

※ 本大題請於試卷內之「選擇題作答區」依序作答。

I. 選擇題:(一題 1 分，共 30 分)

1. In plant embryos asymmetrical cell division establishes _____.
 - (A) the apical-basal axis
 - (B) vascular tissues
 - (C) vegetative tissues
 - (D) cotyledons
 - (E) root apical meristems
2. What will produce sperm cells in plants?
 - (A) Pollen tubes
 - (B) Cotyledons
 - (C) Ovules
 - (D) Zygotes
 - (E) Pollen grains
3. What are the end products of the light reactions of photosynthesis?
 - (A) glucose + O₂
 - (B) glucose + CO₂
 - (C) O₂, ATP, and NADPH
 - (D) ATP
 - (E) NADH and FADH₂
4. Chloroplasts generate a proton gradient _____.
 - (A) cross the thylakoid membrane
 - (B) across the plasma membrane
 - (C) in the stroma
 - (D) in the stomata
 - (E) between inner and outer membrane
5. What is the primary function of the Calvin cycle?
 - (A) to use ATP to release CO₂
 - (B) to split water and release O₂
 - (C) to transport RuBP out of the chloroplast
 - (D) to synthesize simple sugars from CO₂
 - (E) to assimilate NO₃⁻
6. What is the function of the vascular cambium of a tree?
 - (A) to generate primary tissues at the shoot and root tips
 - (B) to generate bark
 - (C) to transport water and nutrients
 - (D) to store compounds such as resins and gums
 - (E) to generate secondary xylem and secondary phloem
7. Why are most leaves thin and broad?
 - (A) to maximize their ability to collect water
 - (B) to minimize water loss
 - (C) to maximize their ability to collect light
 - (D) to minimize the rate of CO₂ absorption
 - (E) to maximize heat dissipation

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8. What would happen if a living plant cell were placed in a solution of pure water?
- (A) The internal pressure potential would increase.
 - (B) The internal pressure potential would decrease to zero.
 - (C) The internal solute potential would increase to zero.
 - (D) The cell would expand until it would burst.
 - (E) The cell would shrink and become plasmolyzed
9. What is the function of the Casparian strip in the endodermal cells of roots?
- (A) to increase the root's capacity for water absorption
 - (B) to allow water to move apoplastically into the xylem
 - (C) to force water and nutrients to pass through membranes
 - (D) to generate the pressure necessary to push water into the shoot
 - (E) to produce lateral roots
10. Cation exchange is a process _____.
- (A) in which anions are washed away by water moving through the soil
 - (B) in which protons replace positive ions bound to soil particles making them available for plants
 - (C) that is more efficient at high pH
 - (D) that is enhanced by sandy soil
 - (E) in which negatively charged ions are released from soil particles
11. In order for a coleoptile to bend toward the light, _____.
- (A) auxin moves from the illuminated side of a coleoptile tip to the shaded side
 - (B) auxin is destroyed on the illuminated side of a coleoptile tip
 - (C) proton pumps are activated on the illuminated side of a coleoptile tip
 - (D) red light is absorbed by PHOT1
 - (E) the pH in cell walls on the shaded side of the coleoptile increases
12. Plant life cycles alternate between a sporophyte stage and a gametophyte stage. In the sporophyte stage, _____.
- (A) gametes are produced by mitosis
 - (B) spores are produced by meiosis
 - (C) gametes are produced by meiosis
 - (D) cells contain half the DNA of a gametophyte cell
 - (E) spores release sporangia
13. Roots use ATP during nutrient uptake _____.
- (A) to pump sodium ions into cells
 - (B) to pump water across membranes
 - (C) to take up cations but not anions
 - (D) to create a high pH in the apoplast
 - (E) to pump protons out of root cells
14. Of the eight haploid nuclei in an angiosperm female gametophyte, _____.
- (A) only two nuclei are fertilized by the sperm cells
 - (B) two polar nuclei fuse with a sperm cell to form the 3n endosperm
 - (C) two are called sperm nuclei
 - (D) the egg cell fuses with a synergid to form the zygote
 - (E) seven are not used and eventually degenerate

15. Which growth hormone prevents germination in dormant seeds and causes stomata to close when a plant is in need of water?
- (A) cytokinin
 - (B) auxin
 - (C) gibberellin
 - (D) abscisic acid
 - (E) ethylene
16. In the development of a fiber cell, which of the following genes would you expect to be turned on in the developing fiber cell but not in a developing parenchyma cell?
- (A) Genes for production of cellulose.
 - (B) Genes for production of hemicelluloses.
 - (C) Genes for production of lignin.
 - (D) Genes for production of rRNA.
 - (E) Genes for production of tRNA.
17. If plants with red flowers are selfed, plants of the F1 generation produce flowers that are red or white in a ratio of 3 red: 1 white. With respect to flower color, the parent plants must be
- (A) homozygous with red dominant to white.
 - (B) homozygous with white dominant to red.
 - (C) heterozygous with red dominant to white.
 - (D) heterozygous with white dominant to red.
 - (E) There is not enough information given to tell.
18. Plastids and mitochondria contain some DNA. This DNA is inherited from:
- (A) Plastids and mitochondria in both the sperm and egg and thus are biparental.
 - (B) Copies of DNA in the nucleus and thus are biparental.
 - (C) Plastids and mitochondria in the sperm only and thus are inherited paternally.
 - (D) Plastids and mitochondria in the egg only and thus are inherited maternally.
 - (E) DNA that is free in the cytoplasm that then organizes the plastid or mitochondria.
19. Pitcher plants have leaves modified into a long, upright tube that traps and digests insects. The Australian pitcher plant, *Cephalotus follicularis*, has a similar structure and function to the North American pitcher plants, *Sarracenia* spp. but the two genera are from completely different lineages. This is an example of:
- (A) allopatric speciation.
 - (B) convergent evolution.
 - (C) geographic speciation
 - (D) phyletic speciation.
 - (E) sympatric speciation.
20. Which of the following would be the best criterion for placing two separate species in the same genus?
- (A) They occasionally interbreed, producing a sterile hybrid.
 - (B) Both are trees.
 - (C) Both produce red colored flowers.
 - (D) Both exhibit C4 photosynthesis.
 - (E) Both have exactly the same growth requirements.
21. Sexual reproduction is triggered in diatoms by
- (A) hormones.
 - (B) presence of a compatible mating type.
 - (C) cell size.
 - (D) environmental chemicals.
 - (E) day length.

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 - (C) plastids and mitochondria in the egg only and thus are inherited maternally.
 - (D) plastids and mitochondria in the sperm only and thus are inherited paternally.
 - (E) plastids and mitochondria in both the sperm and egg and thus are biparental.
23. Algae whose cytokinesis is most similar to your own cells are algae that produce
- (A) a phragmosplast and a cleavage furrow.
 - (B) a phragmosplast and a cell plate that grows radially outward.
 - (C) a phycoplast and a cell plate that grows radially inward.
 - (D) a phycoplast and a cleavage furrow.
 - (E) None of the answer is correct.
24. Prokaryotic flagella differ from eukaryotic flagella in that prokaryotic flagella:
- (A) are surrounded by a plasmalemma.
 - (B) consist of microtubules.
 - (C) consist of subunits of flagellin.
 - (D) are long, slender appendages.
 - (E) are involved in motility.
25. Which of the following statements about bryophytes is FALSE?
- (A) They lack xylem and phloem.
 - (B) The cell walls of their water-conducting cells are lignified.
 - (C) They exhibit alternating heteromorphic generations.
 - (D) The sporophyte is usually nutritionally dependent on the gametophyte.
 - (E) The gametophyte is usually larger than the sporophyte.
26. Which of the following statements is correct?
- (A) The wood of pine contains only tracheids that are of uniform diameter.
 - (B) If you see a tree with no leaves in the winter, it is definitely not a conifer.
 - (C) A pine pollen tube is parasitic on the megasporangium.
 - (D) Cycad seed cones and pollen cones may be found on the same plant.
 - (E) If you see a tree with no leaves in the winter, it is definitely not a conifer.
27. Seeds can be stored for the longest period in germplasm banks by:
- (A) storing them at very low temperatures.
 - (B) burying them in special glass containers underground.
 - (C) storing them at room temperature in low humidity chambers.
 - (D) sealing them in air-tight plastic bags at temperatures just above room temperature.
 - (E) keeping them underwater at low CO₂ and low temperatures.
28. If you wanted to locate a diploid nucleus in an ascomycete, you would look at the
- (A) ascospore
 - (B) ascus
 - (C) conidiospore
 - (D) sclerotium
 - (E) none of the above

29. The habitat of a plant species would include all of the following except
- (A) length of the growing season.
 - (B) bear by plants of other species.
 - (C) the composition of the soil.
 - (D) insects that lay their eggs in the plant's leaves.
 - (E) a person who picks some of the species' flowers once.
30. The photosynthetic apparatus of green and purple bacteria lacks photosystem (PS)II. This means that these autotrophs cannot produce
- (A) sugars
 - (B) ATP
 - (C) O₂
 - (D) a and c
 - (E) a, b, or c

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II. 解釋下列各題中的名詞:(一題3分,共30分;請依題號順序作答)

- 31. Light compensation point
- 32. Kranz anatomy
- 33. Apoplast; symplast
- 34. Active transport; diffusion
- 35. Osmosis
- 36. Commensalism; mutualism
- 37. Gene flow; gene drift
- 38. Epistasis; pleiotropy
- 39. Endomycorrhizas; ectomycorrhizas
- 40. Mixotroph; saprotroph

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III. 問答題:(一題5分,共40分;請依題號順序作答)

- 41. Which organelle functions as storage of both nutrient reserves and waste products? What is the name of its membrane?
- 42. What are the first enzymes for CO₂ fixation in C₃ and C₄ plants, respectively? What cells are these enzymes located, respectively?
- 43. What are the roles of malate-aspartate shuttle in respiration?
- 44. What is apical dominance? How is auxin involved?
- 45. What roles do cotranslational and posttranslational import play in the sorting of proteins in the cell?
- 46. Draw and label an embryo sac including eight-nuclei, seven-cells, and explain the eventual fate of each (during double fertilization).
- 47. Distinguish among simple, aggregate and multiple fruits, and give an example of each.
- 48. Why is it important to maintain the genetic diversity of crop plants? Explain why it is sometimes advantageous to use perennial varieties of grain crops instead of the traditional annual varieties.