

※ 注意：選擇題請於答案卷之「選擇題作答區」依序作答。

(一) 單選題 (每題2分；共60分)

1. The probable sequence in which land plants evolved is
 - A) Prokaryotic bacteria --> eukaryotic algae --> cyanobacteria --> land plants
 - B) Eukaryotic bacteria --> cyanobacteria --> eukaryotic algae --> land plants
 - C) Cyanobacteria --> eukaryotic algae --> prokaryotic bacteria --> land plants
 - D) Prokaryotic bacteria --> cyanobacteria --> eukaryotic algae --> land plants
2. Which of the following statements about prokaryotes is incorrect?
 - A) They make minerals available to plants through the process of decay
 - B) They cause numerous plant and animal diseases
 - C) They divide, sometimes quite rapidly, by the process of mitosis
 - D) Some can convert atmospheric nitrogen to a form which can be used by plants
3. Which of the following would be LEAST likely to affect osmosis in plants?
 - A) proton pumps in the membrane
 - B) a difference in solute concentrations
 - C) receptor proteins in the membrane
 - D) aquaporins.
4. What will happen if a cell with a solute potential of -0.4MPa and a pressure potential of 0.2MPa is placed in a chamber filled with pure water that is pressurized 0.5MPa ?
 - A) Water will flow out of the cell.
 - B) Water will flow into the cell.
 - C) The cell will be crushed.
 - D) The cell will explode.
5. 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.
6. If you grow yeast cells in a sealed container that contains a sugar solution, what begins to appear in solution is ethanol and the cells begin to die. This happens because
 - A) There is a lack of oxygen
 - B) There is too much oxygen available
 - C) There is not enough light for the cells to grow
 - D) The solution contained too much sugar initially
7. Where in a chloroplast would you find the highest concentration of protons?
 - A) In the stroma.
 - B) In the lumen of the thylakoid.
 - C) In the intermembrane space.
 - D) In the antenna complex.
8. If the gene encoding the enzyme rubisco is mutated such that it is non-functional, the process that would be affected is
 - A) the ability to make ATP.
 - B) the ability to harvest photons.
 - C) the ability to fix carbon.
 - D) the ability to make O_2 .
9. When we eat plants, we are eating mostly polysaccharides. What are they?
 - A) Starch & Cellulose
 - B) Glucose & Sucrose
 - C) Lignin & Pectin
 - D) DNA & RNA

10. How could you distinguish between a root hair versus a very small root?
A) Root hairs do not have a cuticle.
B) Root hairs are white, while roots are brown.
C) Root hairs only absorb water, not nutrients like roots.
D) Root hairs are extensions of single cells, while roots are multicellular.
11. Which of these actions describes secondary growth?
A) Growth in height. B) Development of wood and bark.
C) Growth of herbaceous tissue. D) Development of leaves and flower.
12. Why do nitrogen-fixation nodules contain large amounts of leghemoglobin?
A) It helps transport oxygen to the bacteria.
B) The nitrogenase enzyme interacts with the iron in the leghemoglobin.
C) The leghemoglobin helps break the triple bond of N₂.
D) It stimulates the Nod factors.
13. Systemin can correctly be described as a(n)
A) peptide. B) oligosaccharide. C) receptor. D) lipid.
14. A deficiency of _____ is MOST likely to produce symptoms in younger leaves before older leaves.
A) Boron B) Potassium C) Manganese D) copper
15. 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.
16. Which of the following statements about translocation through phloem is true?
A) No energy is required.
B) It is aided only by root pressure.
C) The direction of flow can change if the sources and sinks change.
D) Transport only occurs from the roots to the shoot.
17. 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.
18. 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
19. 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.
20. Parasitic plants have roots highly modified into
A) Haustorial roots. B) Nodular roots.
C) Mycorrhizal roots. D) Tap roots

21. The most promising approach to solving the world's food problems is:
- A) increasing the use of pesticides.
 - B) increasing the use of fertilizers.
 - C) increasing the availability of water.
 - D) improving the existing crops.
22. The process of after-ripening of seed involves:
- A) enzymatic modification of a dormant seed so that it will germinate.
 - B) biochemical conversion of a germinating seed to a dormant seed.
 - C) cessation of the flow of nutrients from the parent plant to the ovule.
 - D) stimulation of the primary meristems to develop.
23. 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
24. Hornworts almost universally form a symbiotic relationship with the cyanobacterium *Nostoc*. The probable advantage to the hornwort of this relationship is that they
- A) are protected from desiccation
 - B) gain fixed nitrogen
 - C) gain absorbed phosphorus
 - D) receive sugars for growth
25. The sequence of events summarized in the telome theory is
- A) totally dichotomous branching ---> overtopping ---> planation ---> webbing ---> megaphylls
 - B) totally dichotomous branching ---> overtopping ---> planation ---> webbing ---> microphylls
 - C) overtopping ---> totally dichotomous branching ---> planation ---> webbing ---> megaphylls
 - D) totally dichotomous branching ---> planation ---> overtopping ---> webbing ---> microphylls
26. Water lilies (*Nymphaeaceae*) are currently classified in as part of the:
- A) monocots.
 - B) eudicots.
 - C) basal angiosperms.
 - D) magnoliids.
27. Green, red, and brown algae may have originated by separate endosymbiotic associations of chloroplasts with eukaryotic cells. Evidence for this includes
- A) DNA sequences that clearly show this
 - B) pigments in the chloroplasts of each group
 - C) differences in associations of the chloroplasts with endoplasmic reticulum
 - D) membrane lipids associated with the chloroplasts of each group
28. A major reason fungi are classified in a separate group from the eubacteria is that they
- A) are heterotrophic
 - B) are decomposers
 - C) are eukaryotic
 - D) lack cellulose in their cell walls
29. Nonnative invasive species are often a threat to native species because the
- A) typically grow larger than other plants.
 - B) are not susceptible to any diseases.
 - C) are parasitic.
 - D) do not have natural enemies in their new location.
30. In tropical rainforests, most small shrubs and herbs occur as epiphytes, high in the canopy, because
- A) The soil is poor and they receive nutrients from the trees
 - B) Temperatures are warmer
 - C) There is more available light
 - D) There is more available water

※本大題請於答案卷內之「非選擇題作答區」標明題號依序作答。

(二) 問答題 (每題4分；共40分)

1. What is maternal inheritance? Why is in plants it easier to study plastid inheritance than mitochondrial inheritance?
2. Explain the three steps (nitrogen fixation, nitrogen reduction, and nitrogen assimilation) in the conversion of N_2 into organic nitrogen that is part of a plant. Which types of organism are capable of performing each step?
3. Define and give examples of the four ways (tropic, nastic, morphogenic, and taxis) that a plant or a cell can respond to a stimulus?
4. What is a leaf like early in the morning, with respect to conditions that affect water movement? Describe what happens as the sun rises. Be especially careful to consider how the stomata/mesophyll and the related water potentials change.
5. If you were given an unfamiliar vegetable, how could you tell if it was a root or a stem, based on its external features and a microscopic examination of its cross section?
6. What is the difference between a spore and a gamete? What is the difference between a spore and a zygote? Describe monobiontic and dibiontic life cycles. Be careful to mention all possible types.
7. Select examples of adaptation for drought, one for flooding, and one for salt tolerance and explain how each enhances plant survival?
8. Corn has been genetically engineered to produce the anti-insect poison of a bacterium, *Bacillus thuringensis*. What is one benefit of this? What are some of the risks?
9. What is the difference between monoecious and dioecious? What is the difference between self-pollination and cross-pollination? If pollen is transferred from the stamens of a flower to the stigma of the same flower, is that cross-pollination or self-pollination? If it is transferred from the stamen of one flower to the stigma of another flower on the same plant? If it is transferred from the stamen of one flower to the stigma of another flower on a different plant, but a plant that is a clone of the first one?
10. What is genetic drift? What is a founder? Are these important in large populations or in small ones? How are these phenomena important when we create national parks and preserves to protect endangered species?

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