



Plant and Soil Science

Study Guide

Assessment:

**6303 Introduction to Plant and Soil
Science**

career tech ✓
Testing
The Provider of Online Testing Solutions

Aligned with the National
Agriculture, Food and
Natural Resources (AFNR)


**OKLAHOMA
WORKS**

Overview

This study guide is designed to help students prepare for the Introduction to Plant and Soil Science assessment. It not only includes information about the assessment, but also the skills standards upon which the assessment is based and test taking strategies. The assessment measures a student's ability to apply knowledge of the skills necessary for success in the plant and soil science field.

Each of the four sections in this guide provides useful information for students preparing for the Agriculture Education assessments.

- CareerTech and Competency-Based Education: A Winning Combination
- Introduction to Plant and Soil Science assessment
 - ▶ Assessment Information
 - ▶ Standards and Test Content
 - ▶ Sample Questions
 - ▶ Abbreviations, Symbols, and Acronyms
- Strategies for Test Taking Success
- Notes

The assessment standards are aligned with those of the Agriculture, Food and Natural Resources (AFNR). AFNR standards were developed by the National Council for Agricultural Education (The Council). The Council's vision is to be the premier leadership organization for shaping and strengthening school-based agricultural education (SBAE) at all levels in the United States. Its mission is to proactively identify current and emerging issues of national concern, provide innovative solutions in response to current and emerging issues, coordinate the efforts of appropriate entities in strengthening programs, and serve as a national advocate for school-based agricultural education.

For more information about these standards, go to:

www.ffa.org/thecouncil/Documents/finalafnrstandardsv324609withisbn_000.pdf

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CareerTech and Competency-Based Education: A Winning Combination

Competency-based education uses learning outcomes that emphasize both the application and creation of knowledge and the mastery of skills critical for success. In a competency-based education system, students advance upon mastery of competencies, which are measurable, transferable outcomes that empower students.

Career and technology education uses industry professionals and certification standards to identify the knowledge and skills needed to master an occupation. This input provides the foundation for development of curriculum, assessments and other instructional materials needed to prepare students for wealth-generating occupations and produce comprehensively trained, highly skilled employees demanded by the work force.

Tools for Success

CareerTech education relies on three basic instructional components to deliver competency-based instruction: skills standards, curriculum materials, and competency assessments.

Skills standards provide the foundation for competency-based instruction and outline the knowledge and skills that must be mastered in order to perform related jobs within an industry. Skills standards are aligned with national skills standards and/or industry certification requirements; therefore, a student trained to the skills standards is equally employable in local, state and national job markets.

Curriculum materials and textbooks contain information and activities that teach students the knowledge and skills outlined in the skills standards. In addition to complementing classroom instruction, curriculum resources include supplemental activities that enhance learning by providing opportunities to apply knowledge and demonstrate skills.

Certification Assessments test the student over material outlined in the skills standards and taught using the curriculum materials and textbooks. When used with classroom performance evaluations, certification assessments provide a means of measuring occupational readiness.

Each of these components satisfies a unique purpose in competency-based education and reinforces the knowledge and skills students need to gain employment and succeed on the job.

Measuring Success

Evaluation is an important component of competency-based education. Pre-training assessments measure the student's existing knowledge prior to receiving instruction and ensure the student's training builds upon this knowledge base. Formative assessments administered throughout the training process provide a means of continuously monitoring the student's progress towards mastery.

Certification assessments provide a means of evaluating the student's mastery of knowledge and skills. Coaching reports communicate assessment scores to students and provide a breakdown of assessment results by standard area. The coaching report also shows how well the student has mastered skills needed to perform major job functions and identifies areas of job responsibility that may require additional instruction and/or training.

Introduction to Plant and Soil Science Assessment Information

What is the Introduction to Plant and Soil Science assessment?

The Introduction to Plant and Soil Science assessment is an end-of-course assessment for students in plant and soil science programs. The assessment provides an indication of student mastery of basic knowledge and concepts necessary for success in careers in this area.

How was the assessment developed?

The assessment was developed by the CareerTech Testing Center. The assessment and standards align with those of the Agriculture, Food and Natural Resources (AFNR) Career Cluster Content Standards. Items were developed and reviewed by a committee of subject matter experts.

What does the assessment cover?

Specifically, the tests includes multiple-choice test items over the following areas:

Introduction to Plant and Soil Science (75 questions)

Life Knowledge and Cluster Skills	4%
Environmental Service Systems	9%
Natural Resource Systems	2%
Plant Systems	85%

What are the benefits of using this assessment?

Students receive a certificate for each assessment that he/she passes. This certificate may be included in his/her portfolio and used to communicate the student's mastery of the subject matter to potential employers.

When should the assessment be taken?

The CareerTech Testing Center recommends that students take the assessments as soon as possible after receiving all standards-related instruction, rather than waiting until the end of the school year.

Is the assessment timed?

No. However, most students finish the assessment within one hour.

What resources can students use on these assessments?

Students are allowed to use calculators and scratch paper on CTTC assessments; however, these items must be provided by the testing proctor and returned to the proctor before the student's exam is submitted for scoring. Calculator apps on cell phones and other devices may not be used on these assessments.

What accommodations can be made for students with Individualized Education Plans (IEPs)?

Accommodations are allowed for students with an Individualized Education Plan. Examples of allowable accommodations include:

- Extended time — This assessment is not timed; therefore, students may take as much time as needed to finish. The assessment must be completed in one testing session.
- Readers — A reader may be used to read the assessment to a student who has been identified as needing this accommodation.
- Enlarged text — Students needing this accommodation can activate this feature by clicking the **AA** icon in the upper right corner of the screen.

What can students expect on Test Day?

All CTTC assessments are web-based and delivered exclusively by a proctor in the school's assessment center. The proctor **cannot** be an instructor or anyone who was involved with the student during instruction.

Assessments are delivered in a question-by-question format. When a question is presented, the student can select a response or leave the question unanswered and advance to the next question. Students may also flag questions to revisit before the test is scored. All questions must be answered before the test can be submitted for scoring.

After the assessment is scored, the student will receive a score report that not only shows the student's score on the assessment, but also how the student performed in each standard area.

Can students retake the test?

Students may retake the test unless their school or state testing policies prohibit retesting. Students who can retest must wait at least three days between test attempts.



Standards and Test Content

Introduction to Plant and Soil Science

Life Knowledge and Cluster Skills (2 questions)

1. Use proper safety practices/personal protective equipment.
 - pesticide application PPE
2. Handle chemicals and equipment in a safe and appropriate manner.
 - pest control
3. Follow operating instructions related to specific tools and equipment needed to complete a task.
 - pesticide label instructions

Environmental Service Systems (6 questions)

1. Explain the process of soil formation through weathering.
2. Explain how the physical qualities of the soil influence the infiltration and percolation of water.
 - particles types
 - texture
 - structure
 - bulk density
 - porosity

Natural Resource Systems (4 questions)

1. Demonstrate techniques used to identify rock, mineral and soil types.
2. Identify rock, mineral and soil types.

Plant Systems (63 questions)

1. Explain systems used to classify plants.
 - taxonomy
 - life cycles
 - structures
 - agronomic use
2. Compare and contrast the hierarchical classification of agricultural plants
3. Describe the morphological characteristics used to identify agricultural plants.
 - structures
 - monocot and dicot
4. Identify agriculturally important plants by common names.
5. Identify agriculturally important plants by scientific names.
6. Diagram a typical plant cell and identify plant cell organelles and their functions.
7. Identify the components, the types and the functions of plant roots.



8. Identify the components and the functions of plant stems.
9. Discuss leaf morphology and the functions of leaves.
10. Identify the components of a flower, the functions of a flower and the functions of flower components.
11. Identify the different types of flowers and flower forms.
12. Explain the functions and components of seeds and fruit.
13. Explain the basic process of photosynthesis and its importance to life on Earth.
14. Explain requirements necessary for photosynthesis to occur and identify the products and byproducts of photosynthesis.
15. Explain cellular respiration and its importance to plant life.
16. Explain factors that affect cellular respiration and identify the products and byproducts of cellular respiration.
17. Identify the five groups of naturally occurring plant hormones and synthetic plant growth regulators.
18. Identify the plant responses to plant growth regulators and different forms of tropism.
19. Describe the effects air, temperature and water have on plant metabolism and growth.
 - germination
 - growing degree days (GDD)
20. Identify the categories of soil water.
21. Discuss how soil drainage and water-holding capacity can be improved.
22. Identify the essential nutrients for plant growth and development and their major functions.
23. Describe nutrient deficiency symptoms and recognize environmental causes of nutrient deficiencies.
24. Discuss the influence of pH and cation exchange capacity on the availability of nutrients.
25. Collect soil and plant tissue samples for testing and interpret the test results.
26. Identify fertilizer sources of essential plant nutrients, explain fertilizer formulations, and describe different methods of fertilizer application.
27. Calculate the amount of fertilizer to be applied and calibrate equipment to apply the prescribed amount of fertilizer.
28. Explain pollination, cross-pollination and self-pollination of flowering plants.
29. Demonstrate sowing techniques and provide favorable conditions for seed germination.
30. Handle seed to overcome seed dormancy mechanisms and to maintain seed viability and vigor.
31. Explain the principles behind recombinant DNA technology and the basic steps in the process.
 - GMOs
 - Bt and Ht crops
32. Give examples of the risks and advantages associated with genetically modified plants.
33. Explain the reasons for preparing growing media before planting.
 - site selection
 - seeding pattern
34. Demonstrate proper planting procedures and post-planting care.
 - equipment used
 - seeding rate, date and depth



35. Identify types of plant pests and disorders.
36. Identify major local weeds, insect pests and infectious and noninfectious plant diseases.
37. Describe damage caused by plant pests and diseases.
38. Diagram the life cycles of major plant pests and diseases.
39. Describe pest control strategies associated with integrated pest management.
40. Describe types of pesticide controls and formulations.
41. Explain risks and benefits associated with the materials and methods used in plant pest management.
42. Explain sustainable agriculture and objectives associated with the strategy.
43. Describe sustainable agriculture practices and compare the ecological effects of traditional agricultural practices with those of sustainable agriculture.
44. Identify harvesting methods and harvesting equipment.
45. Assess the stage of growth to determine crop maturity or salability and demonstrate proper harvesting techniques.
46. Identify storage methods for plants and plant products.
47. Explain the proper conditions to maintain the quality of plants and plant products held in storage.
48. Explain the reasons for preparing plants and plant products for distribution.
49. Demonstrate techniques for grading, handling and packaging plants and plant products for distribution.



Sample Questions

- _____ 1. Which plant growth regulator is produced by plants under stress to inhibit growth?
- a. abscisic acid
 - b. auxin
 - c. cytokinins
 - d. gibberellic acid
- _____ 2. Which macronutrient is most likely lost to leaching?
- a. calcium
 - b. phosphorus
 - c. potassium
 - d. nitrogen
- _____ 3. How many pounds of active ingredient are in 50 pounds of 20-5-15 fertilizer?
- a. 20
 - b. 25
 - c. 35
 - d. 50
- _____ 4. The practice of controlling wind and water erosion by managing crop residues is called:
- a. cultivating.
 - b. conservation tillage.
 - c. conventional tillage.
 - d. disking.
- _____ 5. Superweeds are weeds that:
- a. outgrow other weeds.
 - b. overcrowd desired crops.
 - c. are resistant to herbicides.
 - d. require manual control methods.
- _____ 6. What piece of seed-planting equipment is most appropriate for large seeds such as corn and sunflower?
- a. air seeder
 - b. broadcast seeder
 - c. drill
 - d. planter

- _____ 7. Drought conditions cause which group of diseases to occur?
- a. abiotic
 - b. biotic
 - c. pathogen
 - d. insect-introduced
- _____ 8. What type of chemical is applied to control weeds?
- a. fungicide
 - b. herbicide
 - c. insecticide
 - d. pesticide
- _____ 9. What is the process of separating grain from the remaining plant material?
- a. baling
 - b. combining
 - c. picking
 - d. threshing
- _____ 10. Which of the following products is considered a value-add product?
- a. wheat flour
 - b. wheat straw
 - c. wheat hay
 - d. wheat seed



Sample Questions — Key

1. Which plant growth regulator is produced by plants under stress to inhibit growth?
 - a. abscisic acid Correct
 - b. auxin Incorrect
 - c. cytokinins Incorrect
 - d. gibberellic acid Incorrect

2. Which macronutrient is most likely lost to leaching?
 - a. calcium Incorrect
 - b. phosphorus Incorrect
 - c. potassium Incorrect
 - d. nitrogen Correct

3. How many pounds of active ingredient are in 50 pounds of 20-5-15 fertilizer?
 - a. 20 Correct
 - b. 25 Incorrect
 - c. 35 Incorrect
 - d. 50 Incorrect

4. The practice of controlling wind and water erosion by managing crop residues is called:
 - a. cultivating. Incorrect
 - b. conservation tillage. Correct
 - c. conventional tillage. Incorrect
 - d. disking. Incorrect

5. Superweeds are weeds that:
 - a. outgrow other weeds. Incorrect
 - b. overcrowd desired crops. Incorrect
 - c. are resistant to herbicides. Correct
 - d. require manual control methods. Incorrect

6. What piece of seed-planting equipment is most appropriate for large seeds such as corn and sunflower?
 - a. air seeder Incorrect
 - b. broadcast seeder Incorrect
 - c. drill Incorrect
 - d. planter Correct

7. Drought conditions cause which group of diseases to occur?

- a. abiotic Correct
- b. biotic Incorrect
- c. pathogen Incorrect
- d. insect-introduced Incorrect

8. What type of chemical is applied to control weeds?

- a. fungicide Incorrect
- b. herbicide Correct
- c. insecticide Incorrect
- d. pesticide Incorrect

9. What is the process of separating grain from the remaining plant material?

- a. baling Incorrect
- b. combining Incorrect
- c. picking Incorrect
- d. threshing Correct

10. Which of the following products is considered a value-add product?

- a. wheat flour Correct
- b. wheat straw Incorrect
- c. wheat hay Incorrect
- d. wheat seed Incorrect

Abbreviations, Symbols and Acronyms

The following is a list of abbreviations, symbols, and acronyms used in the Plant and Soil Science study guide and on the Plant and Soil Science assessment.

%	Percent
AFNR	Agriculture, Food and Natural Resources
Bt	Bacillus thuringiensis
DNA	Deoxyribonucleic acid
EPA	Environmental Protection Agency
FDA	Food and Drug Administration
FEMA	Federal Emergency Management Agency
GDD	Growing degree days
GMO	Genetically modified organism
Ht	Herbicide tolerant
IEP	Individualized Education Plan
NPK	Nitrogen, phosphorus and potassium
OSHA	Occupational Safety and Health Administration
pH	Potential of Hydrogen
PPE	Personal Protective Equipment
USDA	United States Department of Agriculture
SBAE	School-Based Agricultural Education

Test Taking Strategies

This section of the study guide contains valuable information for testing success and provides a common-sense approach for preparing for and performing well on any test.

General Testing Advice

1. Get a good night's rest the night before the test — eight hours of sleep is recommended.
2. Avoid junk food and “eat right” several days before the test.
3. Do not drink a lot or eat a large meal prior to testing.
4. Be confident in your knowledge and skills!
5. Relax and try to ignore distractions during the test.
6. Focus on the task at hand — taking the test and doing your best!
7. Listen carefully to the instructions provided by the exam proctor. If the instructions are not clear, ask for clarification.

Testing Tips

1. Read the entire question before attempting to answer it.
2. Try to answer the question before reading the choices. Then, read the choices to determine if one matches, or is similar, to your answer.
3. Do not change your answer unless you misread the question or are certain that your first answer is incorrect.
4. Answer questions you know first, so you can spend additional time on the more difficult questions.
5. Check to make sure you have answered every question before you submit the assessment for scoring — unanswered questions are marked incorrect.



