

**Washington State Science Olympiad
2025 Division B/C State Tournament**

BOTANY

Answer Keys

Instructions:

1. Both B and C teams share the same time slot. Make sure they write their team name and team number correctly
2. The test is for 50 minutes. We should give them warning at 10min, 5 min, 1 min as we get to the end of the test.
3. The tests are reused from each block. Make sure they do not write their name or answer on the test itself. Answer sheets (stapled) can be separated, but make sure it was stapled with the correct team name etc and separate from the reused (unstapled) test.

General Questions (20.5 points)

1. A
2. B
3. D
4. starch (tiebreaker)
5. Peat (1 point)
6. Tannins . (1 point)
7.
 - a. False
8.
 - a. True
9.
 - a. True
10. wheat and barley . (2 points)
11. B
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)
 - a. Roots, stems, and leaves (0.5 points each)
 - b. Root system and shoot system (1 points each)
13. In monocots, primary vascular bundles in the stem are _____ arranged, but in eudicots they are arranged in a _____. (2 points)
 - a. Scattered (1 point); Ring (1 point)
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)
 - a. Sepals are responsible for protecting the developing flower bud until it is ready to be pollinated
15. Primary growth _____ the plant. Secondary growth will _____ the plant. (1 point)
 - a. Lengthen (0.5 points), widen (0.5 points)

Plant Anatomy (10 points)

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

- a. Spongy mesophyll
- b. stoma
- c. Phloem
- d. xylem
- e. Bundle sheath

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

- f. Ovule
- g. Ovary
- h. Pericarp
- i. Stigma
- j. Sepal

Photosynthesis (20 points)

18. Following photolysis, the resulting protons are released into the Lumen, contributing to the proton gradient across the Thylakoid membrane. (2 points)

19. The Calvin Cycle takes place in the chloroplast stroma (1 points)

20. Carbon dioxide is “fixed” by bonding to ribulose 1,5-biphosphate. (tiebreaker)

21. RUBISCO can use Oxygen or Carbon dioxide as a substrate (1 point)

22. The malate or aspartate produced in the C₄ pathway moves next into bundle-sheath cells. (1 point)

23. A (1 point)

24. False

25. True (Tiebreaker)

26. False

27. True

28. During photosynthesis, plants intake _____, _____, _____ and release _____ and _____. (2 points)

Carbon dioxide, light, water;

oxygen, carbohydrates

29. False

30. Why are C4 plants combine with _____ to create malate which is transported into _____ cells. (2 points)

a. PEP, bundle sheath

31. (True or False) All CAM plants can keep their stomata closed night and day.

a. False

32. (True or false) Under dry conditions, C4 plants can outcompete C3 plants.

a. True

33. (True or False) The light harvesting complex contains a reaction center. (1 point)

a. True

34. In the C4 pathway, PEP carboxylase is responsible for (2 points)

a. Catalyzes the formation of oxaloacetate.

Propagation (25 points)

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

a. Adventitious

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

a. Bulb

i. Underground modified

b. Corm

i. Underground modified

c. Tuber

i. Underground modified

d. Rhizome

i. Underground modified

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: Pluck a leaf, let it calluses, buds, cut the head off, let plants grow on the stem

38. Lettuce : Cut the head and put the base in water

- 39. Aloe : Take the pups and take a leaf
- 40. Potato : Cut the eyes out and put it in soil
- 41. Lavender : Cuttings
- 42. String of pearls : Cuttings
- 43. Tomato : Cuttings (side shoots)

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)
 - a. Aloe does not produce collagen to promote skin growth. It will only relieve the burn
- 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?
 - a. Clove/peppermint which both contain antibacterial and anesthetic properties
- 46. In ancient Chinese medicine, ginseng was a popular plant used to cure many diseases. What are some diseases people may use ginseng for?
 - a. Diabetes