



Exploring the World of Science

University of Michigan Science Olympiad
2021 Invitational Tournament

Botany C Key

Test length: 50 Minutes

Team name: KEY

Student names: KEY



1. What is the stalk of an inflorescence called? (Answer with one lowercase word.)

ANSWER: peduncle

2. What are the two fertile parts of a flower?

- a. **stamen, carpel**
- b. sepal, petal
- c. stamen, sepal
- d. carpel, petal

3. What is the term for a flower species containing its reproductive parts of separate flowers? (Answer with one lowercase word.)

ANSWER: dioecious

4. Name the fungus that causes black stem rust. (Answer with a full binomial name, first letter capitalized.)

ANSWER: *Puccinia graminis*

5. What gene was inserted into wheat to make it resistant to the above fungus until recently? (Answer with the proper name of the gene, capitalization included.)

ANSWER: Sr31

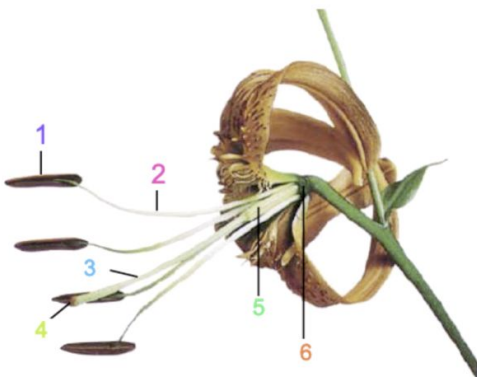
6. Assign each of the following plants as either a monocot or dicot:

- a. california poppy: **dicot**
- b. orchids: **monocot**
- c. rice: **monocot**
- d. bananas: **monocot**
- e. redwood: **dicot**
- f. cacti: **dicot**

7. Assign each of the following characteristics as belonging to a monocot or dicot:

- a. parallel leaf veins: **monocot**
- b. taproot system: **dicot**
- c. flowers in groups of 5: **dicot**

8. Label the below image:



ANSWER:

- 1 - anther
- 2 - filament
- 3 - style
- 4 - stigma
- 5 - ovary
- 6 - receptacle

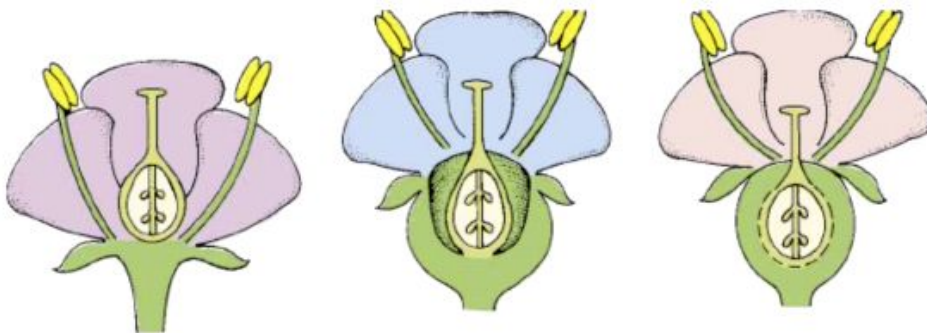
9. Label the below image:



ANSWER:

- 1 - stigma
- 2 - style
- 3 - corolla
- 4 - anther
- 5 - filament
- 6 - calyx
- 7 - ovary
- 8 - pedicel

10. Label the following flowers as either epigynous, perigynous, or hypogynous:



ANSWER: hypogynous, perigynous, epigynous

11. What is the name of the process of producing fruit without any seeds? (Answer with one lowercase word.)

ANSWER: parthenocarpy

12. Explain how CAM plants overcome dehydration.

ANSWER: Since they live under conditions of high light intensity and water stress, they only open their stomata at night and store carbon dioxide in the form of organic acids to process during the day.

13. The rate of water evaporation from a plant doubles for every [BLANK] degrees C increase in temperature. (Answer in number format)

ANSWER: 10

14. Stomata normally close when the external temperature reaches:

- a. 30-35 C
- b. 35-40 C**
- c. 40-45 C
- d. 45-50 C

15. Chlorophyll b ultimately transfers its energy to photosynthesis without the aid of chlorophyll a.

ANSWER: False

16. What is the optimal absorption peak of Photosystem II?

ANSWER: 680 nm

17. What is the name of the cryptochrome complex between Photosystem II and I?

ANSWER: b6/f

18. What is the starting compound of the Calvin cycle?

ANSWER: Ribulose 1,6-bisphosphate (RuBP)

19. What is the name of the enzyme that is critical for carbon fixation in the Calvin cycle?

ANSWER: Rubisco

20. Most of the fixed carbon in plants is stored as glucose.

ANSWER: False

21. Name the deficiency:



ANSWER: Magnesium (Mg^{2+})

22. Name the deficiency:



ANSWER: Potassium (K^{+})

23. Name the largest and most diverse group of plants living today, other than the angiosperms?

ANSWER: Ferns

24. What part of a plant's root helps direct it towards resources?

ANSWER: Rootcap

25. Name the three regions of general root development.

ANSWER: Region of cell division, cell elongation, maturation

26. What is the term used to describe parenchyma tissue with large, intracellular spaces?

ANSWER: Aerenchyma

27. Substances passing through the cortex that only travel via the cell walls follow what pathway?

ANSWER: Apoplastic pathway

28. What is the name of the layer that replaces the epidermis as a protective covering in woody roots?

ANSWER: Periderm

29. What is the term used to describe young, lateral roots?

ANSWER: Root primordium

30. What is the difference between nonfleshy and storage roots?

ANSWER: Predominance of parenchyma cells in the secondary xylem and phloem of the storage roots

31. What is the principle of parsimony?

ANSWER: Construct the cladogram in the simplest way possible

32. What bacterium houses the Ti plasmid, which is used to transfer foreign genes by bombarding plants with high-velocity microprojectiles of RNA or DNA?

ANSWER: Agrobacterium tumefaciens

33. What vesicles play the role of statoliths in plants?

ANSWER: amyloplasts

34. What plant hormone is primarily responsible for gravitropism?

ANSWER: auxin

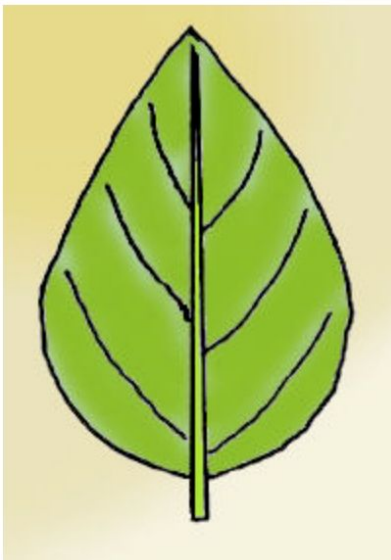
35. What are the two main families of plant photoreceptors?

ANSWER: red-light-sensing phytochromes and blue-light-sensing cryptochromes (CRY1, CRY2)

36. What's the equation for nitrification?

ANSWER: $2 \text{NH}_4^+ + 3 \text{O}_2 \rightarrow 2 \text{NO}_2 + 4 \text{H}^+ + 2 \text{H}_2\text{O}$

37. What type of shape is the below leaf?



ANSWER: ovate

38. Classify the following plants as either short-day, long-day, or day-neutral:

- a. chrysanthemums: **short-day**
- b. poinsettias: **short-day**
- c. asters: **long-day**
- d. California poppies: **long-day**
- e. potatoes: **long-day**
- f. corn: **day-neutral**
- g. cucumbers: **day-neutral**

39. Say you have a short-day plant whose photoperiod is 12 hours. You store it in an area that has 13 hours of continuous nighttime, except for 10 minutes in between when the plant is illuminated with light. Do you expect this plant to form flowers? Explain your answer thoroughly.

ANSWER: Short-day plants require a continuous period of nighttime that's longer than their photoperiod. Thus, this plant would've flowered if it were not for the 10-minute interruption, and thus won't flower.

40. Define "canker," in the context of plant disease.

ANSWER: A small area of dead tissue.

41. What type of organism causes anthracnose?

ANSWER: Fungi

42. Name the below plant disease:



ANSWER: Rust

43. The relationship between the black walnut (which secretes juglone) and surrounding plants can best be described as which of the following?

ANSWER: amensalism

44. Name the group of plants that nurture the young embryo sporophyte within the paternal gametophyte.

ANSWER: Embryophytes

45. Give the general reaction equation for the Calvin cycle.

ANSWER: $3 \text{ CO}_2 + 6 \text{ NADPH} + 6 \text{ H}^+ + 9 \text{ ATP} \rightarrow \text{G3P} + 6 \text{ NADP}^+ + 9 \text{ ADP} + 3 \text{ H}_2\text{O} + 8 \text{ Pi}$

46. In plants that use CAM photosynthesis, what four-carbon acid is produced as a form of carbon dioxide storage at night?

ANSWER: Malic acid

47. Name the specific type of cells that help transport water in the xylem of vascular plants, have lignified walls, and have perforations at their end plates.

- a. Parenchyma
- b. Collenchyma
- c. Sclerenchyma
- d. Tracheids
- e. **Vessel Elements**

48. Approximately what percentage of plants exhibit mycorrhizae? (Enter your answer as a number with no other characters.)

ANSWER: 80

49. Name the biological phenomenon by which an organism produces chemicals that influence the growth, survival, and reproduction of surrounding organisms. (Capitalize the first letter of the word and don't add any additional characters.)

ANSWER: allelopathy

50. Name the virus that causes the yellowing and stunts the growth of tomato plants. (Make sure your answer is lowercase and to include the word "virus.")

ANSWER: tomato mosaic virus