

The number of points (out of a total of 150) that each question is worth is indicated in parentheses. For multiple choice questions, provide the BEST answer. Answer essay and short answer questions thoroughly but concisely; extraneous information may be counted against you. Also, if you are asked to list, for example, three items, listing more than three items may be counted against you. Good luck!

1. (3) Your name: _____
2. (3) In what gene are there at least six possible point mutations that have been found to confer herbicide resistance in plants?
 - a. the gene encoding ACCase
 - b. the gene encoding EPSPS
 - c. the gene encoding the D1 protein
 - d. the gene encoding ALS
3. (3) The Casparian strip
 - a. is a barrier to herbicide uptake via roots
 - b. is a barrier to herbicide uptake via leaves
 - c. provides a conduit for herbicide movement through the xylem
 - d. provides a conduit for herbicide movement through the phloem
4. (3) Soil-applied herbicides are used to control
 - a. simple perennials
 - b. creeping perennials
 - c. established plants
 - d. young seedlings
5. (3) Herbicide metabolism in plants is mediated to large extent by
 - a. P450s and protoporphyrinogen
 - b. P450s and GSTs
 - c. GSTs and peroxidases
 - d. benoxacor and dichlormid
6. (3) A xylem-mobile herbicide will accumulate in
 - a. mature leaves
 - b. roots
 - c. meristems
 - d. flowers and seeds
7. (3) Herbicides of this family are soil applied to control grasses and small-seeded broadleaf weeds
 - a. thiocarbamates
 - b. acid amides
 - c. dinitroanilines
 - d. all of the above

8. (3) As defined by the Federal Noxious Weed Act, a noxious weed is
 - a. any plant deemed especially harmful
 - b. a plant not already present, or not widely present, in the U.S.
 - c. a plant that produces seed that may contaminate crop seed
 - d. defined separately for each state by each state

9. (3) Herbicides of this family control grass weeds and have foliar activity
 - a. dinitroanilines
 - b. benzoic acids
 - c. thiocarbamates
 - d. aryloxyphenoxypropionic acids

10. (3) For most herbicides, crop tolerance is due to
 - a. reduced herbicide uptake
 - b. enhanced herbicide metabolism
 - c. an insensitive herbicide target site
 - d. reduced herbicide translocation

11. (3) Glyphosate
 - a. has both foliar and soil activity
 - b. has only soil activity
 - c. has only foliar activity
 - d. controls only broadleaf weeds

12. (3) Which of the following is NOT declared a noxious weed by the State of Illinois?
 - a. kudzu
 - b. Canada thistle
 - c. marihuana
 - d. field bindweed

13. (3) Successful control of a creeping perennial weed such as Canada thistle will probably require
 - a. performing the tillage operation in mid summer
 - b. performing the tillage operation in early spring
 - c. repeating the tillage operation after about two weeks
 - d. using shallow tillage so as not to sever the roots

14. (3) “Classical” biocontrol
 - a. entails a one-time release of the biocontrol agent
 - b. is the same as “augmentative” biocontrol
 - c. is the same as “inundative” biocontrol
 - d. to date has never been successful

15. (3) A herbicide “site of action” refers to
 - a. what the herbicide binds to in the plant (usually an enzyme) to cause death
 - b. the organelle within the plant cell where the herbicide functions
 - c. the biochemical process (for example, carotenoid biosynthesis) blocked by the herbicide
 - d. whether the herbicide is soil applied or foliar applied

16. (3) What term would best describe a waterhemp biotype that can survive treatment by both sulfonylureas and imidazolinones?
- multiple tolerance
 - cross tolerance
 - multiple resistance
 - cross resistance
17. (3) The K_d of a herbicide refers to
- how strongly it is adsorbed to soil
 - its vapor pressure
 - its relative acidity
 - the pH at which it is half ionized
18. (3) The best control of a perennial weed would be obtained
- by applying a systemic herbicide just before flowering
 - by applying a contact herbicide just before flowering
 - by applying a systemic herbicide during seed fill
 - by applying a contact herbicide during seed fill
19. (3) Illinois noxious weeds are determined by
- the Illinois Director of the Department of Agriculture
 - the Dean of the College of Agriculture of the University of Illinois
 - the Director of the Agriculture Experiment Station at the University of Illinois
 - all of the above
20. (3) The mechanical weed control strategy known as “chaining” refers to
- dragging chains just beneath the soil surface to remove seedlings
 - using swinging chains to cut weeds
 - dragging a heavy chain between two large tractors to remove shrubs
 - locking up weeds behind bars
21. (3) Most cases of weed resistance are to what herbicides?
- bipyridyliums
 - HPPD inhibitors
 - ACCase inhibitors
 - ALS inhibitors
22. (3) Herbicides of this family control both broadleaf and grass weeds but have no soil activity
- pyridines
 - pyrimidinylthiobenzoates
 - triazines
 - bipyridiniums
23. (3) Which of the following herbicide-resistant weeds have been documented in Illinois?
- waterhemp resistant to PPO inhibitors
 - waterhemp resistant to paraquat
 - common cocklebur with multiple resistance to ALS inhibitors and to triazines
 - all of the above

24. (3) Herbicides of this family control broadleaf weeds and have both foliar and soil activity
- phoxycarboxylic acids
 - bipyridiniums
 - acid amides
 - cyclohexanediones
25. (3) On which type of soil would the labeled application rate of a soil-applied herbicide be the highest?
- sandy soil with low organic matter
 - sandy soil with high organic matter
 - clay soil with low organic matter
 - clay soil with high organic matter
26. (3) Which of the following is FALSE regarding HPPD-inhibiting herbicides?
- they are used in corn
 - they are used in soybean
 - they block carotenoid biosynthesis
 - they control some broadleaf weeds and some grasses
27. (3) Which of the following is FALSE for a phloem-mobile herbicide?
- It moves from source tissue to sink tissue.
 - It moves from the roots to transpiring tissue.
 - It will accumulate in roots.
 - It will accumulate in meristems.
28. (3) Which of the following would be the LEAST effective herbicide resistance management strategy?
- using a tank mix of a phoxycarboxylic acid herbicide and a cyclohexanedione
 - using glyphosate (with glyphosate-resistant soybean) one year and an acid amide plus a phoxycarboxylic acid the next year
 - using selective tillage to supplement chemical weed control
 - using a residual herbicide followed by a postemergence herbicide
29. (3) Selectivity of herbicides in this family often depends on soil placement
- aryloxyphenoxypropionic acids
 - sulfonylureas
 - dinitroanilines
 - diphenylethers
30. (3) Match each item on the left with the appropriate item on the right.
- | | |
|---------------------------------|------------------|
| ___ Roundup | a. common name |
| ___ glyphosate | b. chemical name |
| ___ N-(phosphonomethyl)-glycine | c. trade name |
31. (4) What is the term used for a biocontrol agent formulated as a herbicide?

32. (6) List the three general ways by which herbicides are degraded in the soil.

33. (6) Discuss two ways by which crop rotations aid weed management?

34. (8) Besides preventative strategies, what are the four general weed control strategies?

35. (30) For each herbicide or herbicide family, write the letter of the correct site of action. (Some letters may be used more than once.)

- | | |
|--|-----------------------|
| i. ____ triketones | a. ALS |
| ii. ____ cyclohexanediones | b. ACCase |
| iii. ____ diphenylethers | c. D1 protein |
| iv. ____ dinitroanilines | d. tubulin |
| v. ____ glyphosate | e. dioxygenase |
| vi. ____ isoxaben | f. HPPD |
| vii. ____ imidazolinones | g. cellulose synthase |
| viii. ____ triazines | h. pyruvate kinase |
| ix. ____ aryloxyphenoxypropionic acids | i. PPO |
| x. ____ pyrimidinylthiobenzoates | j. EPSP synthase |

Using the list of herbicide families in question 35, write the appropriate Roman numeral on the blank next to each structure below.

36. (2) ____

38. (2) ____

37. (2) ____

39. (2) ____