



University of Michigan Science Olympiad



Exploring the World of Science

2021 Invitational Tournament

Home Horticulture B/C

Test length: 50 Minutes

Team name: _____ **Team number:** _____

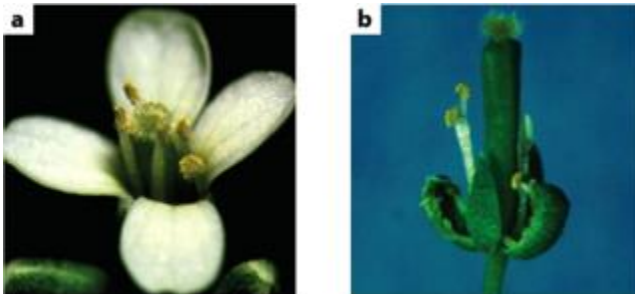
Student names: _____

All questions are worth 1 pt each unless otherwise stated.

Tiebreaker Order: 3, 50, 20, 21, 15, 9, 51, 39, 45, 42

Basic Botany

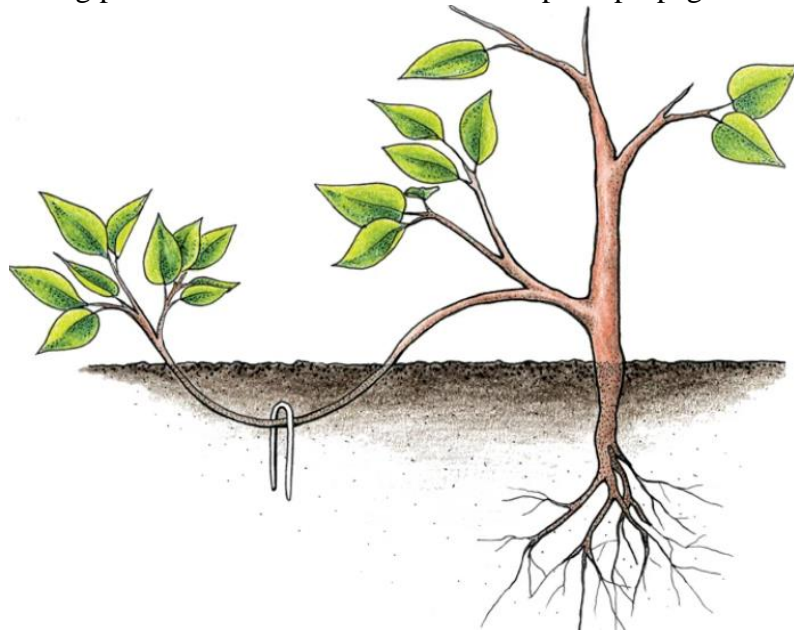
1. What hormone is produced in the meristems of plants to encourage cell division and elongation?
 - a. Ethylene
 - b. Auxin
 - c. Gibberellin
 - d. Strigolactone
 - e. Salicylic acid
2. What is it called when plants grow towards the light source? Phototropism
3. What polymer in cell walls of plants allows for the xylem cell walls to be more rigid?
 - a. Cellulose
 - b. Peptidoglycan
 - c. Lignin
 - d. Phospholipids
 - e. Cholesterol
 - f. Chitin
4. Looking at the images provided, the wild type (left) and mutant (right). According to the ABC model development hypothesis, the mutant flower has carpels developing where the wild type develops sepals. As a result, there is a loss of function mutation in which gene?



- a. Gene A
 - b. Gene B
 - c. Gene C
 - d. Not enough information
5. Inside a plant's chloroplasts, where does the Calvin Cycle take place?
 - a. Inner membrane
 - b. Thylakoid Stack
 - c. Thylakoid Space
 - d. Outer membrane
 - e. Stroma
 6. What colors of light are the most important for plant growth?
 - a. Blue and Green
 - b. Yellow and Red
 - c. Blue and Yellow
 - d. Blue and Red
 - e. Orange and Green

Plant Propagation

7. In the carpel of a plant, the gametes contain how many nuclei after meiosis and mitosis?
8
8. During double fertilization, there is a _____ endosperm and _____ embryo in the seed.
 - a. Haploid, Diploid
 - b. Diploid, Haploid
 - c. Diploid, Diploid
 - d. Diploid, Triploid
 - e. Triploid, Diploid
 - f. Haploid, Triploid
9. What are plants that have stems underground and produce smaller clones of the parent plant called? Rhizomes
10. The following picture demonstrates what kind of plant propagation technique?



- a. Division
- b. Layering
- c. Grafting
- d. Duplication
- e. Linking
- f. Suckering

Soil Health, Fertilizer Management, Composting

11. Which of the following can/should be composted? (Select all that apply)
 - a. Clean Cardboard
 - b. Yogurt
 - c. Fish bones
 - d. Coffee Grounds
 - e. Fireplace ashes
 - f. Charcoal ash
12. Which of the following are soil nutrient levels that a soil test report would provide? (Select all that apply)
 - a. pH
 - b. Phosphate
 - c. Iron
 - d. Potash
 - e. Calcium
13. Andrew uses a package of 5-10-5 fertilizer for his plants, but his plants have generally had a yellowish tint on its leaves. What kind of fertilizer should he add/mix to reduce the yellowing?
 - a. 10-10-5
 - b. 5-30-10
 - c. 5-10-10
 - d. 5-20-10
14. True or False: Poultry manure generally has more nitrogen than cow manure.
15. What is it called when fertilizer is applied along a garden row or in a circle surrounding an individual plant?
 - a. Side dressing
16. If crops' leaching potential is relatively large/high, what type of fertilizer should be used?
 - a. Micronutrient Fertilizer
 - b. Phosphorous Fertilizer
 - c. Inhibitor Fertilizer
 - d. Potassium Fertilizer
 - e. Nitrate Fertilizer
 - f. Ammonium Nitrogen Fertilizer
17. True or False: If a water level reading has a nitrate level of about 15 ppm, it is not safe to use as water for plants.
18. If Caleb has a garden 20 ft long and 16 ft wide, how many pounds of 5-10-5 fertilizer should be put in? (Range of answers will be taken)
 - a. 12.8 pounds – 19.2 pounds (any number between will be fine)

Entomology of Pests and Pest Management

19. Sarah has a garden plot that has been growing geraniums during the summer. However, during early August, she notices that some of the leaves have been chewed. Additionally, it looks as though there are white tunnel patterns under the surface of the leaves. What pest may have caused this?
- Mites
 - Caterpillars
 - Aphids
 - Beetles
 - Moths
20. Amanda is growing hosta plants in her garden, but she is suspecting that slugs may be in her garden and damaging her plants. What should she be looking for on the plant leaves that may suggest slugs are living in her garden? (Select all that apply)
- Folded leaves
 - Abnormal plant growths
 - Chewed leaves
 - Rolled leaves
 - Discolored leaves
21. This picture depicts milkweed that has been attacked by a pest. Its leaves have begun to discolor and curl with yellow specs. The pest is seen to be hiding under leaves of the plants and they are reddish brown in color. What pest may this be?



- Psyllid
- Spider mite
- Spider

- d. Tree cricket
 - e. Sawfly
22. Jenna has an orange tree in her backyard, but aphids are seen to be damaging the tree and the fruit. What is a biological control agent that can be used to control the aphids?
- a. Lacewing or ladybug larvae
23. Transgenic modifications have allowed certain corn to naturally produce insecticidal Cry proteins that have prevented caterpillars such as the European corn borer from reducing crop yield. What is the type of corn called?
- a. Bt-corn
24. Name 2 advantages of the transgenic modification mentioned in the previous problem instead of directly applying insecticides.
- a. Lower cost, No need to directly apply, No indirect sprays on other neighboring crops, Hard to Store Cry protein, Less Insecticide use

Plant Diseases

25. Most plant diseases are caused by what?
- a. Fungi
 - b. Bacteria
 - c. Viruses
 - d. Algae

26. Jeramiah has a row of cucumber plants that have begun to show leaves that look like the following. Identify the disease



Downy Mildew

27. Given that a leaf of a squash plant is damaged, you decide to cut off the leaf at it's stem leaving an open wound of sap. Which of the following companion plants would allow you to mask the smell of the sap to prevent as many insects from feeding on the plant?
- a. Sandalwoods
 - b. Marigolds
 - c. Roses
 - d. Carrots
 - e. Lemongrass

Vegetables, Tree Fruit, and Small Fruit

For Questions 28- 31, please use the following fruit categories below. Answers may be used more than once. (.5 pts each)

A. True Berry	D. Aggregate Fruit
B. Pepo	E. Multiple Fruit
C. Hesperidium	F. Accessory Fruit

28. What type of fruit is a pineapple?
 - a. E
29. What type of fruit is a lime?
 - a. C
30. What type of fruit is a pomegranate?
 - a. A
31. What type of fruit is a banana?
 - a. A
32. What is the biological mechanism that produces seedless fruits called?
 - a. Stenospermocarpy
33. Corey's garden currently has sweet corn planted and wants to add another vegetable. She wants to potentially grow lettuce, tomatoes, bell peppers, or zucchini. Given that Corey already planted the sweet corn on the east side of her garden and it is early spring, which of the vegetables would most likely grow the best with the sweet corn?
 - a. Lettuce (cool season in spring and able to grow in shade)
 - b. Tomatoes
 - c. Bell Peppers
 - d. Zucchini
34. If a tree is not thinned prior to the fruit blossoms opening, what would happen?
 - a. More regular sized fruit grows with a more bitter flavor
 - b. Fruits grow together in clusters more
 - c. Immature fruits drop
 - d. More leaves are grown creating denser foliage
 - e. Nothing changes

Lawn Care and Pruning Ornamentals

35. If you have a bush that is not bushy enough but has reached the desired height, what pruning can do done to trigger the plant to become bushier?
 - a. Cut off the leaves at ends of several branches
 - b. Cut off the tips of the main shoots
 - c. Cut off lower branches
 - d. Cut off higher branches at the stem
 - e. Cut off leaves at the base of most branches

36. The following picture demonstrates what type of horticultural practice?



- a. Mulching
 - b. Olericulture
 - c. Pomology
 - d. Topiary
 - e. Floriculture
37. What is the practice called when after you mow your lawn you leave the grass clippings behind?
- a. Composting
 - b. Mulching
 - c. Grasscycling
 - d. Raking
 - e. Proofing
 - f. Layering
38. Tony was mowing his lawn as usual. Two days later, he notices that a majority of the grass seems to grow tilted compared to the ground instead of upright. What may be the issue causing this?
- a. The grass is overgrown and weighed down
 - b. The lawn is on a hill
 - c. Tony keeps mowing his lawn in the same direction
 - d. Rabbits were most likely on his lawn
 - e. The sprinklers are not evenly watering his lawn

39. Rank the following from best time to water your lawn and outdoor plants to worst.

1. Early Morning
2. Mid-afternoon (1:00 PM)
3. Late afternoon (5:00 PM)
4. Evening
 - a. 3, 1, 4, 2
 - b. 2, 1, 3, 4
 - c. 1, 3, 2, 4
 - d. 3, 1, 2, 4
 - e. 4, 3, 1, 2

Woody ornamentals, herbaceous plants, and native plants

40. The following picture is the bark of a woody ornamental. Identify the plant with its common name.



Red pine

41. The plant Hoary vervain (*Verbena stricta*) is a native plant known to the Midwest region. Which of the following growing conditions would the plant thrive in the most?

- a. Full sun, dry soil, large deer population
 - b. Full sun, dry soil, large grasshopper population
 - c. Shaded area, wet soil, large butterfly population
 - d. Shaded area, wet soil, large hummingbird population
 - e. Full sun, wet soil, large grasshopper population
 - f. Shaded area, dry soil, large butterfly population
42. True grasses, sedges, and rushes are classified as what type of plant?
- a. Graminoids
 - b. Forbs
 - c. Ferns
 - d. Woody

43. Which of the following are advantages of planting native plants in a Michigan garden?

(Select all that apply)

- a. Drought and freeze resistance
 - b. Depletes less soil nutrients
 - c. Extensive root systems break clay
 - d. Slows wildfires
 - e. Higher insect resistance
44. Dogwoods tend to grow to 15 to 20 ft tall at maturity. If Connor wanted to plant a dogwood on his property, what is the minimum distance he should place the plant away from his ranch house?
- a. 4-8 ft
 - b. 8-12 ft
 - c. 12-16 ft
 - d. 16-20 ft

Weeds and Invasive Plants

45. Which of the following are ways an allelopathic plant may inhibit growth of other plants?

(Select all that apply)

- a. Grow a deeper root system taking up more nutrients
 - b. Release chemicals that inhibit flowering of neighboring plants
 - c. Grow leaves sooner to shade/block other plants
 - d. Release chemicals that attract pollinators to it instead of other plants
 - e. Release chemicals that damage mycorrhiza fungi which have a symbiotic relationship with other plants
46. With the impacts of climate change altering CO₂ concentrations across the globe, how does this affect the prevalence of weeds? (.5 pts)
- a. Increases prevalence of weeds
 - b. Decrease prevalence of weeds
 - c. No change on weed growth
47. Explain your answer for Question 46.
- a. Weeds show greater resilience to changes in CO₂ concentrations and rising temp due to diverse gene pool and adaptability.

Garden Wildlife

48. Jerry is allergic to the western honeybee *Apis mellifera*, so he does not want to attract any bees to pollinate his garden. However, he still needs his garden to be pollinated by other animals such as hummingbirds and butterflies. What color plants would you recommend his garden be predominantly?

- a. Red
- b. Yellow
- c. White
- d. Purple
- e. Blue

49. Amelia is planning on adding a hummingbird feeder to her garden and plans to provide sugar water. What type of sugar should she use?
- a. Powdered sugar
 - b. Brown sugar
 - c. Cane Sugar
 - d. Honey
 - e. Artificial Sweetener
50. The following wildlife animal has had significant population declines due to what host plant being killed by deforestation and herbicides?



- a. Marigolds
- b. Milkweed
- c. Dogbane
- d. Crabgrass
- e. Pennisetum

Nuisance Animals

51. Which of the following nuisance animals may have made this type of mound?



- a. Vole
 - b. Mouse
 - c. Gopher
 - d. Mole
 - e. Chipmunk
52. Which of the following animals requires a permit if you want to use lethal control?
(Select all that apply)
- a. Deer
 - b. Squirrels
 - c. Woodchucks
 - d. Skunks
 - e. Moles

53. Claudia sees these animals droppings in her garden in late autumn. What animal should she suspect first would leave them?



- a. Cottontail rabbit
- b. Skunk
- c. Raccoon
- d. Chipmunk
- e. Squirrel