowly.
  - B. HIV targets both humoral and cell-mediated immunity.
  - C. HIV blocks antigen recognition by macrophages.
  - D. HIV destroys MHC molecules.
  - E. HIV blocks the inflammatory response.
- (B) 50. Which of the following statements does **NOT** describe a function of the cell walls of bacteria?
- A. They maintain cell shape.
  - B. They prevent cross fertilization.
  - C. They avoid disintegration in water with low concentrations of salt.
  - D. They protect against other bacteria.
  - E. They protect against viruses.
- (E) 51. Which of the following statements is **NOT** true of Gram-positive bacteria?
- A. They have a thicker peptidoglycan layer than do Gram-negative bacteria.
  - B. They turn purple when subjected to the Gram-staining process whereas Gram-negative bacteria stain pink.
  - C. They lack the lipopolysaccharide that Gram-negative bacteria have.
  - D. They fluoresce at a different color than do Gram-negative bacteria.
  - E. They have a gram molecular weight of more than 1.0 whereas Gram-negative bacteria have a gram molecular weight of less than 1.0.
- (E) 52. Which of the following is **NOT** an advantage that fungal mycorrhizae bestow upon plants ?
- A. The fungus supplies water to the plant.
  - B. The fungus supplies mineral nutrients to the plant.
  - C. The fungus binds the soil and prevents erosion.
  - D. The fungus protects the plant against pathogens and toxins.
  - E. The fungus supplies organic food to the plant.
- (B) 53. The difference between fungal endomycorrhizae and fungal endophytes is :
- A. Endomycorrhizae live inside fungi and endophytes live inside plants.
  - B. Endomycorrhizae form arbuscules that facilitate exchanges of water and food between the fungus and plant root cells, whereas endophytes invade plant cells and provide the plant with protective antibiotics and toxins.
  - C. Endomycorrhizae are beneficial to its host plant but endophytes harm the host plant.
  - D. Endomycorrhizae form arbuscules on plant roots that produce toxins killing parasitic nematodes, whereas endophytes assist in the transport of water through the plant.
  - E. none of the other choices provided

- (E) 54. Transfer efficiency is usually low because
- A. many organisms cannot digest all their prey.
  - B. much of assimilated energy is used for metabolism.
  - C. most organisms have more resources than they need.
  - D. much of assimilated energy is used for metabolism and most organisms have more resources than they need.
  - E. many organisms cannot digest all their prey and much of assimilated energy is used for metabolism.
- (A) 55. An inverted pyramid of numbers exists when
- A. primary producers are less numerous than their consumers.
  - B. primary producers are more numerous than their consumers.
  - C. each predator has a parasite.
  - D. consumers eat other consumers.
  - E. parasites parasitize other parasites.
- (B) 56. Which of the following is **TRUE** of a morphogen ?
- A. It is a signaling molecule required for cell-to-cell contact within the embryo.
  - B. It is a signaling molecule that induces differentiation of cells within the embryo.
  - C. It is a signaling molecule that induces blastulation of the developing embryo.
  - D. It is a signaling molecule that induces implantation of the embryo into the uterus of mammals.
  - E. It is a signaling molecule that separates out cytoplasmic factors to their respective cells within the developing embryo.
- (D) 57. Which of the following is important to the development of dorsal structures such as the neural tube and notochord ?
- A. Spemann's organizer
  - B. noggin
  - C. cadherins
  - D. both Spemann's organizer and noggin
  - E. both Spemann's organizer and cadherins
- (A) 58. Species richness is
- A. the number of species in a community.
  - B. the quality of species in a community.
  - C. abundance of individuals.
  - D. biomass.
  - E. the number of species in a community and abundance of individuals.
- (B) 59. Species richness increases, for most taxa, with
- A. increasing latitude.
  - B. decreasing latitude.
  - C. decreasing temperatures.
  - D. increasing latitude and decreasing latitude.
  - E. decreasing latitude and decreasing temperatures.
- (A) 60. Which of the following would occur if a cell's spliceosomes were mutated so they no longer functioned normally?
- A. Introns would remain in the mature mRNA.
  - B. Exons would be missing in the mature mRNA.
  - C. Transcription would cease.
  - D. A functional protein would still be produced.
  - E. RNA processing would remain intact.
- (B) 61. Which of the following statements about RNA processing in eukaryotes is **INCORRECT** ?
- A Introns are excised out of pre-mRNA to produce the mature mRNA.
  - B. A complex composed entirely of proteins is used to remove introns from the pre-mRNA.
  - C. A poly A tail is added on to the 3' end of the mRNA.
  - D. A 7-methylguanosine cap is added on to the 5' end of the mRNA.
  - E. Processing occurs in the nucleus.
- (A) 62. In the Hardy-Weinberg equation , the letters  $p$  and  $q$  represent
- A. frequencies of alleles in a population.
  - B. the number of individuals of different phenotypes in a population.
  - C. the number of individuals of different genotypes in a population.
  - D. the frequencies of individuals of different genotypes in a population.

- (D) 63. Which of these would violate the conditions for the Hardy-Weinberg equation ?  
A. The population is large. B. Mating is random regarding phenotypes and genotypes.  
C. Migration does not occur into or out of the population. D. Natural selection is occurring.  
E. NO new mutations arise.
- (B) 64. The major difference between natural selection and artificial selection is  
A. how the variations arise.  
B. how the parents are chosen.  
C. that differences in alleles determine traits in artificial selection while there are no such differences in natural selection.  
D. that natural selection can greatly alter the traits of a species while artificial selection results only in minor changes.
- (A) 65. Artificial selection is driven by  
A. humans selecting which organisms to breed based on desirable traits.  
B. humans creating an environment with certain traits to arise in response to that environment.  
C. natural variation in reproductive success.  
D. finding vestigial structures and preserving them for future generations.
- (A) 66. Production efficiency =  
A. net productivity/assimilation  $\times 100$  B. net productivity/assimilation  $\times 10$   
C. net assimilation/productivity  $\times 100$  D. net assimilation/productivity  $\times 10$   
E. net assimilation + productivity  $\div 10$
- (B) 67. Production efficiency is \_\_\_\_\_ in endotherms than in ectotherms.  
A. higher B. lower C. the same D. more often zero E. fine
- (B) 68. A gene pool is  
A. the genes that are unique to a species. B. all the genes in a population.  
C. all the similar genes in a gene family. D. a swimming hole for geneticists.
- (C) 69. The gene pool of the next generation is derived from  
A. all individuals of a population.  
B. randomly selected individuals of a population.  
C. those individuals of a population that reproduce.  
D. individuals in a population that choose to contribute.
- (E) 70. A growing hypha experiences which of the following ?  
A. transport by vesicles of enzymes from the Golgi apparatus to the hyphal tip  
B. uptake of water by osmosis  
C. extension of the hyphal tip  
D. transport by vesicles of cell-wall materials  
E. all of the other choices provided.
- (A) 71. The distinction between karyogamy and plasmogamy is:  
A. Karyogamy is the fusion of nuclei and plasmogamy is the fusion of the cytoplasm.  
B. Karyogamy is the fusion of cytoplasm and plasmogamy is the fusion of nuclei.  
C. Karyogamy is the fusion of dikaryotic cells and plasmogamy is the fusion of gametes.  
D. Karyogamy is the fusion of hyphae and plasmogamy is the fusion of mycelia.  
E. Karyogamy is the fusion of nuclei and plasmogamy is the attack of blood plasma by fungal pathogens
- (C) 72. What type of gene mutation occurred to produce the following protein sequence ?  
Normal: JAYBIRDCATPAW  
Mutated: JAYBIRDCATPAW  
A. nonsense B. missense C. silent D. sense E. frameshift
- (A) 73. Which of the following results in a spontaneous mutation ?  
A. free radicals produced by cellular metabolism.  
B. exposure to ultraviolet light  
C. exposure to benzo (a)-pyrene, a chemical substance found in cigarette smoke  
D. exposure to ultraviolet light and benzo (a)-pyrene  
E. exposure to X-rays



- (E) 74. The ten phyla of living land plants include:
- (1) liverworts, (2) hornworts, (3) mosses, (4) lycophytes, (5) pteridophytes, (6) cycads, (7) ginkgos, (8) conifers, (9) gnetophytes, and (10) angiosperms
  - (1) liverworts, (2) hornworts, (3) mosses, (4) lycophytes, (5) pteridophytes (6) cycads, (7) ginkgos, (8) conifers, (9) gnetophytes, and (10) flowering plants
  - (1) Hepatophyta, (2) Anthocerophyta, (3) Bryophyta, (4) Lycopodiophyta, (5) Pteridophyta, (6) Cycadophyta, (7) Ginkgophyta, (8) Coniferophyta, (9) Gnetophyta, and (10) Anthophyta
  - (1) liverworts, (2) hornworts, (3) mosses, (4) lycophytes, (5) ferns, horsetails and whisk-ferns, (6) cycads, (7) ginkgos, (8) conifers, (9) gnetophytes, and (10) flowering plants
  - all the other choices provided are correct.
- (A) 75. Bread mold can grow in a minimal medium without supplements (wild type) while certain mutated strains (mutants) can only grow in a minimal medium that is supplemented with specific intermediates found in the following metabolic pathway for arginine synthesis:  
**minimal** ----> **ornithine** ----> **citrulline** ----> **arginine**, where enzyme 1 converts the precursor to ornithine, enzyme 2 converts ornithine to citrulline, and enzyme 3 converts citrulline to arginine.  
 Which of the following would be **TRUE** of a strain that can grow in minimal medium containing ornithine, citrulline, or arginine, but not in minimal medium alone?
- The strain would have a mutation in the gene that encodes enzyme 1.
  - The strain would have a mutation in the gene that encodes enzyme 2.
  - The strain would have a mutation in the gene that encodes enzyme 3.
  - The strain would have a mutation in the gene that encodes for enzymes 1, 2, and 3.
  - The strain would be the wild type with no genetic mutations.
- (B) 76. A pollination syndrome is :
- the synchronous release of pollen by many individuals of wind-pollinated trees
  - specializations of plants that attract a specific kind of pollinator
  - the simultaneous release of two sperm, one to affect fertilization and the other to initiate formation of endosperm
  - a brushlike tongue of hummingbirds to which pollen adheres
  - a series of bristles on the backs of insects to which pollen adheres
- (E) 77. Which of the following explains why leaf primordia develop in spiral or whorled patterns around the stem tip ?
- accumulation of auxin in the stem tip
  - depletion of auxin near leaf primordia
  - accumulation of auxin in leaf primordia
  - loosening of cell walls
  - None of these choices is correct.
- (B) 78. In MacArthur and Wilson's island biogeography model, species richness is a balance between
- net extinction and extinction.
  - arrival and extinction.
  - arrival and speciation.
  - net extinction and extinction, arrival and extinction, and arrival and speciation.
  - None of these choices are correct.
- (E) 79. Which of the following is the best explanation for why plants may use active rather than passive transport ?
- The phospholipid bilayer is not formed.
  - Protein channels are plugged.
  - Development of pores has not occurred.
  - Membrane potential is blocked.
  - Solute concentration is a factor.
- (E) 80. Some bacteria exhibit a primitive form of behavior in that they can sense the properties of their environments and use that ability to make adaptive responses. Which of the following are **NOT** capabilities of any known bacterium?
- orientation with respect to the Earth's magnetic field
  - move to other bacteria and aggregate with them in response to chemical signals
  - find nutrients by moving upward in the water column with the aid of flotation devices
  - respond to other individual bacteria and transmit DNA via conjugation
  - none of the other options presented

- (D) 81. Knowledge of a pathogen's genome is useful because:
- A. It allows scientists to cause mutations in the DNA thereby killing the pathogen.
  - B. It allows scientists to prevent meiosis and the duplication of genes necessary for the survival of the pathogen.
  - C. It allows developing drugs that make antibodies against the pathogen.
  - D. It allows developing drugs that target metabolic pathways unique to the pathogen.
  - E. none of the choices provided
- (B) 82. The Modern Synthesis of evolution is based on
- A. observations of the formation of new species.
  - B. Darwin's ideas and modern concepts of genetics.
  - C. experimental studies of populations performed by Darwin.
  - D. recent concepts of adaptation and reproduction.
- (A) 83. The function of pits in the walls of tracheids is:
- A. allowing the passage of water
  - B. stopping backflow of water
  - C. secretion of resin
  - D. sealing off air bubbles
  - E. allowing the escape of air
- (D) 84. Which of the following statements is **NOT** true of *Trichomonas vaginalis*?
- A. It attacks the human genitourinary tract.
  - B. It lacks true mitochondria.
  - C. It has hydrogenosomes.
  - D. It has mitosomes.
  - E. It has a flagellum.
- (D) 85. A (n) \_\_\_\_ is an organized unit of DNA sequences that enables a segment of DNA to be transcribed into RNA and ultimately results in the formation of a functional product.
- A. chromosome
  - B. trait
  - C. allele
  - D. gene
  - E. expression
- (B) 86. Commensalism differs from mutualism in that
- A. both partners benefit in commensalism, but not in mutualism.
  - B. both partners benefit in mutualism, but not in commensalism.
  - C. mutualists are typically smaller than their partners.
  - D. commensalists are usually plants.
  - E. both partners benefit in commensalism, but not in mutualism and commensalists are usually plants.
- (E) 87. During exposure to elevated glucose, a yeast cell's membrane glucose transporters will rapidly increase so the cell can import glucose. Which would represent the yeast cell response?
- A. increased membrane glucose transporters
  - B. increased membrane glucose receptors
  - C. increased glucose transport into the cell
  - D. both increased membrane glucose transporters and glucose receptors
  - E. both increased membrane glucose transporters and glucose transport into the cell
- (B) 88. Temperature is important to the distribution of organisms because
- A. no other factors are limiting.
  - B. of the inability of most organisms to regulate their temperature.
  - C. food is usually plentiful.
  - D. no other factors are limiting and of the inability of most organisms to regulate their temperature
  - E. no other factors are limiting and food is usually plentiful
- (A) 89. Biological Evolution is defined as
- A. heritable changes in characteristics across generations.
  - B. any change in an individual that can be observed.
  - C. changes that result in new species arising.
  - D. any changes measurable from generation to generation
- (C) 90. Plant hormones bind specific cellular receptor molecules that trigger gene expression responses. Which statement is correct concerning these responses?
- A. Only cells lacking receptors can bind hormones.
  - B. Only cells in the meristem can respond.
  - C. Only cells that express the appropriate receptors can bind hormones.
  - D. Only cells that have been previously activated can bind hormones.
  - E. None of these choices is correct.

- (B) 91. Which of the following is **NOT** a characteristic of the gametophyte stage of flowering plant ?  
A. haploid B. diploid C. gamete producing  
D. dependent of the sporophyte E. comprised usually only of 8 nuclei
- (E) 92. Similarity in evolutionarily unrelated groups due to adaptation to similar environments is called  
A. homology. B. analogy. C. commonality.  
D. convergence. E. analogy and convergence are correct.
- (C) 93. Biomagnification leads to concentration of toxins like DDT in  
A. predators.  
B. all members of higher trophic levels.  
C. predators and all members of higher trophic levels.  
D. decomposers.  
E. lower trophic levels.
- (A) 94. Sympatric species are  
A. more likely than allopatric species to display character displacement.  
B. always show character displacement.  
C. less likely than allopatric species to display character displacement.  
D. unlikely to be competing.  
E. more likely than allopatric species to display character displacement, less likely than allopatric species to display character displacement, and unlikely to be competing.
- (C) 95. Which of the following represents the proper order of events in embryonic development?  
A. fertilization, gastrulation, neurulation, cleavage, organogenesis  
B. fertilization, cleavage, gastrulation, organogenesis, neurulation  
C. fertilization, cleavage, gastrulation, neurulation, organogenesis  
D. fertilization, gastrulation, cleavage, neurulation, organogenesis  
E. fertilization, gastrulation, cleavage, organogenesis, neurulation
- (D) 96. Which statement most aptly describes the body of a fungus?  
A. Tiny threadlike septa collectively make up the mycelium.  
B. Tiny threadlike mycelia collectively make up the septa.  
C. Tiny threadlike mycelia collectively make up the hypha.  
D. Tiny threadlike hyphae collectively make up the mycelium.  
E. Tiny threadlike mycelia collectively make up the dikaryote.
- (D) 97. Plant stem cells are able to do which of the following ?  
A. They grow into leaves.  
B. They are mature cells.  
C. They are located in the developed part of the vascular tissue.  
D. They are undifferentiated cells that can produce new tissues.  
E. They are mostly found at the tip of leaves.
- (A) 98. Which of the following is **NOT** true of horizontal (lateral) transfer of genetic information ?  
A. transfers genes from parent to progeny B. increases genetic diversity  
C. is important for inferring phylogeny D. can produce large genetic change  
E. occurs commonly in bacteria
- (A) 99. One use of knowledge of relative water content (RWC) would be to develop plants for:  
A. tolerance of water stress B. salt tolerance C. heat tolerance  
D. shock tolerance E. mineral tolerance
- (D) 100. Which of the following basic features of transcription is **NOT** shared by both prokaryotes and eukaryotes?  
A. Both prokaryotic and eukaryotic genes have a promoter site.  
B. RNA polymerase transcribes genes in both prokaryotes and eukaryotes.  
C. Gene transcription involves initiation, elongation, and termination in both prokaryotes and eukaryotes.  
D. The complexity of protein components involved in transcription is similar for both prokaryotes and eukaryotes.  
E. The initiation of transcription in both prokaryotes and eukaryotes involves the interactions of more than one protein.

- (A) 101. The following sequence represents events in the development of a fruit:
- A. pollination, fertilization, embryo, ovary matures
  - B. pollination, germination of pollen, endosperm, ovule
  - C. pollination, endosperm, embryo, ovule matures
  - D. pollination, fertilization, germination of pollen, ovule matures, embryo forms
  - E. pollination, double fertilization, ovule matures, embryo forms, ovary matures
- (E) 102. The primary reason why certain trees tend to grow straight and tall with few lateral branches when compared with other trees is because:
- A. of unknown reasons
  - B. Lateral buds are missing in many of these trees.
  - C. Lateral bud development is dependent on temperature.
  - D. Gibberellins affect the buds detrimentally.
  - E. Auxins inhibit lateral bud development.
- (A) 103. It is estimated that humans can produce over 1.5 million different types of antibodies. Which of the following statements regarding this extraordinary variation is **INCORRECT**?
- A. We inherit over 1.5 million different and distinct immunoglobulin genes from our parents at fertilization.
  - B. V and J domains of antibody light chains are randomly joined
  - C. Random segments of DNA can be removed from antibody genes.
  - D. V and J domains of antibody heavy chains are randomly joined.
  - E. Cytosines in the variable regions of antibody genes can be converted to uracils via hypermutation.
- (B) 104. Archaea have very diverse environmental requirements and tolerances. From what you have learned about them, which among the following conditions or substances do ALL archaeans require for survival and reproduction ?
- A. oxygen
  - B. water
  - C. moderate pH
  - D. moderate temperature
  - E. moderate salinity
- (D) 105. The protein of T2 bacteriophage is labeled with  $^{35}\text{S}$  and the DNA with  $^{32}\text{P}$ . Where would one detect most of the  $^{32}\text{P}$  if the T2 bacteriophage were allowed to infect the bacteria?
- A. on the phage coat surrounding the T2 bacteriophage
  - B. on the membrane of the infected bacteria
  - C. inside the T2 bacteriophage capsid
  - D. inside the infected bacteria
  - E. The  $^{32}\text{P}$  would be equally distributed within the T2 bacteriophage and infected bacteria.
- (C) 106. A bacterial "bloom" is:
- A. the reproductive parts of bacteria
  - B. malformation of flowers caused by bacterial infections
  - C. unusual coloring of the water of lakes, ponds, or the sea caused by high numbers of bacteria
  - D. souring of milk caused by bacteria
  - E. swelling of a wound because of bacterial infection
- (C) 107. Experiments involving the peptide known as CLAVATA3 were carried out to determine which of the following?
- A. the binding properties of CLAVATA3
  - B. the size of the peptide
  - C. the influence of CLAVATA3 on peripheral zone cell development
  - D. the role of auxin in cell elongation
  - E. None of these choices is correct
- (A) 108. An interaction where species A has a negative effect on species B, but not vice versa is best termed
- A. amensalism
  - B. interference competition.
  - C. exploitative competition.
  - D. commensalism.
  - E. interspecific competition.

- (E) 109. Which of the following statements best compares the ovary, ovule, and egg?
- A. The three terms are synonymous.
  - B. The ovary is the lower part of the pistil that houses the ovules (also called eggs).
  - C. An ovule is the lower part of the pistil that houses the ovary that in turn contains the eggs.
  - D. Ovules are small ovaries and either can produce eggs.
  - E. The ovary is the lower part of the pistil that houses the ovules that in turn contain the eggs.
- (B) 110. Which of the following is likely required to initiate cell differentiation during development?
- A. cell division
  - B. the presence of certain mRNAs needed for expression of cell-specific proteins.
  - C. the buildup of cell-to-cell adhesion molecules
  - D. the presence of carbohydrates
  - E. hydration of the egg during fertilization