※ 注意：請於試卷內之「選擇題作答區」依序作答。

Multiple choice questions. Select only ONE best answer to each question (2% for each).

1. What is the difference between experimental replicates and experimental controls?
A) Replicates decrease sample size.　B) Replicates are "repeat" samples under a given condition.
C) Experimental controls do not need to have experimental replicates.
D) All replicates differ from other replicates by a single factor.
E) All replicates in an experiment are found under the control conditions.

2. _____ atoms give organic molecules their overall shape; _____ atoms determine the overall chemical behavior of organic molecules. A) Carbon; H_2O　B) Hydrogen; CO_2　C) Hydrogen; C, N, and O　D) Carbon; H, N, and O　E) Nitrogen; C, H, and O

3. Carnivorous adaptations of plants mainly compensate for soil that has a relatively low content of A). potassium.　B). nitrogen.　C). calcium.　D). water.　E). phosphate.

4. 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 have responsible irrigation.　B). to minimize soil erosion in arid lands.
C). bioremediation to help clean up mine spoils.　D). to help locate suitable sites for toxic waste storage.
E). nitrogen fixation by symbiotic bacteria in root nodules.

5. The lock-and-key analogy for enzymes applies to the _____.
A) specificity of enzyme primary, secondary, and tertiary structure
B) specificity of enzyme tertiary subunits joining to form a quaternary structure
C) specificity of enzymes binding to their substrate　D) specificity of enzymes interacting with water
E) specificity of enzymes interacting with ions

6. Which of the following structural features is common to cellulose, chitin, and peptidoglycan?
A) They all contain peptide bonds.　B) They are all composed of glucose in either the α or β form.
C) They all contain ionic bonds.　D) They are all composed of highly branched fibers.
E) They can all form bonds between polymer chains that create parallel strands.

7. Under what circumstances does phospholipid bilayer membrane transport always require energy?
A) whenever molecules are moved that are too large to pass through the membrane
B) whenever a solute needs to be moved from low concentration to high concentration through a membrane
C) whenever a solute is charged, such as an ion, and is moved through a membrane
D) whenever a molecule is polar and is moved through a membrane
E) whenever a molecule is nonpolar and is moved through a membrane

8. Which of the following is NOT a characteristic that chloroplasts and mitochondria share?
A) They both have their own DNA.　B) They both have their own matrix.
C) They both have multiple membranes.　D) They are both part of the endomembrane system.
E) They are both capable of reproducing themselves.

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9. Most of the CO_2 from the catabolism of glucose is released during _____.

A) glycolysis　B) electron transport　C) chemiosmosis　D) the Calvin cycle　E) the Krebs cycle

10. Based on what you know about the structure and function of the antenna complex, irradiating a leaf with which of the following light types would result in the release of the greatest quantities of oxygen?

A) green and blue light　B) green and red light　C) red and blue light
D) red and orange light　E) violet and red light

11. Some cells have several nuclei per cell. How could such multinucleated cells be explained?

A) The cell had multiple S phases before it entered mitosis.
B) The cell had multiple metaphases before it entered cytokinesis.
C) The cell underwent repeated cytokinesis but no mitosis.
D) The cell underwent repeated mitosis, but cytokinesis did not occur.
E) The cell underwent repeated mitosis with simultaneous cytokinesis.

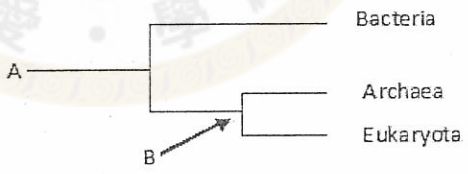
12. Currently available transgenic plants have been modified for all of the following traits except

A). insect resistance.　B). herbicide resistance.　C). nitrogen fixation.
D). improved nutritional quality.　E). virus resistance.

13. Put the steps of the process of signal transduction in the order they occur: 1: A conformational change in the signal-receptor complex activates an enzyme. 2: Protein kinases are activated. 3: A signal molecule binds to a receptor. 4: Target proteins are phosphorylated. 5: Second messenger molecules are released.

A) 3, 1, 5, 2, 4　B) 3, 1, 2, 4, 5　C) 2, 1, 4, 3, 5　D) 1, 2, 5, 3, 4　E) 1, 2, 3, 4, 5

14. The phylogenetic tree on the right _____.



A) includes noncellular and cellular life-forms
B) depicts the three major domains of life
C) includes only the unicellular life
D) includes only the multicellular life
E) includes unicellular and multicellular life, but not complex animals and plants

15. If mutation prevented the formation of lignin, which plant tissue would be most affected?

A) vascular cambium.　B) epidermis.　C) fiber.　D) collenchyma.　E) parenchyma.

16. All of the following cell types are correctly matched with their functions except

A). mesophyll↔photosynthesis　B). guard cell↔regulation of transpiration
C). sieve-tube member↔translocation　D). vessel element↔water transport.
E). companion cell↔formation of secondary xylem and phloem

17. 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). A genes only.　B). B genes only.　C). C genes only.　D). A and B genes only.　E). A and C genes only.

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18. Arrange the following five events in an order that explains the mass flow of materials in the phloem. 1: Water diffuses into the sieve tubes. 2: Leaf cells produce sugar by photosynthesis. 3: Solutes are actively transported into sieve tubes. 4: Sugar is transported from cell to cell in the leaf. 5: Sugar moves down the stem.

A). 2, 1, 4, 3, 5.　B). 1, 2, 3, 4, 5.　C). 2, 4, 3, 1, 5.　D). 4, 2, 1, 3, 5.　E). 2, 4, 1, 3, 5.

19. One is most likely to see guttation in small plants when the

A). transpiration rates are high.
B). root pressure exceeds transpiration pull.
C). preceding evening was hot, windy, and dry.
D). water potential in the stele of the root is high.
E). roots are not absorbing minerals from the soil.

20. 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.
E). diffusion through stomata.

21. Which of the following is a correct sequence of processes that takes place when a flowering plant reproduces?

A). meiosis→fertilization→ovulation→germination
B). growth of pollen tube→pollination→germination→fertilization
C). fertilization→meiosis→nuclear fusion→formation of embryo and endosperm
D). meiosis→pollination→nuclear fusion→formation of embryo and endosperm
E). meiosis→mitosis→nuclear fusion→growth of pollen tube

22. Which of the following types of plants is NOT able to self-pollinate?

A). monoecious　B). dioecious　C). complete　D). wind-pollinated　E). insect-pollinated

23. What do results of research on gravitropic responses of roots and stems show?

A) Light is required for the gravitropic response.
B) Some responses of plants require no hormones at all.
C) Different tissues have the same response to auxin.
D). Cytokinin can only function in the presence of auxin.
E). The effect of a plant hormone can depend on t he tissue.

24. If you take a short-day plant and put it in a lab under conditions where it will flower (long nights and short days), but interrupt its day period with a few minutes of darkness, what will happen?

A) It will flower.　B) It will not flower.　C) It will die.
D) It will lose its ability to photosynthesize.　E) It will form new shoots from the axillary buds.

25. 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) biological clock　E) thigmomorphogenesis

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26. Which level of ecological study focuses the most on abiotic factors?
A) speciation ecology　B) population ecology　C) community ecology
D) ecosystem ecology　E) behavioral ecology.

27. Which of the following organisms would most likely be located at the bottom of a pyramid of biomass?
A) diatoms　B) squid　C) crustaceans　D) seals　E) sharks

28. Which abiotic factor would have the most significant physiological effect on migrating salmon?
A) water solute content　B) competition for resources　C) ambient temperature
D) human-built structural interferences　E) sea water temperature

29. Wetlands are standing bodies of freshwater, just like lakes and ponds. However, wetlands are different from lakes and ponds because _____.
A) wetlands have shallow water　B) wetlands have emergent vegetation
C) wetlands have oxygen-poor water　D) wetlands have shallow water and emergent vegetation
E) wetlands have emergent vegetation and oxygen-poor water

30. All of the following are examples of mutualism except
A) lichens　B) mycorrhizae　C) nitrogen-fixing bacteria in nodules
D) plasmodial slime molds　E) zooflagellates that live in the guts of termites

31. Which of the following statements best explains why a new community is able to replace the resident community?
A) Species in the resident community die from old age.
B) Species in the resident community die from disease that eventually appears.
C) Given enough time, new species able to compete for the same resources as the resident species will arrive.
D) Species extinction is inevitable.
E) The biotic and abiotic characteristics of the habitat change due to the influence of the resident community.

32. Two species of finches living on separate islands have beaks of the same size. On one island where both species live together, beak sizes are different. This is an example of
A) genetic drift.　B) coevolution.　C) character displacement.　D) sexual selection.　E) kin selection.

33. A devastating blizzard dramatically reduces the size of a population and results in the disappearance of several alleles from the gene pool. This is an example of
A) genetic drift.　B) coevolution.　C) character displacement.　D) sexual selection.　E) kin selection.

34. A fish swimming into an estuary from a river would have which of the following as its greatest physiological challenge?
A) The high water flow would make the fish expend more energy.
B) The low oxygen content would give the fish difficulty in swimming aerobically.
C) The temperature change would stress the fish by denaturing its proteins.
D) The change in water solute content would challenge the osmotic balance of the fish.
E) The flux of nutrients washing into the estuary would give the fish difficulty in swimming aerobically.

35. The carnivorous pitcher plant is successful in bog habitats because _____.
A) it can tolerate lack of oxygen in the bog water　B) it can tolerate the high acidity of the bog water
C) it has a strategy to get nitrogen, which gives it a competitive advantage
D) it can gain oxygen in an unusual way　E) it demands high nitrogen content

36. Besides sunlight, which would be the next most important climatic factors for plants?
A) wind and fire　B) moisture and wind　C) temperature and wind
D) temperature and moisture　E) wing only

37. For a species to be called "invasive," it must _____.
A) be introduced to a new area　B) spread rapidly in this new area
C) eliminate native species　D) be introduced to a new area and spread rapidly in this new area
E) be introduced to a new area, spread rapidly in this area, and eliminate native species

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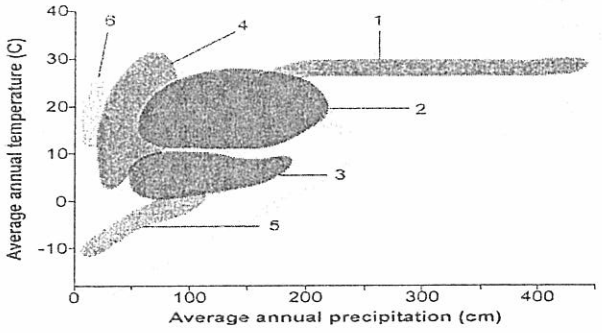
38. In the figure, which number would designate the arctic tundra biome?

A) 2
B) 3
C) 4
D) 5
E) 6

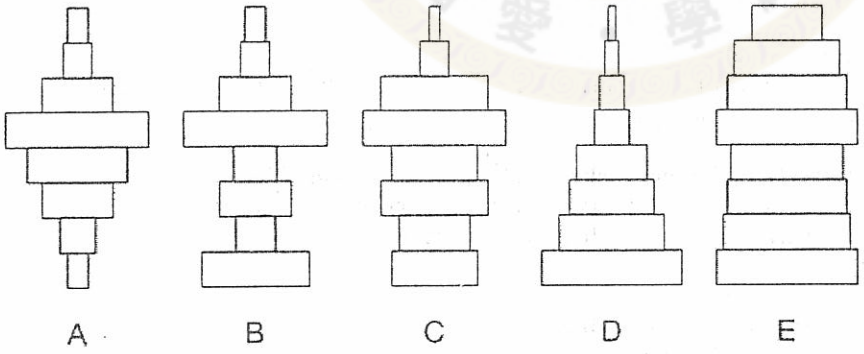


39. Which of the following organisms is likely to have the widest geographic distribution?
A) bacteria　　B) *Thermus aquaticus* bacteria　　C) Fairy pitta
D) Taiwan macaca　　E) Formosan land-locked salmon

40. If the last remaining population of a particular bird species were all highly related, which type of diversity would be of greatest concern when planning to keep the species from going extinct?
A) genetic diversity　　B) species diversity　　C) ecosystem diversity
D) both genetic and species diversity　　E) both species and ecosystem diversity

41. Which of the following statement is true regarding species diversity and taxonomic diversity?
A) Species diversity measures the relative frequency of all alleles present in a species.
B) In taxonomic diversity, the evolutionary relationships of species in a lineage are important.
C) In species diversity, the number of animals in a particular lineage is important.
D) The variety of species in a given area represents taxonomic diversity.
E) Species diversity is higher in the high elevation.

42. Which of the populations is most nearly experiencing zero population growth over the time period represented by the diagram?



43. Ecosystems services include processes that increase the quality of the abiotic environment. Which of the following processes would not fall under this category?
A) Keystone predators have a marked effect on species diversity.
B) Green plants produce the oxygen we breathe.
C) The presence of land plants builds soil.
D) The presence of diverse wetlands helps in flood control.
E) The presence of a watershed prevents the removal of nutrients from an ecosystem

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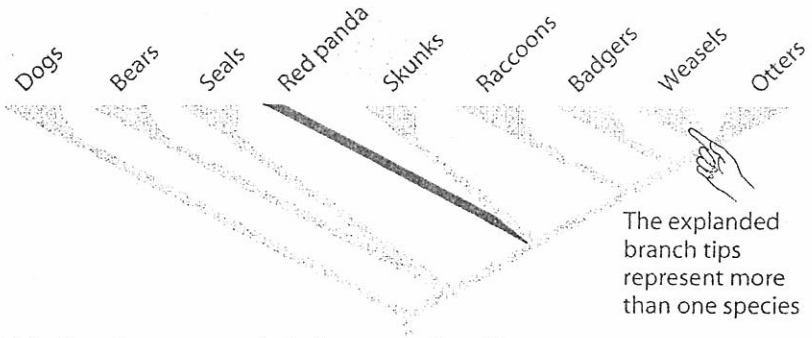
44. According to the figure, which of the following explains why the red panda is an important species to preserve?



A) Red pandas are a symbol of conservation efforts.
B) Red pandas live in areas that are critically endangered.
C) Seals are more important to preserve than the red panda because the ocean environment is critically endangered.
D) Phylogenetically distinct species are high-priority species to target for conservation.
E) All species on the tree are important to preserve.

45. Which one of the following is likely not a hotspot for breeding birds in Taiwan?
A) Taipei City　　B) Shei-Pa National Park　　C) Central Mountain Range
D) Yushan National Park　　E) None of the above

46. A land developer is arguing with a group of ecologists. Of course the land developer wants the most land possible for building houses, but has to compromise by saving some land for wildlife habitat. The land developer offers 20 ha in evenly distributed but isolated 1-ha portions. The ecologists keep arguing for one 20 ha area to remain intact. Why are the ecologists making this proposal?
A) There really is no difference; they should both work equally well.
B) The isolated hectare plots are better because they spread out the habitat.
C) The isolated plots are more vulnerable to edge effects.
D) The large plot will create more inbreeding in many species.
E) The large plot is more important.

47. The appearance of a new mutation is
A) a random event　　B) the result of natural selection　　C) the result of artificial selection
D) the result of sexual reproduction　　E) usually a beneficial event

48. How would you classify the genetic basis for most behavioral traits in the animal kingdom?
A) One gene typically codes for one behavior.　　B) One gene typically codes for many behaviors.
C) Many genes typically code for one behavior.　　D) Behaviors are learned, not coded by genes.
E) Behaviors are not coded by genes.

49. Which of the following is an example of sexual selection?
A) Dark-colored peppered moths in London at the beginning of the industrial revolution
B) The mane of a lion　　C) Insecticide resistance in insects
D) Darwin's finches in the Galapagos Islands
E) The ability of certain insects to avoid harm when consuming toxic plants.

50. A model that estimates the likelihood that a population will avoid extinction for a given period of time is called a(n) _____.
A) metapopulation.　　B) population viability analysis.　　C) age pyramid.
D) life table.　　E) modeling approacha.

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