



TEXAS EDUCATOR CERTIFICATION
TE_xES | TE_xMaT | TASC/TASC-ASL

Texas Examinations of Educator Standards™ (TE_xES™) Program

Preparation Manual

Agriculture, Food and Natural Resources 6–12 (272)



Table of Contents

About The Test	3
The Domains	4
The Standards	5
Domains and Competencies.....	7
Domain I — Foundations of Agricultural Education	7
Domain II — Agribusiness and Economics	9
Domain III — Plant and Soil Science.....	10
Domain IV — Animal Science.....	12
Domain V — Agricultural Mechanics, Engineering and Technology	14
Domain VI — Natural Resources and Environmental Science	16
Domain VII — Food Science and Processing	17
Approaches to Answering Multiple-Choice Questions.....	19
How to Approach Unfamiliar Question Formats	19
Question Formats.....	20
Single Questions	21
Multiple-Choice Practice Questions	24
Answer Key and Rationales	36
Study Plan Sheet	50
Preparation Resources	51

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

About The Test

Test Name	Agriculture, Food and Natural Resources 6–12
Test Code	272
Time	5 hours
Number of Questions	100 multiple-choice questions
Format	Computer-administered test (CAT)

The TExES Agriculture, Food and Natural Resources 6–12 (272) test is designed to assess whether a test taker has the requisite knowledge and skills that an entry-level educator in this field in Texas public schools must possess. The 100 multiple-choice questions are based on the Agriculture, Food and Natural Resources 6–12 test framework and cover grades 6–12. The test may contain questions that do not count toward the score. Your final scaled score will be based only on scored questions.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

The Domains

Domain	Domain Title	Approx. Percentage of Test	Standards Assessed
I.	Foundations of Agricultural Education	18%	Agriculture, Food and Natural Resources 6–12 I, II, IX, X, XI
II.	Agribusiness and Economics	12%	Agriculture, Food and Natural Resources 6–12 III
III.	Plant and Soil Science	14%	Agriculture, Food and Natural Resources 6–12 IV
IV.	Animal Science	16%	Agriculture, Food and Natural Resources 6–12 V
V.	Agricultural Mechanics, Engineering and Technology	16%	Agriculture, Food and Natural Resources 6–12 VI, VII
VI.	Natural Resources and Environmental Science	12%	Agriculture, Food and Natural Resources 6–12 VIII
VII.	Food Science and Processing	12%	Agriculture, Food and Natural Resources 6–12 V, VIII

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

The Standards

Agriculture, Food and Natural Resources 6–12 Standard I:

The agriculture, food and natural resources (AFNR) teacher understands the scope of agriculture and the foundations of agricultural education and applies the process of scientific discovery to the various disciplines of agriculture.

Agriculture, Food and Natural Resources 6–12 Standard II:

The agriculture, food and natural resources (AFNR) teacher promotes student development through effective use of career pathways, supervised agricultural experiences, leadership development and student organizations (e.g., FFA).

Agriculture, Food and Natural Resources 6–12 Standard III:

The agriculture, food and natural resources (AFNR) teacher understands and applies principles of economics and business management in AFNR enterprises.

Agriculture, Food and Natural Resources 6–12 Standard IV:

The agriculture, food and natural resources (AFNR) teacher understands plant and soil science and applies principles and methods used in plant production and management.

Agriculture, Food and Natural Resources 6–12 Standard V:

The agriculture, food and natural resources (AFNR) teacher understands animal science and animal food processing and applies principles and methods used in animal care, production and management.

Agriculture, Food and Natural Resources 6–12 Standard VI:

The agriculture, food and natural resources (AFNR) teacher understands and applies principles and methods of AFNR power, structural, and mechanical systems and related technologies.

Agriculture, Food and Natural Resources 6–12 Standard VII:

The agriculture, food and natural resources (AFNR) teacher has a basic understanding of emerging technologies and understands the use of information technologies in the AFNR industries.

Agriculture, Food and Natural Resources 6–12 Standard VIII:

The agriculture, food and natural resources (AFNR) teacher understands and applies knowledge of environmental systems, natural resource management, and the effects of agriculture, energy and food processing on the environment.

Agriculture, Food and Natural Resources 6–12 Standard IX:

The agriculture, food and natural resources (AFNR) teacher knows how to organize and manage an effective agriculture, food, and natural resources program and how to work with school, community and industry representatives to support the program.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

Agriculture, Food and Natural Resources 6–12 Standard X:

The agriculture, food and natural resources (AFNR) teacher knows how to plan, implement and utilize instruction and student assessment, including academic integration.

Agriculture, Food and Natural Resources 6–12 Standard XI:

The agriculture, food and natural resources (AFNR) teacher understands and applies appropriate safety and risk management procedures and practices to ensure the safety and well-being of all students in the classroom, laboratory, field and supervised agricultural experiences (SAE).

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

Domains and Competencies

The content covered by this test is organized into broad areas of content called **domains**. Each domain covers one or more of the educator standards for this field. Within each domain, the content is further defined by a set of **competencies**. Each competency is composed of two major parts:

- The **competency statement**, which broadly defines what an entry-level educator in this field in Texas public schools should know and be able to do.
- The **descriptive statements**, which describe in greater detail the knowledge and skills eligible for testing.

Domain I – Foundations of Agricultural Education

Competency 001: *The teacher understands the foundations of agricultural education.*

The beginning teacher:

- Understands the philosophy and goals of agricultural education.
- Recognizes the scope of agriculture and its effects on society (e.g., impact on global trends, international impact and contributions).
- Identifies historical events, recent developments and major areas of research in agriculture and natural resource utilization.
- Knows the concepts and terms used in agriculture and agricultural education and the sources of information about agriculture, agricultural education and agricultural careers.
- Knows the characteristics and functions of agricultural education advisory committees, how to organize and work effectively with these committees and how to encourage student, community and industry involvement in agricultural education programs.
- Understands the use of scientific principles, methods (e.g., hypothesis versus theory, verification processes, solving problems), measurements and calculations (e.g., algebra, geometry, statistical analysis) in agriculture and agricultural education.
- Collects, organizes, displays and analyzes data according to an orderly plan, using data, tables, graphs, narrative descriptions or other methods as appropriate.
- Understands the legal and ethical issues related to agricultural education (e.g., ethical treatment of animals, liability for accidental injury).
- Understands the basic functions, types, characteristics and tools associated with maps (e.g., scale, direction, elevation, co-ordinates) and their significance to agricultural industries.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

Competency 002: *The teacher understands and applies procedures and practices to ensure the safety of all students in the classroom and laboratory.*

The beginning teacher:

- A. Applies procedures for selecting and maintaining equipment, materials and technology used in the agricultural classroom and lab.
- B. Applies strategies for instructing students in the proper and safe use of materials, tools and instruments and for monitoring student behavior in the agricultural classroom and lab.
- C. Understands personal and occupational safety practices, including basic first aid, and appropriate practices for preventing and responding to accidents in the agricultural classroom and lab.
- D. Identifies potential hazards in the agricultural classroom and lab.
- E. Applies strategies for incorporating safety training into the agricultural education program and for developing and implementing safety plans for the agricultural classroom and lab.
- F. Identifies procedures for the proper use, storage and disposal of hazardous materials (e.g., chemicals, petroleum products, biological waste products) used in the agricultural classroom and lab.
- G. Identifies sources of safety-related information (e.g., Safety Data Sheet (SDS), formerly known as Material Safety Data Sheet (MSDS), emergency response procedures) and federal, state and local agencies, laws and regulations concerned with maintaining safety in the agricultural classroom and lab.

Competency 003: *The teacher understands how to advise and assist students in career planning and development and how to promote student development through supervised agricultural experiences (SAEs).*

The beginning teacher:

- A. Identifies career development and entrepreneurship opportunities in the field of agriculture/agribusiness and the knowledge and skills necessary for various careers in agriculture.
- B. Understands employers' expectations, appropriate work habits, good citizenship skills, and personal characteristics necessary for a successful career in modern agriculture.
- C. Applies strategies for assisting students in career planning and development and in applying for, obtaining, and maintaining employment in agriculture and related fields.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

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- D. Identifies the goals and purposes of SAEs; the relationships among the agricultural classroom, lab, field, and SAEs; and the characteristics of different types of SAEs (e.g., cooperative education, entrepreneurship, mentoring).
 - E. Understands the legal and ethical issues related to SAEs (e.g., child labor laws, validation issues, complaint and appeal processes).
 - F. Applies strategies for coordinating SAEs; assisting students in planning, implementing, and managing their SAEs; and maintaining accurate records, assessing student progress, and evaluating the effectiveness of SAEs.

Competency 004: *The teacher understands how to promote student growth through student leadership development organizations.*

The beginning teacher:

- A. Knows the characteristics, functions and organizational structures of student leadership development organizations (e.g., FFA).
- B. Applies strategies for developing a basic program of activities for a student development organization.
- C. Applies democratic principles and parliamentary procedure to conduct effective meetings of a student leadership development organization.
- D. Understands the roles and responsibilities that advisors have in these organizations and the strategies for encouraging students.
- E. Applies strategies for planning, organizing and conducting career development events (CDEs) and leadership development events (LDEs).
- F. Understands how to help students develop communication and presentation skills (e.g., verbal, nonverbal, listening), interview skills and the ability to prepare and present portfolios and work samples.

Domain II – Agribusiness and Economics

Competency 005: *The teacher understands agricultural entrepreneurship, business management and ethical issues in agricultural businesses.*

The beginning teacher:

- A. Analyzes the role of entrepreneurship in agriculture, methods of entrepreneurial planning, and key factors for successful entrepreneurship.
- B. Identifies the distinguishing characteristics and purposes of different types of organizational structures in agricultural businesses.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

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- C. Identifies the steps in establishing an agricultural business, the components of a business plan, and the decision-making and problem-solving methods of agricultural businesses.
 - D. Understands the basic principles and methods of financial management; the types, characteristics, and purposes of budgets and record-keeping systems used in agricultural businesses; and the sources from which to obtain loans and capital (e.g., private, institutional, government).
 - E. Understands the use of computer hardware and software applications (e.g., spreadsheet, database, communication) in agriculture-related tasks.
 - F. Applies strategies for managing a diverse workforce (e.g., training and supervising personnel, fostering teamwork) and for ensuring respect for diversity in the workplace.
 - G. Identifies agriculture-related government agencies and applies knowledge of work-related and business-related ethics to decision making in agricultural businesses.

Competency 006: *The teacher understands the application of economic and marketing principles to agricultural enterprises.*

The beginning teacher:

- A. Understands key economic principles (e.g., risk, supply and demand, value-added) in agricultural business and how to apply knowledge of economic principles to business-related decision making.
- B. Identifies the factors that influence the pricing and sale of agricultural goods and services.
- C. Identifies the factors (e.g., socioeconomic status, culture, age, gender) that influence consumer behavior.
- D. Understands and applies strategies for marketing agricultural products.
- E. Understands the major global trends in food and fiber production, processing, distribution and demand.
- F. Recognizes the impact of world markets on U.S. and Texas agriculture.

Domain III – Plant and Soil Science

Competency 007: *The teacher understands and applies principles of soil science.*

The beginning teacher:

- A. Knows the nature and properties of soil, the processes of soil formation (e.g., chemical and physical weathering) and the importance of various soil constituents for plant growth.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

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- B. Identifies the components of soil, the physical and chemical properties of different soils and the methods of soil classification.
 - C. Understands the importance of soil conservation, the methods of soil conservation and the mechanical practices that reduce soil erosion.
 - D. Identifies the characteristics, advantages, and disadvantages of various methods of tillage and seedbed preparation.
 - E. Applies knowledge of procedures for performing and interpreting basic soil tests (e.g., nutrient, organic content, pH) and for evaluating the suitability of different types of soil for the production of various crops.
 - F. Applies knowledge of different types and formulations of fertilizers and other soil treatments.
 - G. Understands methods and procedures for improving the quality of soil (e.g., fertilizers, lime and organic matter, mulching).

Competency 008: *The teacher understands basic plant classification, morphology, physiology and genetics.*

The beginning teacher:

- A. Recognizes the structures and functions of plant parts (e.g., flowers, leaves, roots, stems) and how they differ among plant species.
- B. Understands plant classification and identifies distinguishing features of major plant groups (e.g., monocots, dicots).
- C. Understands the basic physiological processes in plants (e.g., photosynthesis, respiration, transpiration, transport of nutrients).
- D. Understands the effects of various environmental factors (e.g., soil characteristics, light intensity, day length, temperature) on plant growth and development.
- E. Knows the basic processes of plant reproduction, the principles of plant genetics and the methods used in the sexual and asexual propagation of plants.
- F. Applies knowledge of the principles, methods and techniques of selective breeding and hybridization of plants.

Competency 009: *The teacher understands basic crop production and management.*

The beginning teacher:

- A. Identifies the types, characteristics and uses of major economic crops grown in Texas.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

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- B. Understands the basic principles of plant production and management (e.g., soil preparation, water management, crop rotation).
 - C. Knows the basic principles and methods of disease, insect and weed control (e.g., integrated pest management, chemical control, biological control) and the safe handling of pest management materials.
 - D. Demonstrates basic knowledge of common nutrient deficiencies, diseases, weeds and insect pests that affect crops.

Competency 010: *The teacher understands horticulture, floriculture and hydroponics.*

The beginning teacher:

- A. Knows the basic methods for managing greenhouse and nursery environments (e.g., controlling temperature, moisture, humidity, pests).
- B. Applies the basic procedures and techniques for propagating, transplanting, growing and maintaining greenhouse and nursery plants.
- C. Understands the basic principles of landscape design and management and procedures and techniques for planning, establishing and maintaining landscapes.
- D. Understands the basic history and principles of floral design and techniques for preparing, handling and storing flowers and decorative plants.
- E. Interprets, evaluates and analyzes floral designs, portfolios and work samples.
- F. Understands the basic principles and procedures for production of aquatic plants.

Domain IV – Animal Science

Competency 011: *The teacher understands the basic animal classification, anatomy, physiology and genetics of various animals such as cattle, horses, swine, poultry and companion animals.*

The beginning teacher:

- A. Identifies the basic characteristics and uses of various breeds and types of animals of major economic importance in the United States.
- B. Knows the basic anatomy of major organs and organ systems (e.g., respiratory, digestive, skeletal, muscular) in various animals (ruminant and nonruminant).
- C. Understands the basic physiological processes (e.g., digestion, respiration, circulation) in various animals (ruminant and nonruminant).

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

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- D. Knows the stages of growth and development in various animals.
 - E. Understands the basic health issues and trends in the consumption of animal products in Texas and the United States.
 - F. Understands the basic principles of genetics and their application to animal reproduction and selective breeding.

Competency 012: *The teacher understands animal production and management of various animals such as cattle, horses, swine, poultry and companion animals.*

The beginning teacher:

- A. Demonstrates general knowledge of animal management practices (e.g., immunizing, taking vital signs, restraining, medicating, performing common surgical procedures).
- B. Recognizes normal and abnormal behaviors in various animals and their relationship to animal management.
- C. Understands the care and safe handling of animals throughout the life cycle and the current historical, legal and ethical considerations in animal production, management and welfare.
- D. Understands the basic nutritional requirements of animals (ruminant and nonruminant) and applies knowledge of animal nutrition (e.g., sources of nutrients, classes of feed, feed additives, analysis, organic molecules in relation to feed) and feeding practices (e.g., formulating rations, issues of feed quality, feeding schedules).
- E. Recognizes common diseases, parasites and genetic disorders of animals and is aware of methods for treatment, control and prevention.
- F. Knows the basic principles of animal reproduction and selective breeding and applies principles of genetics (e.g., EPDs, progeny data, trait selection) to the selective breeding of animals.
- G. Applies basic knowledge of natural and artificial animal breeding practices (e.g., controlling mating, artificial insemination) and current technologies used in animal reproduction (e.g., embryo transfer).
- H. Evaluates breeding animals using various data (e.g., performance testing, production records, progeny testing, visual appraisal).
- I. Understands the basic principles and procedures for animal aquaculture.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

Competency 013: *The teacher understands the facilities required for various animals such as cattle, horses, swine, poultry and companion animals, and the procedures for selecting animals and processing animal products.*

The beginning teacher:

- A. Identifies the different types, characteristics and purposes of animal facilities (e.g., barns, feedlots).
- B. Identifies the appropriate environmental conditions (e.g., lighting, temperature, humidity) for housing various animals and methods of environmental control.
- C. Understands the environmental issues associated with animal facilities and the basic procedures for managing animal waste and maintaining sanitation.
- D. Knows the guidelines for evaluating, purchasing, selling and culling individual animals and how to use relevant information databases in making these decisions.
- E. Identifies the basic sanitation procedures for handling, processing and packaging edible animal products.

Domain V – Agricultural Mechanics, Engineering and Technology

Competency 014: *The teacher understands and applies mechanical principles and power technology in agriculture.*

The beginning teacher:

- A. Understands and applies the basic safety procedures related to agricultural mechanics and technologies.
- B. Identifies and uses personal safety equipment and identifies hazards and safety needs in the home and the workplace.
- C. Understands the basic terms and principles related to simple machines, force, work, power and electricity (e.g., volts, watts, amperes) as they apply to agriculture.
- D. Understands the design, components, functions and basic principles of operation of internal combustion engines, hydraulic systems and related power systems used in agriculture.
- E. Identifies and selects common tools, machinery and equipment used in agriculture and demonstrates knowledge of their proper inspection, maintenance and storage (e.g., animal science, plant science, soil science, veterinary science).
- F. Demonstrates knowledge of the safe and proper operation of agricultural tools, machinery and equipment.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

Competency 015: *The teacher understands agricultural construction and metal fabrication.*

The beginning teacher:

- A. Applies safety regulations, policies, procedures and equipment to the construction of agricultural structures, enclosures and related systems.
- B. Applies knowledge of basic procedures for planning the construction of agricultural structures and enclosures (e.g., locating and surveying sites, using maps and plans, estimating materials and costs, eco-friendly methods, calculating bills of materials).
- C. Applies knowledge of basic construction principles, techniques, methods, tools and materials (e.g., carpentry, concrete, plumbing, wiring) to construct agricultural structures and enclosures.
- D. Identifies commonly used metals and their properties and uses in agriculture and basic principles and techniques for cutting, shaping and joining metal for agricultural applications.
- E. Knows the principles and techniques for safely performing basic metalworking procedures (e.g., cutting, filing, shaping, drilling, soldering, welding).
- F. Understands the design, components and operation of electric circuits, motors, sensors and control devices and the basic wiring procedures used in agriculture.
- G. Demonstrates knowledge of basic plumbing methods, tools and materials and of heating and cooling, water supply and sanitation systems.

Competency 016: *The teacher understands technology and the use of computers and related technologies in agricultural production and management.*

The beginning teacher:

- A. Identifies the basic applications of biotechnology in agriculture (e.g., cold tolerance, herbicide resistance).
- B. Identifies the basic principles of cell biology and tissue culture.
- C. Demonstrates an understanding of basic laboratory techniques used in biotechnology and applies basic principles of DNA fingerprinting to genome mapping and marker-assisted selection and identification of crops and livestock.
- D. Demonstrates an awareness of social, economic, environmental, ethical and legal issues in biotechnology.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

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- E. Knows how to use and access digital technology in agricultural record keeping (e.g., production records, breeding records, nutrient management, Internet resources).
 - F. Recognizes the use of technological systems in agricultural sciences (e.g., the Global Positioning System [GPS], Geographic Information Systems [GIS], remote sensing).
 - G. Applies appropriate technologies to agricultural production and management (e.g., measuring crop yields, monitoring and controlling the greenhouse environment and irrigation systems, monitoring production of milk and eggs, formulating rations, using chip implants for identification).

Domain VI – Natural Resources and Environmental Science

Competency 017: *The teacher understands ecological principles, natural resources and the impact of agriculture on the environment.*

The beginning teacher:

- A. Understands basic ecological principles and concepts (e.g., habitat, carrying capacity, ecological succession, mapping natural resource distribution).
- B. Applies basic knowledge of environmental systems (e.g., atmosphere, weather, climate) and cycles (e.g., carbon cycle, water cycle, stream classification).
- C. Identifies the types of renewable and nonrenewable natural resources.
- D. Identifies the effects of natural resource availability on agriculture and the environment (e.g., effects of geographic distribution of natural resources and fossil fuel extraction and recovery).
- E. Applies knowledge of methods of conservation (e.g., energy efficiency, use of alternative fuels, recycling, runoff control, erosion control).
- F. Analyzes the interdependence of agriculture and the environment (e.g., sustainable agriculture, effects of agriculture on land, air and water; effects of environmental degradation on agricultural production; implementation of green technology; management of watersheds and riparian zones, natural catastrophic events and man-made effects).
- G. Demonstrates knowledge of the advantages and disadvantages of alternative energy sources (e.g., wind, solar, geothermal areas, biomass) that stem from or impact agriculture, food and natural resources.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

Competency 018: *The teacher understands the principles of ecosystem management.*

The beginning teacher:

- A. Understands the basic principles and methods related to land, water and air management and the sustainable use of resources (e.g., types of pollution, point and nonpoint pollution, pollution management strategies).
- B. Identifies the laws, regulations and ethical issues relating to the use, abuse and management of ecosystems and natural resources (e.g., use restrictions, landowner property rights, stewardship).
- C. Understands the types (e.g., cultivated land, rangeland, forest land, wetland), characteristics and management of agricultural ecosystems (e.g., population studies, sample plots and points, resource inventory) and develops and applies basic environmental management plans for managing these systems.
- D. Applies basic principles and methods of agricultural recreation management (e.g., forest, wildlife, fisheries, ecology management).
- E. Analyzes the importance of habitat conservation, wildlife management and sustainable resources.
- F. Applies knowledge of the causes of soil erosion and methods of preventing and reversing soil erosion.
- G. Demonstrates awareness of the responsibilities of government agencies and public service organizations in relation to environmental conservation and management (e.g., United States Department of Agriculture, watershed management, underground water districts, boards of conservation, Environmental Protection Agency, Texas Commission on Environmental Quality, Texas Parks and Wildlife).
- H. Understands and recognizes the historical and current impact of wildlife laws and regulations.

Domain VII — Food Science and Processing

Competency 019: *The teacher understands the processing, packaging, quality analysis and marketing of food and its by-products.*

The beginning teacher:

- A. Understands and analyzes the global, environmental and financial trends and issues in food and fiber production regarding inspection, processing, distribution, research and demand.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

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- B. Demonstrates knowledge of identifying, grading, storing, processing, packaging and quality analysis of edible plant products and their by-products (e.g., fruits, nuts, vegetables, grains), including process value-added methods (e.g., waxing, peeling, washing, preserving, packing).
 - C. Knows the basic principles of livestock harvesting, including preparation and grading of carcasses and identifying and processing wholesale and retail cuts (e.g., fabrication and process value-added methods).
 - D. Knows the basic regulations and procedures for identifying, inspecting, grading, packaging, preserving, storing and labeling edible animal products (e.g., dairy products, eggs, fish).
 - E. Identifies the major industry organizations, groups and agencies and how they regulate the food products and processing industry (e.g., country-of-origin labeling, nutrition labeling, government regulations, laws, inspections).

Competency 020: *The teacher understands issues affecting the food science industry, including biotechnology, employment, safety, the environment and animal welfare.*

The beginning teacher:

- A. Describes the importance of the Hazard Analysis and Critical Control Point (HACCP) system in the processing of food.
- B. Demonstrates knowledge of selecting, harvesting, processing and classifying food products for storage and transportation.
- C. Demonstrates familiarity with the safety principles and recommended equipment for facility management practices.
- D. Understands the basic terms and principles associated with food science and food technology (e.g., nutritive value, food groups, RDA).
- E. Identifies and implements insect, rodent and biohazard control.
- F. Identifies basic sanitation procedures for handling, processing and packaging.
- G. Understands the relationship between food science and biotechnology.
- H. Recognizes animal welfare issues in the preharvesting process.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

Approaches to Answering Multiple-Choice Questions

The purpose of this section is to describe multiple-choice question formats that you will typically see on the Agriculture, Food and Natural Resources 6–12 test and to suggest possible ways to approach thinking about and answering them. These approaches are intended to supplement and complement familiar test-taking strategies with which you may already be comfortable and that work for you. Fundamentally, the most important component in assuring your success on the test is knowing the content described in the test framework. This content has been carefully selected to align with the knowledge required to begin a career as an Agriculture, Food and Natural Resources 6–12 teacher.

The multiple-choice questions on this test are designed to assess your knowledge of the content described in the test framework. In most cases, you are expected to demonstrate more than just your ability to recall factual information. You may be asked to think critically about the information, to analyze it, consider it carefully, compare it with other knowledge you have or make a judgment about it.

When you are ready to respond to a multiple-choice question, you must choose one of four answer options. Leave no questions unanswered. Questions for which you mark no answer or more than one answer are counted as incorrect. Your score will be determined by the number of questions for which you select the correct answer.

Agriculture, Food and Natural Resources 6–12 test is designed to include a total of 100 multiple-choice questions. Your final scaled score will be based only on scored questions. The questions that are not scored are being pilot tested to collect information about how these questions will perform under actual testing conditions. These pilot questions are not identified on the test.

How to Approach Unfamiliar Question Formats

Some questions include introductory information such as a map, table, graph or reading passage (often called a stimulus) that provides the information the question asks for. New formats for presenting information are developed from time to time. Tests may include audio and video stimulus materials such as a movie clip or some kind of animation, instead of a map or reading passage.

Tests may also include interactive types of questions. These questions take advantage of technology to assess knowledge and skills that go beyond what can be assessed using standard single-selection multiple-choice questions. If you see a format you are not familiar with, **read the directions carefully**. The directions always give clear instructions on how you are expected to respond.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

For most questions, you will respond by clicking an oval to choose a single answer choice from a list of options. Other questions may ask you to respond by:

- **Typing in an entry box.** You may be asked to enter a text or numeric answer. Some questions may have more than one place to enter a response.
- **Selecting all that apply.** In some questions, you will be asked to choose all the options that answer the question correctly.
- **Clicking check boxes.** You may be asked to click check boxes instead of an oval when more than one choice within a set of answers can be selected.
- **Clicking parts of a graphic.** In some questions, you will choose your answer by clicking on location(s) on a graphic such as a map or chart, as opposed to choosing from a list.
- **Clicking on sentences.** In questions with reading passages, you may be asked to choose your answer by clicking on a sentence or sentences within the reading passage.
- **Dragging and dropping answer choices into “targets” on the screen.** You may be asked to choose an answer from a list and drag it into the appropriate location in a table, paragraph of text or graphic.
- **Selecting options from a drop-down menu.** This type of question will ask you to select the appropriate answer or answers by selecting options from a drop-down menu (e.g., to complete a sentence).

Remember that with every question, you will get clear instructions on how to respond.

Question Formats

You will see multiple-choice questions in the single-question format on this test. On the following pages, descriptions of this commonly used question format, along with suggested approaches for responding to each question, are provided.

NOTE: After clicking on a link, right click and select “Previous View” to go back to original text.

Single Questions

The single-question format presents a direct question or an incomplete statement. It can also include a reading passage, graphic, table or a combination of these. Four answer options appear below the question.

The following question is an example of the single-question format. It tests knowledge of Agriculture, Food and Natural Resources 6–12 Competency 001: *The teacher understands the foundations of agricultural education.*

Example

Which of the following developments in the 1960s and 1970s was most important in raising worldwide production of staple crops (e.g., wheat, rice, corn)?

- A. creation of new high-yielding strains of grain
- B. rapid growth of the organic farming movement
- C. development of techniques for producing transgenic plants
- D. payment of government subsidies to producers

Suggested Approach

Read the question carefully and critically. Think about what it is asking and the situation it is describing. Eliminate any obviously wrong answers, select the correct answer choice and mark your answer.

In the 1960s and 1970s, worldwide production of staple crops increased dramatically. This item asks which factor was most important in causing this increase. Look at the answer choices and consider which of them describes the most important development in raising production of staple crops during the specified period.

Option A suggests that the creation of new high-yielding strains of grain was most important in raising worldwide production of staple crops in the 1960s and 1970s. In fact, agricultural researchers during this period did develop several new strains of grains that had significantly higher yields per acre than strains that were in use before the period. These new varieties were planted heavily in many countries, particularly in India and other parts of Asia. The resulting increase in yields led to surpluses in several countries that had previously been net importers of food. Dr. Norman Borlaug, an American plant breeder, won a Nobel Peace Prize for his work in helping to lay the groundwork for what became known as the Green Revolution—the development and introduction of improved plant varieties. Option A may be the best response to this item.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

Option B suggests that the rapid growth of the organic farming movement was most important in raising worldwide production of staple crops in the 1960s and 1970s. In fact, organic methods were used to grow staple crops in the developing world as a matter of necessity rather than choice. Yields using these methods were low, and crop losses to pests and weeds were high. Furthermore, the organic movement in developed countries focused primarily on growing non-staple vegetable and fruit crops on a small scale and had no effect on worldwide yields of staple crops. Option B may be eliminated as the best response to this item.

Option C suggests that the development of techniques for producing transgenic plants was most important in raising worldwide production of staple crops in the 1960s and 1970s. Transgenic plants are produced by inserting bits of DNA derived from another organism into the genome of a crop plant. Many transgenic, or “genetically modified,” crops have been produced using these techniques. While use of transgenic plants has currently led to increased yields for some staple crops and promises to increase yields even more in the future, techniques for producing these plants were only developed quite recently and were not available in the 1960s and 1970s. Option C may be eliminated as the best response to this item.

Option D suggests that the payment of government subsidies to producers was most important in raising worldwide production of staple crops in the 1960s and 1970s. Payment of government subsidies to producers of agricultural products is a common practice in many developed countries. In general, however, these subsidies are paid to farmers as an incentive not to produce crops so that overproduction is avoided and prices remain stable. The net effect of these subsidies is to decrease, rather than increase, worldwide production of staple crops. Option D may be eliminated as the best response to this item.

Of the alternatives offered, only option A, creation of new high-yielding strains of grain, had an important effect on raising worldwide production of staple crops in the 1960s and 1970s. Therefore, **the correct response is option A.**

The following item is also in single-item format. It tests knowledge of Agricultural Science and Technology 6–12 Competency 009: *The teacher understands basic crop production and management.*

To increase the amount of nitrogen in the soil, a farmer would most appropriately include which of the following crops in a crop rotation?

- A. timothy
- B. sunflowers
- C. oats
- D. alfalfa

NOTE: After clicking on a link, right click and select “Previous View” to go back to original text.

Suggested Approach

Read the question carefully and critically. Think about what it is asking and the situation it is describing. Eliminate any obviously wrong answers, select the correct answer choice and mark your answer.

Farmers rotate crops for a number of reasons, including limiting the buildup of specific insect pests, increasing organic matter in the soil, and adding nitrogen to the soil. This item asks which crop a farmer would plant in order to increase nitrogen in the soil. Only crops that use symbiotic soil bacteria to fix atmospheric nitrogen (e.g., legumes) add significant amounts of nitrogen to the soil. Consider whether the crop identified in each answer choice can add significant amounts of nitrogen to the soil.

Option A suggests that planting timothy in a crop rotation will increase the amount of nitrogen in the soil. Timothy is a grass that is commonly grown and dried for hay. Although plowing under timothy will increase the amount of organic matter in the soil, timothy is not a legume, does not harbor symbiotic nitrogen-fixing bacteria, and will not increase the amount of nitrogen in the soil when used in a crop rotation. Option A may be eliminated as the best response to this item.

Option B suggests that planting sunflowers in a crop rotation will increase the amount of nitrogen in the soil. Sunflowers are members of the composite family and are commonly grown for seeds and oil. Although sunflowers are often planted in a crop rotation to break the development cycle of insect pests of other crops, sunflowers are not legumes, do not harbor symbiotic nitrogen-fixing bacteria, and will not increase the amount of nitrogen in the soil. Option B may be eliminated as the best response to this item.

Option C suggests that planting oats in a crop rotation will increase the amount of nitrogen in the soil. Oats are grasses that are commonly grown for their seeds. Although plowing under oat straw will increase the amount of organic matter in the soil, oats are not legumes, do not harbor symbiotic nitrogen-fixing bacteria, and will not increase the amount of nitrogen in the soil when used in a crop rotation. Option C may be eliminated as the best response to this item.

Option D suggests that planting alfalfa in a crop rotation will increase the amount of nitrogen in the soil. Alfalfa is a legume that is commonly grown and dried for hay or made into silage for use as a high-protein livestock feed. Since alfalfa is a legume and does harbor symbiotic nitrogen-fixing bacteria, planting alfalfa as part of a crop rotation will increase the amount of nitrogen in the soil. Option D is the best response to this item.

Of the alternatives offered, only alfalfa is capable of increasing the amount of nitrogen in the soil when used in a crop rotation. Therefore, **the correct response is option D.**

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

Multiple-Choice Practice Questions

This section presents some sample test questions for you to review as part of your preparation for the test. To demonstrate how each competency may be assessed, each sample question is accompanied by the competency that it measures. While studying, you may wish to read the competency before and after you consider each sample question. Please note that the competency statements do not appear on the actual test.

For each sample test question, there is a correct answer and a rationale for each answer option. Please note that the sample questions are not necessarily presented in competency order.

The sample questions are included to illustrate the formats and types of questions you will see on the test; however, your performance on the sample questions should not be viewed as a predictor of your performance on the actual test.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 001

1. Which of the following is the most important consideration in choosing members for an agricultural advisory committee?
 - A. Members should represent the diverse aspects of the community.
 - B. Members should be employed in the agricultural industry.
 - C. Members should have a background in education.
 - D. Members should be on a local school board.

Answer and Rationale

COMPETENCY 001

2. Which of the following acts is also known as the Land-Grant College Act?
 - A. Clarke–McNary Act
 - B. Vocational Education Act of 1963
 - C. Smith–Hughes Act
 - D. Morrill Act of 1862

Answer and Rationale

COMPETENCY 003

3. Which of the following is a teacher responsibility in assisting students to plan, implement and manage their Supervised Agricultural Experience (SAE)?
 - A. Providing classroom instruction on choosing an SAE
 - B. Buying the students show animals
 - C. Finding an agricultural job for the student
 - D. Scheduling the hours for each student’s SAE

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 004

4. Which THREE of the following are divisions of an FFA chapter's Program of Activities?
- A. Chapter Development
 - B. School Development
 - C. Community Development
 - D. Student Development

Answer and Rationale

COMPETENCY 005

5. Which of the following organizational structures is most useful when there is pressure for shared resources?
- A. Project organization
 - B. Matrix organization
 - C. Functional organization
 - D. Departmental organization

Answer and Rationale

COMPETENCY 005

6. Which of the following agricultural market structures spends the most on advertising to differentiate its product?
- A. Perfect competition
 - B. Monopolistic competition
 - C. Monopoly
 - D. Oligopoly

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 006

7. Which of the following is considered a physical function in agricultural marketing systems?
- A. Buying
 - B. Selling
 - C. Financing
 - D. Processing

Answer and Rationale

COMPETENCY 006

8. Which of the following is an example of a retail market?
- A. A livestock auction
 - B. Video merchandising
 - C. A roadside farmers market
 - D. An agricultural commodity market

Answer and Rationale

COMPETENCY 007

9. Which THREE of the following are characteristics of a sandy, coarse-textured soil?
- A. Allows water to penetrate rapidly
 - B. Has a high level of plant nutrients
 - C. Allows pathogenic organisms to leach out quickly
 - D. Has good aeration

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 007

10. The three numbers represented on a bag of fertilizer (e.g., 16-20-10) indicate the percentage of the primary plant nutrients in which of the following orders?
- A. P-K-N
 - B. N-P-K
 - C. K-P-N
 - D. N-K-P

Answer and Rationale

COMPETENCY 007

11. If present in soils in equal masses, which of the following, when increased, will increase the soil cation-exchange capacity the most?
- A. Large, negatively charged particles
 - B. Small, negatively charged particles
 - C. Large, positively charged particles
 - D. Small, positively charged particles

Answer and Rationale

COMPETENCY 008

12. Which part of a plant transports water and dissolved minerals up from the plant's roots?
- A. Cambium
 - B. Epidermis
 - C. Phloem
 - D. Xylem

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 008

13. Which of the following is most closely related to the movement of water molecules through a semipermeable membrane from a region of higher water concentration to a region of lower water concentration?
- A. Osmosis
 - B. Capillary action
 - C. Transpiration
 - D. Respiration

Answer and Rationale

COMPETENCY 010

14. Which of the following is a method of exterior design using plants that conserve water?
- A. Edible landscaping
 - B. Xeriscaping
 - C. Hardscaping
 - D. Naturalization

Answer and Rationale

COMPETENCY 011

15. Which breed of sheep first originated in the United States and is known for sheep that are large with white faces and wool on their legs, being useful in crossbred market lamb production, and producing heavy yields with medium wool fleeces?
- A. Rambouillet
 - B. Columbia
 - C. Southdown
 - D. Suffolk

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 011

16. Which of the following swine breeds is best described as having erect ears and a heavily muscled black body with a white belt around the shoulders?
- A. Landrace
 - B. Berkshire
 - C. Hampshire
 - D. Poland China

Answer and Rationale

COMPETENCY 011

17. Which of the following breeds of cattle is known for producing meat with the highest amount of marbling?
- A. Simmental
 - B. Charolais
 - C. Brahman
 - D. Angus

Answer and Rationale

COMPETENCY 011

18. Which of the following cattle breeds produces the largest volume of milk?
- A. Guernsey
 - B. Holstein
 - C. Brown Swiss
 - D. Milking Shorthorn

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 012

19. Which of the following is the most likely age range for puberty in a Holstein heifer expected to calve at 24 months?
- A. 6–7 months of age
 - B. 9–11 months of age
 - C. 14–15 months of age
 - D. 16–17 months of age

Answer and Rationale

COMPETENCY 012

20. The period of time during which an animal is pregnant is called
- A. parturition.
 - B. gestation.
 - C. estrus.
 - D. ovulation.

Answer and Rationale

COMPETENCY 012

21. Which of the following best describes the correct location for administering a subcutaneous (SQ) injection?
- A. Under the tongue
 - B. Under the skin
 - C. Into a muscle
 - D. Into a vein

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 012

22. Which management technique can help reduce stress and aggressive behavior when loading cattle?
- A. Using a curved chute with solid fences to drive them to the desired destination
 - B. Allowing the cattle to remain side by side so they can see each other
 - C. Using an electric prod to make them move quickly
 - D. Allowing enough room so the cattle can turn around

Answer and Rationale

COMPETENCY 012

23. In selecting a bull to use with heifers in a commercial cattle operation, which of the following expected progeny differences (EPDs) should be considered most strongly?
- A. Longevity
 - B. Weaning weight
 - C. Calving ease
 - D. Yearling weight

Answer and Rationale

COMPETENCY 014

24. When using power equipment in the agricultural laboratory, which type of protection is most critical for all students?
- A. Hearing protection
 - B. Eye protection
 - C. Hand protection
 - D. Clothing protection

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 014

25. What is the best way to clean the tip of a soldering iron?

- A. Scraping the tip against a wet sponge after the iron is fully heated
- B. Soaking the iron in flux for a few hours before each use
- C. Using a metal file to file off the remaining solder
- D. Submerging the tip in hot soapy water overnight

Answer and Rationale

COMPETENCY 015

26. Which of the following best describes the purpose of a concrete slump test?

- A. To determine the overall strength of a batch of concrete
- B. To determine the quality of a batch of concrete
- C. To determine the curing time for fresh concrete
- D. To determine the consistency of fresh concrete

Answer and Rationale

COMPETENCY 017

27. Which of the following statements best describes consumers in a food web?

- A. They make their own food.
- B. They get energy directly from the Sun.
- C. They exhibit a heterotrophic mode of nutrition.
- D. They form the base of the trophic pyramid.

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 018

28. Which ecosystem type occupies the most acreage in the United States?

- A. Wetland
- B. Urban land
- C. Forest land
- D. Cultivated land

Answer and Rationale

COMPETENCY 018

29. Which of the following best describes a well-managed farm pond for fish production?

- A. Enough phytoplankton so that the water has a green tint
- B. Clean, crystal clear water
- C. Rooted emergent vegetation covering most of the pond
- D. A layer of filamentous algae covering the surface of the pond

Answer and Rationale

COMPETENCY 018

30. Which legislative act banned the interstate transportation and sale of wildlife and wildlife by-products that have been illegally taken or possessed?

- A. The Lacey Act of 1900
- B. The Fish and Wildlife Act of 1956
- C. The Pittman-Robertson Act of 1937
- D. The Endangered Species Act of 1973

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 018

31. Which of the following plant groups would support a healthy Bobwhite quail population?
- A. Coastal Bermuda and Johnson grass pasture
 - B. Western ragweed, berry vines, and bluestem
 - C. Western ragweed and coastal Bermuda
 - D. Cotton, grain sorghum, and peanuts

Answer and Rationale

COMPETENCY 019

32. Of the following, which THREE are USDA quality grades for eggs?
- A. AA
 - B. A
 - C. BB
 - D. B

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

Answer Key and Rationales

Question Number	Competency Number	Correct Answer	Rationales
1	001	A	<p>Option A is correct because members for an agriculture advisory committee should represent the diverse aspects of the community. Option B is incorrect because members of an agriculture advisory committee do not have to be employed in the agricultural industry. Option C is incorrect because members of an agriculture advisory committee are not required to have a background in education. Option D is incorrect because members of an agriculture advisory committee do not have to be on a local school board.</p> <p>Back to Question</p>
2	001	D	<p>Option D is correct because the Morrill Act of 1862 is known as the Land-Grant College Act. Option A is incorrect because the Clark-McNary Act dealt with enlarging and improving the National Forest Service. Option B is incorrect because the Vocational Act of 1963 authorized a major expansion and redirection of vocational education. Option C is incorrect because the Smith–Hughes Act established vocational agriculture courses.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
3	003	A	<p>Option A is correct because teachers do provide classroom instruction on choosing an SAE. Option B is incorrect because teachers do not buy the students show animals. Option C is incorrect because teachers do not find agricultural jobs for the students. Option D is incorrect because teachers do not schedule the hours for each student’s SAE.</p> <p>Back to Question</p>
4	004	A, C, D	<p>Options A, C and D are correct because they are divisions of an FFA chapter’s Program of Activities. Option B is incorrect because school development is not a division of an FFA chapter’s Program of Activities.</p> <p>Back to Question</p>
5	005	B	<p>Option B is correct because a matrix organization is most useful when there is pressure for shared resources due to reporting lines, which are both horizontal and vertical. Option A is incorrect because a project organization is not the most useful when there is pressure for shared resources because it is structured mostly by area of activity. Option C is incorrect because a functional organization is not the most useful when there is pressure for shared resources due to reporting relationships that are based on specialty. Option D is incorrect because a departmental organization is not the most useful when there is pressure for shared resources due to reporting relationships that are based mainly on function.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
6	005	B	<p>Option B is correct because a monopolistic competition agricultural firm spends the most on advertising to differentiate its product. Option A is incorrect because a perfect competition agricultural firm does not spend the most on advertising to differentiate its product. Option C is incorrect because a monopoly does not spend the most on advertising to differentiate its product. Option D is incorrect because an oligopoly does not spend the most on advertising to differentiate its product.</p> <p>Back to Question</p>
7	006	D	<p>Option D is correct because processing is considered a physical function in agricultural marketing systems. Option A is incorrect because buying is considered an exchange function in agricultural marketing systems. Option B is incorrect because selling is considered an exchange function in agricultural marketing systems. Option C is incorrect because financing is considered a facilitating function in agricultural marketing systems.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
8	006	C	<p>Option C is correct because a roadside farmers market, which sells directly to consumers, is an example of a retail market. Option A is incorrect because a livestock auction is not an example of a retail market; it is a public sale where goods are sold to the highest bidder. Option B is incorrect because video merchandising is not an example of a retail market because sellers are able to create richly engaging experiences, merchandising products in a smarter, more intuitive way. Option D is incorrect because an agricultural commodity market is not an example of a retail market because it is a physical or virtual marketplace for buying, selling, and trading agricultural products.</p> <p>Back to Question</p>
9	007	A, C, D	<p>Options A, C and D are correct because they are characteristics of a sandy, coarse-textured soil. They allow water to penetrate rapidly, pathogenic organisms to leach out quickly, and air to circulate easily. Option B is incorrect because this type of soil does not have a high level of plant nutrients.</p> <p>Back to Question</p>
10	007	B	<p>Option B is correct because N-P-K indicates the percentage of the primary plant nutrients in the correct order on a bag of fertilizer. Option A, C and D are incorrect because they do not indicate the percentage of the primary plant nutrients in the correct order on a bag of fertilizer.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
11	007	B	<p>Option B is correct because small, negatively charged particles have the greatest surface-to-volume ratio and tend to increase the cation-exchange capacity of the soil the most. Option A is incorrect because large, negatively charged particles do not have the greatest surface-to-volume ratio and do not increase the cation-exchange capacity of the soil as much as small, negatively charged particles do. Option C is incorrect because large, positively charged particles do not increase the cation-exchange capacity of the soil as much as small, negatively charged particles do. Option D is incorrect because small, positively charged particles do not increase the cation-exchange capacity of the soil as much as small, negatively charged particles do.</p> <p>Back to Question</p>
12	008	D	<p>Option D is correct because the xylem is the part of a plant that transports water and dissolved minerals up from the roots. Option A is incorrect because the cambium is a meristematic tissue that produces xylem and phloem. Option B is incorrect because the epidermis is the outermost layer of cells covering the leaves and young parts of a plant. Option C is incorrect because the phloem is a plant tissue that carries food throughout a plant.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
13	008	A	<p>Option A is correct because osmosis is the movement of water molecules through a semipermeable membrane from a region of higher water concentration to a region of lower water concentration. Option B is incorrect because capillary action is movement of water within the spaces of a porous material due to the forces of adhesion, cohesion, and surface tension. Option C is incorrect because transpiration is the evaporation of water into the atmosphere from the leaves of plants. Option D is incorrect because respiration is the process that oxidizes organic compounds, releasing the energy that is used in metabolic processes.</p> <p>Back to Question</p>
14	010	B	<p>Option B is correct because xeriscaping refers to landscaping that conserves water. Option A is incorrect because edible landscaping is the practical integration of food plants within an ornamental or decorative setting. Option C is incorrect because hardscaping is the use of inanimate elements of landscaping, especially any masonry work or woodwork. Option D is incorrect because naturalization is allowing the landscape to become more natural by planting trees and shrubs that are found growing naturally in the area.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
15	011	B	<p>Option B is correct because Columbia sheep originated in the United States, and this breed is known for sheep that are large with white faces and wool on their legs. Option A is incorrect because Rambouillet sheep originated in France, have fine wool and are raised for their meat. Option C is incorrect because Southdown sheep originated in Britain and are known primarily for meat. Option D is incorrect because Suffolk sheep originated in Britain and are known for their meat and black faces.</p> <p>Back to Question</p>
16	011	C	<p>Option C is correct because the Hampshire breed is best described as having erect ears and a heavily muscled black body with a white belt around the shoulders. Option A is incorrect because the Landrace breed are white in color, have a rather fine hair coat, long snouts and heavy drooping ears. They have long bodies, deep smooth sides and a noticeable lack of excess fat and wrinkles. Option B is incorrect because the Berkshire breed is best described as black with white points (legs, face and tail) and a short neck and short, blocky legs with strong feet. Option D is incorrect because the Poland-China breed is among the largest of swine. These swine are usually black; some have white spots on different parts of the body, particularly on the feet, nose and tail.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
17	011	D	<p>Option D is correct because the Angus breed is known for producing meat with the highest amount of marbling. Option A is incorrect because the Simmental breed is known for its weight-gaining ability and milk production. Option B is incorrect because the Charolais breed is known for fattening for high finished weight. Option C is incorrect because the Brahman breed is known for its resistance to insects and tolerance to heat.</p> <p>Back to Question</p>
18	011	B	<p>Option B is correct because the Holstein cattle breed produces the largest volume of milk. Option A, C and D are incorrect because the Guernsey, Brown Swiss and Milking Shorthorn cattle breeds do not produce larger volumes of milk than the Holstein.</p> <p>Back to Question</p>
19	012	B	<p>Option B is correct because 9–11 months of age is closest to the age that a Holstein heifer should reach puberty in order to be inseminated several months later and calve at 24 months. Options A, C and D are incorrect because the age range in A is too early and the age ranges in C and D are too late for a Holstein heifer to reach puberty in order to be inseminated several months later and calve at 24 months.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
20	012	B	<p>Option B is correct because gestation is the period of time during which an animal is pregnant. Option A is incorrect because parturition is also called labor and delivery. Option C is incorrect because estrus is the periodic state of sexual excitability during which the female of most mammals is capable of conceiving. Option D is incorrect because ovulation is the period during the reproductive cycle when the ovum is released.</p> <p>Back to Question</p>
21	012	B	<p>Option B is correct because a subcutaneous (SQ) injection is administered under the skin. Option A is incorrect because under the tongue is not the correct route for an SQ injection; under the tongue is sublingual administration. Option C is incorrect because into the muscle is not the correct route for an SQ injection; into the muscle is intramuscular administration. Option D is incorrect because into a vein is not the correct route for an SQ injection; into a vein is intravenous administration (IV).</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
22	012	A	<p>Option A is correct because using a curved chute with solid fences to drive cattle will help reduce stress and aggressive behavior when loading cattle. Option B is incorrect because allowing cattle to remain side by side increases the likelihood of cattle turning around and aggressive behavior. Option C is incorrect because using an electric prod to make cattle move quickly will increase stress and aggressive behavior when loading cattle. Option D is incorrect because allowing cattle enough room to turn around will increase stress and aggressive behavior when loading cattle due to disruption of the orderly flow of cattle.</p> <p>Back to Question</p>
23	012	C	<p>Option C is correct. A heifer is a young cow that has not had its first calf. Therefore the heifer should be mated with a bull that is known to produce smaller calves, resulting in an easier delivery or “calving ease.” Therefore, “calving ease” is the most strongly considered EPD when selecting a bull to use with heifers in a commercial cattle operation. Options A, B and D are incorrect because longevity, weaning weight, and yearling weight are not as important EPD considerations as calving ease when selecting a bull to use with heifers in a commercial cattle operation.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
24	014	B	<p>Option B is correct because when using any power equipment in the agricultural laboratory, eye protection is critical for all students. Options A, C and D are incorrect because when using certain power equipment in the agricultural laboratory, protection for hearing, hands and clothing is important, but usually not as critical as eye protection.</p> <p>Back to Question</p>
25	014	A	<p>Option A is correct because scraping the tip of a hot soldering iron against a wet sponge is the best way to clean the tip. Option B is incorrect because soaking a soldering iron in flux for a few hours before each use is not the best way to clean the tip of a soldering iron. Option C is incorrect because using a metal file to file off remaining solder is not the best way to clean the tip of a soldering iron. Option D is incorrect because submerging the tip of a soldering iron in hot soapy water over night is not the best way to clean the tip of a soldering iron.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
26	015	D	<p>Option D is correct because a concrete slump test is used to determine the consistency of fresh concrete. Option A is incorrect because a concrete cylinder compression test determines the overall strength of a batch of concrete.</p> <p>Option B is incorrect because a series of tests (e.g., air content, temperature, yield, density) would be needed to determine the quality of a batch of concrete.</p> <p>Option C is incorrect because stripping strength, 7-day strength, and 28-day strength tests would in part determine the curing time for fresh concrete.</p> <p>Back to Question</p>
27	017	C	<p>Option C is correct because consumers exhibit a heterotrophic mode of nutrition, which best describes consumers in a food web. Option A is incorrect because consumers do not make their own food. Option B is incorrect because consumers do not get energy directly from the Sun. Option D is incorrect because consumers do not form the base of the trophic pyramid.</p> <p>Back to Question</p>
28	018	C	<p>Option C is correct. Forest land occupies about 29 percent of the acreage in the United States. Option A is incorrect because wetlands occupy about 5 percent of the acreage of the United States. Option B is incorrect because urban lands occupy about 3 percent of the acreage in the United States. Option D is incorrect because cultivated lands occupy about 20 percent of the acreage in the United States.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
29	018	A	<p>Option A is correct because a well-managed pond will have a green tint indicating there are enough phytoplankton to maintain a large fish population. Option B is incorrect because a pond with clean, crystal clear water will not have enough phytoplankton to support a large population of fish. Option C is incorrect because rooted emergent vegetation covering most of the pond will reduce the nutrients available to phytoplankton and make it difficult to harvest the fish. Option D is incorrect because a layer of filamentous algae covering the surface of the pond may result in a reduced concentration of dissolved oxygen in the pond, which could reduce the fish population.</p> <p>Back to Question</p>
30	018	A	<p>Option A is correct because the Lacey Act of 1900 banned the interstate transportation and sale of wildlife and wildlife by-products that were obtained illegally. Option B is incorrect because the Fish and Wildlife Act of 1956 established a comprehensive national fish, shellfish and wildlife resources policy. Option C is incorrect because the Pittman-Robertson Act of 1937 created an excise tax that provides funds to each state to manage wildlife habitats. Option D is incorrect because the 1973 Endangered Species Act provided for the conservation of ecosystems on which threatened and endangered species of fish, wildlife, and plants depend.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
31	018	B	<p>Option B is correct because Western ragweed, berry vines, and bluestem would support a healthy Bobwhite quail population. Option A is incorrect because coastal Bermuda and Johnson grass pasture are better suited for livestock. Option C is incorrect because Western ragweed and coastal Bermuda are better suited for livestock. Option D is incorrect because cotton, grain sorghum, and peanuts are mainly agricultural products and are not used to support animal populations.</p> <p>Back to Question</p>
32	019	A, B, D	<p>Options A, B and D are correct because AA, A, and B are quality grades for eggs. Option C is incorrect because BB is not a quality grade for eggs.</p> <p>Back to Question</p>

Study Plan Sheet

STUDY PLAN						
Content covered on test	How well do I know the content?	What material do I have for studying this content?	What material do I need for studying this content?	Where can I find the materials I need?	Dates planned for study of content	Date Completed

Preparation Resources

The resources listed below may help you prepare for the TExES test in this field. These preparation resources have been identified by content experts in the field to provide up-to-date information that relates to the field in general. You may wish to use current issues or editions to obtain information on specific topics for study and review.

JOURNALS

Educational Leadership, Journal of the Association for Supervision and Curriculum Development. www.ascd.org

Learning and Leading with Technology, International Society for Technology in Education. www.learningandleading-digital.com/

Tech Directions Journal, Prakken Publications. <https://www.techdirections.com/>

The Technology Teacher, <https://www.questia.com/library/p5246/the-technology-teacher>

Journal of Vocational Education & Training, Taylor & Francis Online. <http://www.tandfonline.com/toc/rjve20/current>

Livestock Science, Elsevier.

<http://www.sciencedirect.com/science/journal/18711413>

Journal of the Science of Food and Agriculture, Society of Chemical Industry and John Wiley & Sons. www.interscience.wiley.com/jpages/0022-5142/

HortScience, American Society for Horticultural Science. <http://hortsci.ashspublications.org/>

OTHER RESOURCES

American Psychological Association. (2009). *Publication Manual of the American Psychological Association*, Sixth Edition. Washington, D.C.: American Psychological Association. www.apa.org

Texas A and M University. (1985). *Handbook for Trade and Industrial Shop Teachers*, First Edition. College Station, Texas: Industrial Material Service. <http://eric.ed.gov/?id=ED270567>

U.S. Department of Labor. (1999). *Dictionary of Occupational Titles: Volume 1 and Volume 2 (Dictionary of Occupational Jobs with Onet Definitions)*, Fourth Revised Edition. St. Paul, Minn.: Jist Publishing. http://www.wave.net/upg/immigration/dot_index.html

ONLINE RESOURCES

Association for Supervision and Curriculum Development —
<http://www.ascd.org/books-publications.aspx>

National FFA Organization, FFA news, National Convention schedules, and
agriculture education resources — <https://www.ffa.org>

Texas FFA Organization — <https://www.texasffa.org>

Vocational Agriculture Teachers Association of Texas (VATAT) —
<http://www.vatat.org>