

Washington State Science Olympiad
2025 Division B/C State Tournament

BOTANY
TEST

Instructions:

DO NOT WRITE ON THIS TEST

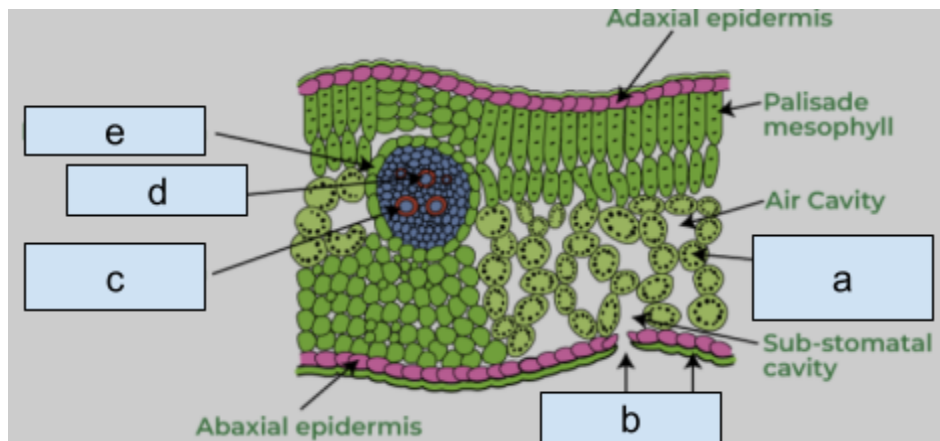
Use the answer sheet to record your answers

General Questions (20.5 points)

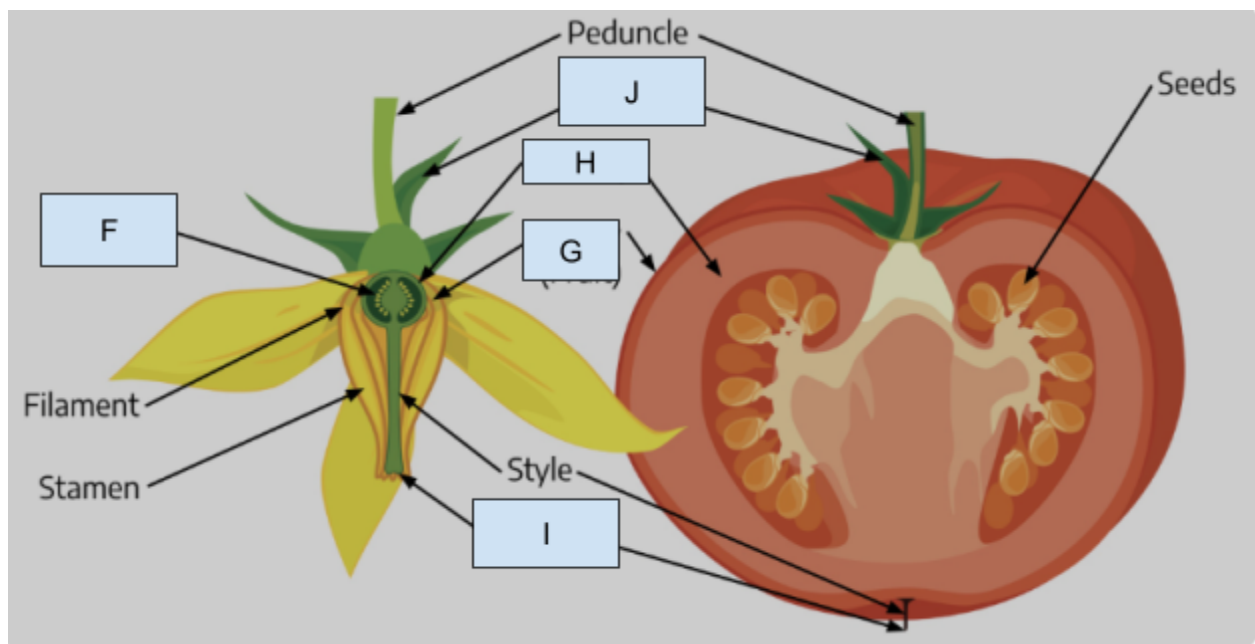
1. (True or False) Sucrose is a monosaccharide. (1 point)
2. A plant cell that unites with another cell is called a: (1 point)
 - a. Mitospore
 - b. Gamete
 - c. Zygote
 - d. Meiospore
 - e. Diploid cell
3. Which of the following statements about heterotrophs is false? (1 point)
 - a. They satisfy their energy requirements through organic compounds
 - b. Most likely evolved before autotrophs
 - c. "Heterotroph" stands for "other feeder"
 - d. They are able to photosynthesize
4. Most of the glyceraldehyde 3-phosphate not exported to the cytosol is converted to _____ and stored in the chloroplasts. (tiebreaker)
5. _____ is a fuel formed from wetland biomass that accumulates under standing water. (1 point)
6. _____ are compounds that make plant proteins indigestible to insects. (1 point)
7. (True or false) All autotrophs obtain their energy from the sun (1 point)
8. (True or false) An example of allelopathy is the inability of weeds to grow near sorghum. (1 point)
9. (True or false) Secondary metabolites are chemicals produced by plants that deter insect herbivores (1 point)
10. The first plants cultivated in the Fertile Crescent were _____ and _____. (2 points)
11. Like stem trichomes, root hairs may be multicellular (1 point)
 - a. True
 - b. False
12. What are the three basic organs that vascular plants have evolved? (1.5 points) What are the two systems that are organized (2 points)
13. In monocots, primary vascular bundles in the stem are _____ arranged, but in eudicots they are arranged in a _____. (2 points)
14. In most flowers, the sepals do not attract pollinators and cannot produce pollen or ovules. Does that make the production of sepals a waste of energy? Explain. (3 points)
15. Primary growth _____ the plant. Secondary growth will _____ the plant. (1 point)

Plant Anatomy (10 points)

16. Utilize the following diagram to label a-e. (1 point each)



17. Utilize the following diagram to label f-j (1 point each)



Photosynthesis (20 points)

18. Following photolysis, the resulting protons are released into the _____, contributing to the proton gradient across the _____ membrane. (2 points)
19. The Calvin Cycle takes place in the _____. (1 point)
20. Carbon dioxide is “fixed” by bonding to _____ (tiebreaker)
21. RUBISCO can use _____ or Carbon dioxide as a substrate (1 point)
22. The malate or aspartate produced in the C₄ pathway moves next into _____. (1 point)
23. C₄ plants require (1 point)
 - a. More ATP to fix Carbon dioxide
 - b. Less ATP to fix Carbon dioxide
 - c. More ATP to fix Oxygen
 - d. Less ATP to fix Oxygen
24. (True or false) All photosynthetic eukaryotes contain both chlorophylls a and b. (1 point)
25. (True or false) The ATP and NADPH generated by the light reactions are used in the Calvin cycle (1 point)
26. (True or false) Photorespiration is an energetically wasteful process that seldom occurs in nature. (1 point)
27. (True or false) The leaf anatomy of a C₄ plants provides a spatial separation between the C₄ pathway and the Calvin cycle. (1 point)
28. During photosynthesis, plants intake _____, _____, _____ and release _____ and _____. (2 points)
29. True or false: Photosystem I occurs before photosystem 2. (1 point)
30. Why are C₄ plants combined with _____ to create malate which is transported into _____ cells. (2 points)
31. (True or False) All CAM plants can keep their stomata closed night and day.
32. (True or false) Under dry conditions, C₄ plants can outcompete C₃ plants.
33. (True or False) The light harvesting complex contains a reaction center. (1 point)
34. In the C₄ pathway, PEP carboxylase is responsible for (2 points)

Propagation (25 points)

35. Cuttings using stems must produce _____ roots to be successful. (1 point)

36. Match the type of specialized structure with the corresponding characteristic or definition of that structure. (10 points; 2 points each)

- a. Bulb
 - i. Underground modified
 - ii. Above ground stem
- b. Corm
 - i. Underground modified
 - ii. Above ground stem
- c. Tuber
 - i. Underground modified
 - ii. Above ground stem
- d. Rhizome
 - i. Underground modified
 - ii. Above ground stem
- e. Runner
 - i. Underground modified
 - ii. Above ground stem

How would you propagate the following plants? Provide an explanation (26-32) (2 point each; 14 points total)

- 37. Succulent
- 38. Lettuce
- 39. Aloe
- 40. Potato
- 41. Lavender
- 42. String of pearls
- 43. Tomato

Medicinal plants (5 points)

44. Andrew Zhao recently received a terrible sunburn in Ithaca, NY. He uses aloe vera to cure his sunburn because his mother taught him to do so. Why is this thought process incorrect? (2 points)

45. Andrew Zhao received tons of candy canes from Santa. Unfortunately, he broke his tooth on one of them and started experiencing extreme tooth pain. Which plant oil should he use to soothe his teeth?

46. In ancient Chinese medicine, ginseng was a popular plant used to cure many diseases. What are some diseases people may use ginseng for?