GACE
Georgia Assessments for the Certification of Educators®

GACE® Study Companion

Agricultural Education Assessment

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Table of Contents

About the Assessment

Assessment Name	Agricultural Education
Grade Level	6–12
Test Code	Test I: 040 Test II: 041 Combined Test I and Test II: 540
Testing Time	Test I: 2 hours Test II: 2 hours Combined Test I and Test II: 4 hours
Test Duration	Test I: 2.5 hours Test II: 2.5 hours Combined Test I and Test II: 5 hours
Test Format	Computer delivered
Number of Selected-response Questions	Test I: 80 Test II: 80 Combined Test I and Test II: 160
Question Format	The test consists of a variety of short-answer questions such as selected-response questions, where you select one answer choice or multiple answer choices (depending on what the question asks for), questions where you enter your answer in a text box, and other types of questions. You can review the possible question types in the ***Guide to Taking a GACE Computer-delivered Test***.
Number of Constructed-response Questions	Test I: 0 Test II: 0 Combined Test I and Test II: 0

The GACE Agricultural Education assessment is designed to measure the professional knowledge of prospective teachers of secondary school Agricultural Education in the state of Georgia.

This assessment includes two tests. You may take either test individually or the full assessment in a single session. The testing time is the amount of time you will have to answer the questions on the test. Test duration includes time for tutorials and directional screens that may be included in the test.

The questions in this assessment assess both basic knowledge across content areas and the ability to apply principles.

The total number of questions that are scored is typically smaller than the total number of questions on the test. Most tests that contain selected-response questions also include embedded pretest questions, which are not used in calculating your score. By including pretest questions in the assessment, ETS is able to analyze actual test-taker performance on proposed new questions and determine whether they should be included in future versions of the test.

Content Specifications

Each test in this assessment is organized into content **subareas**. Each subarea is further defined by a set of **objectives** and their **knowledge statements**.

- The objectives broadly define what an entry-level educator in this field in Georgia public schools should know and be able to do.
- The knowledge statements describe in greater detail the knowledge and skills eligible for testing.
- Some tests also include content material at the evidence level. This content serves as descriptors of what each knowledge statement encompasses.

See a breakdown of the subareas and objectives for the tests in this assessment on the following pages.

Test I Subareas

Subarea	Approx. Percentage of Test
I. Foundations of Agriculture and Agricultural Education	50%
II. Food Science and Biotechnology	24%
III. Power, Structural, and Technical Systems	26%

Test I Objectives

Subarea I: Foundations of Agriculture and Agricultural Education

Objective 1: Understands the agriculture industry and agribusiness systems

The beginning Agricultural Education teacher:

A. Knows the historical development of agriculture
   - Describes the spread of agriculture
   - Describes the value of research in agriculture

B. Understands the value of agriculture
   - Defines agriculture
   - Identifies the areas or branches of agriculture
   - Is familiar with global impacts of agriculture
   - Identifies the major categories of food and fiber products

C. Knows the principles of capitalism and entrepreneurship in the agribusiness industry
   - Describes the law of diminishing returns and how supply and demand interact to determine the price of agricultural commodities
   - Distinguishes between fixed and variable costs, marginal cost and marginal return, inputs and outputs, current and noncurrent assets and liabilities
   - Identifies the opportunity costs within an agribusiness
   - Compares and contrasts the main characteristics of individual proprietorships, partnerships, cooperatives, and corporations
   - Distinguishes among the sectors of agribusiness (e.g., producer, service, processing, and marketing)
   - Identifies methods of reducing risk in an agribusiness

D. Knows the management skills needed to organize an agribusiness
   - Identifies and describes key components of a contract and a lease

- Describes diversification and specialization in agribusiness and the components of an agribusiness plan
- Understands basic management skills (e.g., scheduling, hiring, and purchasing) and the steps in the management decision-making process

E. Knows the record-keeping practices needed to accomplish agribusiness objectives and to make informed decisions

- Describes the purposes of enterprise records
- Develops and completes an enterprise budget
- Develops a balance sheet and analyzes its uses
- Completes and interprets a cash-flow statement
- Identifies the components of a completed inventory
- Describes depreciation
- Develops an income/expense statement and describes its purposes
- Completes a break-even analysis for an enterprise
- Analyzes the important financial ratios and calculations (e.g., net worth, debt to equity, solvency)

F. Is familiar with the fundamentals of savings, investments, and credit in agribusiness

- Identifies the importance of a savings and investment plan and the sources of credit
- Describes ways to build and maintain credit
- Describes a business proposal

G. Is familiar with the marketing principles needed to accomplish agribusiness objectives

- Describes the components and purpose of a promotional campaign, the key factors involved in marketing, how market prices and cycles affect agricultural commodities, and commodity futures and options trading
- Distinguishes between hedging and speculation

Objective 2: Understands leadership, career, and program development in agriculture and agricultural education

The beginning Agricultural Education teacher:

A. Knows the principles of individual and team leadership

- Describes the importance of personal leadership development (e.g., personality, leadership style, and Maslow's hierarchy)
- Describes various forms of leadership (e.g., democratic, authoritarian, and situational)
- Understands basic parliamentary procedure motions described in the *Official FFA Manual*.
- Describes proper presentation and disposal of a main motion

- Describes the purpose of parliamentary procedure in Future Farmers of America (FFA) meetings
- Describes team-building skills (e.g., motivation, communication, and influence)
- Differentiates between the positive and negative attributes of a leader
- Identifies the importance of ethics in leadership

B. Knows the foundational areas of career development

- Describes how to develop a career plan (e.g., strengths, values, and interests)
- Develops a career plan to meet career goals (e.g., education, employment, and lifestyle goals)
- Describes the various components related to job preparation (e.g., résumé development, interviewing, and overall business etiquette)

C. Understands the purpose, structure, and function of the National FFA Organization

- Identifies the FFA mission statement, creed, motto, ceremonies, and salute
- Identifies different types of FFA membership
- Describes major historical moments and figures of the FFA (e.g., founded in 1928, New Farmers of America, E. M. Tiffany, girls allowed in 1969, Henry C. Groseclose)
- Identifies the constitutional officer positions and their duties
- Knows the FFA degrees
- Understands the importance of the Program of Activities and FFA Committee structures
- Identifies and describes career development events (CDEs) and their purpose
- Identifies FFA award programs (e.g., degree programs and applications, proficiencies, leadership awards, scholarships)

D. Knows communication skills

- Describes effective communication skills (e.g., written, verbal, and nonverbal)
- Identifies techniques to improve listening, reading, writing, speaking, and nonverbal communication skills

E. Knows information research skills to make informed decisions

- Describes how to determine validity and reliability of a source (e.g., author, date, bibliography, type of source)
- Understands the scientific method

F. Understands supervised agricultural experiences (SAEs)

- Describes the purpose of an SAE
- Describes the major types of SAEs (e.g., entrepreneurship, placement, agriscience, agribusiness, exploratory)
- Describes how to develop an SAE program

- Identifies student advancement and awards related to the SAE program (e.g., degrees, proficiency awards)
- Applies basic financial record-keeping skills for the establishment and maintenance of an SAE

G. Knows opportunities across the various career pathways of agriculture

- Describes the various career pathways within the Agriculture, Food, and Natural Resources Career Cluster
- Identifies the specific skills and education needed for the career pathways
- Describes agricultural careers available to students in an agricultural education program

H. Is familiar with local program planning and management

- Identifies and describes the three components of a comprehensive agricultural education program
- Defines the scope and sequence for a secondary agricultural education program, including the FFA Alumni Association, Georgia Young Farmers Association, and adult agricultural education programs
- Identifies the purpose and importance of an advisory committee

Subarea II: Food Science and Biotechnology

Objective 1: Understands trends, regulatory agencies, and processes related to food science

The beginning Agricultural Education teacher:

A. Is familiar with major issues and trends affecting the food products and processing industry

- Identifies major trends and developments in the food products and processing industry (e.g., buying local, free-range animals, and irradiated beef)
- Describes dietary trends affecting the food industry (e.g., low fat, sugar free, gluten free)

B. Is familiar with regulatory agencies that effect the food products and processing industry

- Describes how the United States Department of Agriculture (USDA) and the United States Food and Drug Administration (FDA) regulate the food products and processing industry (e.g., country-of-origin labeling, nutrition labeling, and inspections)

C. Is familiar with selecting, harvesting, processing, and classifying food products for storage, distribution, and consumption

- Describes the purpose of grading to select food products for a specific use
- Describes the methods that add value to agricultural commodities
- Identifies basic processing techniques (e.g., preservation, homogenization, and meat fabrication)

- Describes the importance of controlled features in the processing of food (e.g., temperature, moisture, and sanitation)

Objective 2: Understands biotechnology as it relates to the agriculture industry

The beginning Agricultural Education teacher:

A. Is familiar with major innovations, historical developments, and applications of biotechnology in agriculture
   - Identifies the major biotechnological innovations (e.g., increased yields, herbicide tolerance, and insect resistance)
   - Describes the advantages that advances in biotechnology offer local producers
B. Is familiar with the ethical, legal, social, cultural, safety, and environmental issues related to biotechnology
   - Identifies the major legal and ethical issues surrounding the adoption of biotechnology
   - Identifies the social and cultural issues related to agricultural biotechnology (e.g., resistance to the use of genetically modified organisms (GMOs), hormones)
   - Identifies the economic impact of biotechnology
   - Describes the environmental issues related to agricultural biotechnology (e.g., herbicide resistance in weeds, beneficial-insect decline)
C. Is familiar with basic, safe laboratory procedures
   - Identifies the principles of aseptic technique
   - Identifies potential hazards in a biotechnology lab
   - Identifies the safety equipment needed to properly conduct a laboratory experiment
   - Describes safe handling of laboratory materials, chemicals, and equipment
D. Is familiar with the various uses of genetic engineering in the agricultural industry
   - Identifies the uses of genetic engineering, cloning, and stem-cell research in agriculture
   - Identifies the purpose of genetically modifying organisms in agriculture

Subarea III: Power, Structural, and Technical Systems

Objective 1: Understands science principles and safety of power, structural, and technical systems

The beginning Agricultural Education teacher:

A. Is familiar with the physical science principles and engineering applications associated with power, structural, and technical systems

- Describes the basic principles of work and power (e.g., pneumatics, hydraulics, and simple machines)
- Differentiates among basic metals as they pertain to a welding shop (e.g., mild steel, cast iron, brass, and copper)
- Describes horsepower for engines, equipment, and electrical motors
- Differentiates among conduction, convection, and radiation
- Describes principles of oil viscosity and lubrication

B. Is familiar with various power and energy sources
   - Describes proper safety procedures for dealing with power and energy sources
   - Compares and contrasts the benefits and costs of various energy sources (e.g., wind, solar, hydro, coal, and nuclear)
   - Differentiates among energy sources (e.g., internal combustion, mechanical, and electrical)

C. Is familiar with the principles of power, energy transfer, and conversion
   - Describes the basic operating principles of an electric motor
   - Describes the basic principles of gears and pulleys, and gear reduction and multipliers
   - Describes the transfer of power/energy from a motor to an implement

D. Knows the proper use, storage, and disposal of potentially hazardous materials
   - Describes the importance of proper laboratory safety
   - Interprets instructions and precautions
   - Identifies Occupational Safety and Health Administration (OSHA) regulations regarding laboratory safety colors and uses
   - Explains the proper storage of compressed-gas bottles according to OSHA regulations
   - Describes the proper storage and disposal of hazardous materials (e.g., fuels, pesticides, and paints)

E. Is familiar with the application of technology to the agriculture industry
   - Defines the term “GIS (Geographic Information System)” and explains its relationship to GPS (Global Positioning System)
   - Explains how GPS and GIS are used in precision agriculture
   - Lists the common applications of GPS technology in agriculture
   - Identifies potential applications for computer-controlled technology (e.g., greenhouse controls (GNC), computer numerical control machines, and automated equipment)

Objective 2: Understands applications of power, structural, and technical systems

The beginning Agricultural Education teacher:

A. Is familiar with electricity and electrical wiring
   - Identifies proper safety procedures for working with electricity and electrical wiring
   - Defines common electrical terms (e.g., amp, volt, ohm, watt, kilowatt, kilowatt hour, conductor, resistance, and transformer)
   - Determines amperage, voltage, horsepower, wattage, and rpm from the nameplate on an electric motor
   - Identifies the importance of grounding and ground fault circuit interrupters (GFCIs)
   - Calculates electrical power usage and cost using Ohm's law
   - Interprets electrical diagrams of common 110–120 volt AC electrical circuits (e.g., single-pole switches, three-way switches, outlets, GFCI, and fixtures)
   - Distinguishes the differences between AC and DC circuits
   - Identifies conductors and insulators

B. Knows the safe operation and maintenance of hand tools, power tools, and other equipment
   - Identifies potential safety hazards in the agriculture mechanics laboratory
   - Identifies and follows OSHA regulations
   - Identifies hand tools and determines their uses
   - Identifies power tools and determines their uses
   - Identifies the proper use of electrical wiring tools and supplies
   - Describes the basic use and maintenance of common pneumatic shop equipment (e.g., air compressor, impact wrench)
   - Describes hand-tool and power-tool maintenance

C. Is familiar with the principles of small-engine operation, maintenance, and repair
   - Identifies basic maintenance procedures and adjustments of internal combustion engines
   - Identifies the basic parts of a small gas engine
   - Describes the four-stroke cycle and the two-stroke cycle
   - Describes the principles of spark-ignition engine (gas) operation
   - Describes the basic principles of compression engine (diesel) operation
   - Identifies the different fuels used in internal combustion engines
   - Describes engine displacement

D. Is familiar with metal fabrication and welding
   - Describes and identifies metal shop safety procedures and equipment

- Describes different types of welding (e.g., shielded metal-arc welding (SMAW), gas metal-arc welding (GMAW), flux-cored arc welding (FCAW), tungsten-inert gas (TIG), oxy-fuel, and brazing)
- Identifies common welding joints, including lap, butt, and fillet
- Describes basic arc welding procedures and terminology (e.g., positions, classifying rods, and polarity)
- Describes proper metal-cutting practices (e.g., oxy-fuel, plasma, cutoff saws, and shears)
- Describes basic oxy-fuel welding procedures and terminology (e.g., positions, equipment setup, and selection)
- Describes the fundamentals of cold metal work

Test II Subareas

Subarea	Approx. Percentage of Test
I. Animal Systems	34%
II. Environmental and Natural Resource Systems	34%
III. Plant Systems	32%

Test II Objectives

Subarea I: Animal Systems

Objective 1: Understands the principles of animal science as related to the agriculture industry

The beginning Agricultural Education teacher:

A. Is familiar with the historical development and trends of the animal systems industry
   - Explains past, current, and emerging trends related to the animal agricultural industry
   - Describes the domestication of animals

B. Knows the classification, anatomical characteristics, and physiological characteristics
   - Understands the taxonomical classification system of animals
   - Identifies the structure and function of the major body systems of animals (e.g., digestive, reproductive, and respiratory)
   - Distinguishes animals by species, use, sex, age, and physical traits

C. Is familiar with proper health care of animals
   - Describes the use of vaccination and immunization in the animal science industry

- Selects proper routes of administration of medications and vaccines on various animal species
- Describes methods of controlling parasites of livestock
- Describes noninfectious and infectious diseases and disorders
- Differentiates between normal and abnormal behavior in common poultry and livestock
- Identifies causes of abnormal behavior in common poultry and livestock

D. Knows basic principles of animal nutrition

- Describes the importance of proper nutrition for animal production
- Differentiates between ruminant and nonruminant digestion
- Identifies the major groups of nutrients (e.g., proteins, carbohydrates, and minerals)
- Describes the general principles involved in balancing a ration
- Calculates a balanced ration, given animal requirements and feed composition, using the Pearson's square method

E. Is familiar with the principles and practices of basic animal reproduction

- Defines terminology related to reproductive management and breeding systems, including castration, estrus, gestation, lactation, and parturition
- Explains the role of the estrus cycle, ovulation, heat detection, and fertilization in animal reproduction management
- Identifies practices and principles related to animal reproduction (e.g., artificial insemination, embryo transfer, and selective breeding)
- Describes processes involved in cell division, including how genes affect the transmission of characteristics
- Completes Punnett square crosses for one-factor and two-factor crosses
- Defines phenotype and genotype of animals

Objective 2: Understands animal production, management, and safety

The beginning Agricultural Education teacher:

A. Knows the basic principles of animal production and management

- Selects market and breeding livestock based on visual assessment
- Selects animals to cull based on performance data
- Describes grading systems of livestock (e.g., feeder, quality, and yield)
- Interprets expected progeny differences (EPDs) to make production decisions
- Describes management procedures needed for effective livestock production (e.g., castration, docking, and dehorning)
- Defines crossbreeding, grading up, inbreeding, linebreeding, and purebred breeding

B. Knows safety practices related to animal production

- Describes basic procedures for handling animal materials (e.g., vaccinations, supplements)
- Describes safe animal-handling procedures
- Identifies the components of a safety and biosecurity plan for a specific class of animals

C. Is familiar with the proper design and use of animal facilities and the equipment for safe and efficient production

- Identifies common styles of facilities for common poultry and livestock production
- Identifies safe and effective facility designs based on animal species and environment
- Describes equipment needed for safe and effective handling of common poultry and livestock (e.g., squeeze chute, twitch, and grooming stand)

D. Is familiar with the effects of environmental conditions on animal production

- Understands that various environmental conditions affect animal agriculture (e.g., air, water, and temperature)
- Describes the effect of detrimental environmental conditions on common poultry and livestock (e.g., health, production, and reproduction)

E. Is familiar with the impacts of animal production on the environment

- Describes environmental conditions affected by animal production
- Describes the importance of a waste-management and an animal-disposal plan for livestock operations

F. Is familiar with the issues related to animal rights, animal welfare, and producer responsibilities

- Differentiates between animal welfare and animal rights
- Describes the USDA inspection process for livestock processing and handling facilities

Subarea II: Environmental and Natural Resource Systems

Objective 1: Understands the principles of environmental science

The beginning Agricultural Education teacher:

A. Is familiar with natural cycles related to environmental and natural resource management

- Identifies and explains the carbon cycle, water cycle, and nitrogen cycle as they relate to the environment

B. Is familiar with chemical properties related to environmental and natural resources

- Differentiates between organic and inorganic compounds

- Describes preemergence/postemergence and selective/nonselective herbicides
- Describes the effects of chemicals on organisms at different levels of the food chain (e.g., biomagnification)
- Differentiates between point (agricultural) and nonpoint (nonagricultural) source pollution

C. Is familiar with the various ecosystems of the environment
   - Identifies and describes the various types of ecosystems (e.g., biomes, aquatic versus terrestrial)
   - Identifies biotic and abiotic factors that define an ecosystem

D. Is familiar with the ecological concepts and principles related to natural resource systems
   - Identifies common forestry harvest techniques (e.g., clear-cut, thinning)
   - Explains the process of succession in a forest
   - Describes the purpose of reforestation (e.g., soil erosion, water quality, sustainability)
   - Explains the difference between preservation and conservation
   - Describes the concepts of population growth and carrying capacity

Objective 2: Understands the principles of environmental management and land use

The beginning Agricultural Education teacher:

A. Is familiar with the issues and regulations in forestry, land use, and environmental and natural resource management
   - Identifies the federal agencies responsible for forestry, environmental regulation, and natural resource management (e.g., United States Environmental Protection Agency (EPA), Natural Resources Conservation Service (NRCS), and Bureau of Land Management (BLM))
   - Describes the impact of federal regulations on agriculture production (e.g., Endangered Species Act (ESA) of 1973, water rights)
   - Describes the Georgia forestry industry

B. Knows the use of personal protective equipment (PPE) and safety procedures related to forestry, environmental, and natural resource management
   - Identifies PPE and safety procedures related to forestry, environmental, and natural resource management (e.g., fisheries, wildlife)

C. Is familiar with the role of forestry, environmental, and natural resource management in the local, state, and national economies
   - Describes the importance of hunting, trapping, fishing, and outdoor recreation to the economy
   - Knows significant legislation milestones related to natural resources (e.g., Clean Air Act, Clean Water Act)

- Explains the contributions of environmental and natural resource management to the national economy
- Describes the impact of forestry on the economy

D. Is familiar with the use, production, and processing of forestry and natural resources
   - Identifies products derived from forestry and natural resources (e.g., wood products, fuels, fish, and wildlife)
   - Differentiates between renewable and nonrenewable resources

E. Is familiar with procedures used to develop a forestry, environmental, and natural resource management plan
   - Describes population sampling techniques (e.g., quadrant sampling, electrofishing in aquatic systems, radio tracking)
   - Describes food web and the relationship between a species and the habitat needed to support that species
   - Explains the importance of an indicator species

F. Knows the general impact of land use on environmental and natural resources
   - Describes methods used to limit erosion and runoff (e.g., buffers, windbreaks)
   - Describes best management practices and explains how they benefit the environment (e.g., stocking rate, protection of critical wildlife habitat)
   - Describes the effects of urban sprawl on the environment

G. Is familiar with wetlands and their role in the environment
   - Explains the role of wetlands in the environment and the need for wetland conservation (e.g., flood control, wildlife habitat)

H. Is familiar with the impact of conventional and alternative energy sources on the environment
   - Identifies environmental impacts of energy production
   - Identifies and explains the use of conventional and alternative energy sources (e.g., fossil fuels, solar, and biomass)

Subarea III: Plant Systems

Objective 1: Understands the principles of plant and soil science as related to the agriculture industry

The beginning Agricultural Education teacher:

A. Is familiar with the historical development of plant science and its relationship with society
   - Knows the development of human use of plants (e.g., food, fiber, shelter)
   - Identifies the major milestones and advances of plant science (e.g., plant genetics, soil amendments)

- Understands the importance of plants in the global food supply

B. Knows general safety issues related to plant systems
   - Identifies and describes safety hazards related to plant production systems (e.g., chemicals, equipment, and tools)
   - Defines hazardous plant classifications (e.g., noxious, invasive)
   - Identifies and understands the use of personal protective equipment (PPE)
   - Interprets safety data sheet (SDS) information
   - Knows the guidelines for safe pesticide use

C. Knows the basic principles of identification, classification, anatomy, and physiology as related to plant production and management
   - Understands the taxonomical classification system of plants and the importance of binomial nomenclature
   - Differentiates between monocots and dicots
   - Describes reproductive and vegetative plant parts and their functions (e.g., roots absorption, stem support)
   - Describes major plant processes (e.g., photosynthesis, transpiration, and respiration)
   - Identifies and classifies plants according to use and growth habits (e.g., agronomic, horticultural, annual, perennial)
   - Differentiates between herbaceous and woody plants

D. Is familiar with the influence of environmental factors on plant growth
   - Describes how temperature, light, moisture, and air affect plant growth
   - Interprets USDA Plant Hardiness Zone Maps

E. Knows the basic characteristics and uses of soils, growing media, and nutrients
   - Identifies the macronutrients and micronutrients needed for plant growth
   - Describes the role of nitrogen (N), phosphorus (P), and potassium (K) in plant growth
   - Explains the role soil pH plays in plant production
   - Understands the materials used in soilless media, such as vermiculite, perlite, sphagnum moss, and horticultural-grade sand
   - Explains soil structure and texture as related to plant growth
   - Describes the types of water in soil (e.g., gravitational, capillary, hydroscopic, and chemically combined)
   - Describes the horizons within a soil profile
   - Understands the basics of soil conservation practices

F. Is familiar with the propagation, cultivation, and harvesting of plants
   - Describes sexual reproduction in plants (e.g., fertilization, germination, and pollination)

- Describes asexual propagation methods (e.g., cutting, layering, and grafting)
- Identifies major types of cultivation for horticultural crops, including hydroponics
- Identifies major types of cultivation for agronomic crops
- Identifies harvesting techniques (e.g., hand, mechanical)
- Describes the importance of growth regulators

Objective 2: Understands the principles of plant production and management

The beginning Agricultural Education teacher:

A. Is familiar with the use of integrated pest management (IPM) in plant production
   - Describes IPM and its purposes
   - Differentiates between cultural, biological, mechanical (physical), and chemical controls
   - Describes the types and uses of pesticides (e.g., herbicides, fungicides, and insecticides)

B. Is familiar with production and management practices associated with horticultural crops
   - Identifies proper management and production techniques related to greenhouses, orchards, gardens, and nurseries
   - Describes greenhouse structures and systems
   - Describes the divisions of horticulture (e.g., pomology, floriculture, landscape, and olericulture)

C. Is familiar with production and management practices associated with agronomic crops
   - Identifies equipment used in cultivating and harvesting agronomic crops
   - Identifies and describes the production and management practices of agronomic crops
   - Explains the importance of weed and pest control in agronomic crop production
   - Describes the divisions of agronomic crops (e.g., cereal grains, forage, oil, fiber)
   - Describes the purposes of crop rotation
   - Describes the fundamentals of cold metal work

D. Is familiar with the principles and elements of landscape and floral design
   - Identifies and describes the principles and elements of landscape and floral design

Practice Questions

The practice questions in this study companion are designed to familiarize you with the types of questions you may see on the assessment. While they illustrate some of the formats and types of questions you will see on the test, your performance on these sample questions should not be viewed as a predictor of your performance on the actual test. Fundamentally, the most important component in ensuring your success is familiarity with the content that is covered on the assessment.

To respond to a practice question, choose one of the answer options listed. Be sure to read the directions carefully to ensure that you know what is required for each question. You may find it helpful to time yourself to simulate actual testing conditions. A correct answer and a rationale for each sample test question are in the section following the practice questions.

Keep in mind that the test you take at an actual administration will have different questions, although the proportion of questions in each subarea will be approximately the same. You should not expect the percentage of questions you answer correctly in these practice questions to be exactly the same as when you take the test at an actual administration, since numerous factors affect a person's performance in any given testing situation.

Directions: Each of the questions or incomplete statements below is followed by four suggested answers or completions. Select the one that is best in each case.

1. Which of the following best describes the long-term trend in employment in occupations related to agriculture in the United States?

   A. Jobs on farms are decreasing
   B. Jobs in food processing are decreasing
   C. Jobs in ornamental horticulture are decreasing
   D. Jobs in agriculture service occupations are decreasing

Answer and Rationale

2. Which of the following was the principal cause for the decline and abandonment of irrigated farmland in the Sumerian Empire and the Nile valley of ancient Egypt?

   A. There was no regular fertilization with nitrogen sources
   B. The benefits of crop rotation were unknown
   C. Soil salts accumulated under poor drainage conditions
   D. Irrigated lands had to be near the water source and suffered frequent, disastrous flooding

Answer and Rationale

3. A farmer buys a new tractor for $40,000 and expects to use it for 20 years, after which the tractor will have a salvage value of $10,000. What is the straight-line depreciation that can be taken for the first year of ownership?

   A. $1,500
   B. $1,667
   C. $2,000
   D. $2,250

Answer and Rationale

4. The demand for which of the following products is likely to be the most elastic?

   A. Milk
   B. Bread
   C. Salt
   D. Pork

Answer and Rationale

5. Which of the following is the most probable effect of tariffs and quotas on domestic prices and domestic production?

   A. Both prices and production increase
   B. Both prices and production decrease
   C. Prices decrease, and production increases
   D. Prices increase, and production decreases

Answer and Rationale

6. An enterprise analysis shows an average return of $151 for each $100 of feed fed to hogs last year and a return of $130 per $100 of feed fed this year. Assuming stable feed costs and no major death losses, which of the following is the most likely explanation for the difference in returns?

   A. Lower feed efficiency
   B. Poor record keeping
   C. Lower market prices
   D. Lower purchase prices

Answer and Rationale

7. Which of the following degrees can be awarded by the local chapter of the FFA?

I. Greenhand FFA Degree
II. Chapter FFA Degree
III. State FFA Degree
IV. American FFA Degree

A. I only
B. II only
C. I and II only
D. I, II, III, and IV

Answer and Rationale

8. Which of the following concepts in Robert's Rules of Order requires that motions be dealt with in order of importance?

A. Order of business
B. Orders of the day
C. Order of precedence
D. Point of order

Answer and Rationale

9. The primary purpose of a supervised agricultural experience (SAE) program is to

A. provide a basis for students to apply for and win proficiency awards.
B. provide students with income to be used to learn money management skills.
C. give students a chance to earn enough money to qualify for local, state, and national FFA degrees.
D. allow students to apply skills learned in the classroom and learn new skills in a specialized area.

Answer and Rationale

10. Which of the following is a type of bacterium that produces a toxin in food under anaerobic conditions?

    A. Clostridium botulinum
    B. Clostridium tetani
    C. Mycobacterium bovis
    D. Staphylococcus aureus

Answer and Rationale

11. Which of the following is a likely outcome of the development and use of genetically modified plants by agricultural biotechnology companies?

    A. Reduced cost of plant seeds
    B. New plant varieties being patented
    C. Increased genetic diversity within a planted field
    D. Less oversight and regulation than for unmodified crops

Answer and Rationale

12. Which of the following most likely indicates the presence of water in the hydraulic system in a piece of farm machinery?

    A. A grayish, milky fluid
    B. Excessive fluid use
    C. Excessive thinning of the fluid
    D. A noisy relief valve

Answer and Rationale

13. Before removing a gas-powered lawn mower blade, it is most important to do which of the following?

    A. Adjust the wheels to their highest level
    B. Remove the spark plug
    C. Empty the gas tank
    D. Remove the air filter

Answer and Rationale

14. Which of the following is the best power hand tool and the best position for cutting a 14 inches wide by 8 feet long strip from a 4-foot by 8-foot sheet of 3/4-inch A/C plywood?

    A. Portable jigsaw, A side up
    B. Portable jigsaw, C side up
    C. Portable circular saw, A side up
    D. Portable circular saw, C side up

Answer and Rationale

15. Which of the following is a disorder in ruminants characterized by an excessive accumulation of gas in the rumen?

    A. Agalactia
    B. Bloat
    C. Bovine pleuropneumonia
    D. Grass tetany

Answer and Rationale

16. An electric fence installed to keep both mature cattle and sheep in a field should have a wire placed at which of the following heights?

I. 6 inches
II. 18 inches
III. 40 inches
IV. 60 inches

A. I only
B. II only
C. II and III only
D. III and IV only

Answer and Rationale

17. Which of the following methods of reforestation has the lowest direct cost but is also the slowest method and the least reliable?

A. Natural seeding
B. Direct seeding
C. Planting seedlings
D. Planting cuttings

Answer and Rationale

18. It is important to stock farm ponds with fish that can maintain themselves in balance with the food supply and other fish. A pond stocked with bream should also be stocked with which of the following?

A. Bass
B. Carp
C. Catfish
D. Crappies

Answer and Rationale

19. When under maximum pressure, the fluid volume in a closed hydraulic system should be closest to what percent of its original volume?

    A. 10
    B. 50
    C. 75
    D. 100

Answer and Rationale

20. Which **TWO** of the following methods of soil cultivation leave the previous year's crop residue on the soil before and after planting the next crop in order to reduce soil erosion and runoff?

    A. Strip cropping
    B. Crop rotation
    C. Conservation tillage
    D. Contour farming

Answer and Rationale

21. A farmer is using corn and soybeans to create a feed ration that is 18 percent protein. The corn has 10 percent protein, and the soybeans have 45 percent protein. What percent of each ingredient is required to make the desired 18 percent protein ration?

    A. 75% corn, 25% soybeans
    B. 25% corn, 75% soybeans
    C. 77% corn, 23% soybeans
    D. 23% corn, 77% soybeans

Answer and Rationale

22. If the permeability of subsoil is rapid, the subsoil texture is most likely classified as

    A. coarse.
    B. medium.
    C. fine.
    D. silty.

Answer and Rationale

23. Moderate and frequent irrigation would normally be most appropriate for a corn crop growing in a

    A. dispersed alluvial fan soil.
    B. heavy-textured soil, such as silty clay.
    C. light-textured soil, such as loamy sand.
    D. region of low humidity.

Answer and Rationale

24. The loss of water in the form of vapor from plants is referred to as

    A. transpiration.
    B. respiration.
    C. oxidation.
    D. condensation.

Answer and Rationale

25. The maximum depth that plant roots can readily penetrate without encountering a restrictive soil layer is referred to as

    A. effective depth.
    B. depth to the subsoil.
    C. depth to a parent material.
    D. O horizon.

Answer and Rationale

26. Soil structure refers to which of the following?

    A. Arrangement of soil particles
    B. Proportion of sand, silt, and clay
    C. Organic composition
    D. Profile depth

Answer and Rationale

27. In a four-cycle engine, what is the name of the stroke in which the piston is rising and both valves are closed?

    A. The intake stroke
    B. The exhaust stroke
    C. The power stroke
    D. The compression stroke

Answer and Rationale

28. Which of the following is part of a farm combine?

    A. Beater
    B. Conditioner
    C. Seed plate
    D. Furrow opener

Answer and Rationale

29. The principles of xeriscaping would be best exemplified by a homeowner who

    A. installs an in-ground sprinkler system that operates on a timer.
    B. lowers the cutting height on the lawn mower to reduce the surface area of the cutting blade.
    C. increases the use of fertilizer on the turfgrass to promote growth.
    D. replaces nonnative ornamentals with native shrubs that do not require irrigation.

Answer and Rationale

Answer Key and Rationales

Question Number	Correct Answer	Rationale
1	A	**Option A is correct.** There is a national trend of fewer workers employed in jobs on the farm. Back to Question
2	C	**Option C is correct.** The areas specified are deserts with very low rainfall, high temperatures, and high rates of evaporation. The Tigris, Euphrates, and Nile Rivers were used to irrigate huge areas, but with extensive development of irrigated areas there was insufficient water to flush out the salts that had accumulated over the years. Back to Question
3	A	**Option A is correct.** The tractor's value will drop by $30,000 (from $40,000 to $10,000) over 20 years. The annual loss in value (depreciation) thus averages $1,500 per year. Back to Question

Question Number	Correct Answer	Rationale
4	D	**Option D is correct.** Of the products listed, only pork has several substitutes that consumers can buy if the price of pork becomes too high. Back to Question
5	A	**Option A is correct.** Tariffs and quotas mean that some type of restriction is put on imported products. With fewer products on the market, buyers bid up the price of the domestic product to ensure their supply. Back to Question
6	C	**Option C is correct.** Changes in market price have a greater influence on returns than do most other inputs. Back to Question

Question Number	Correct Answer	Rationale
7	C	**Option C is correct.** FFA degrees, in order from lowest to highest level, are: Greenhand, Chapter, State, and American. The first two degrees are awarded by the local chapter. The third degree is given by the state association, and the American FFA Degree is given by the National FFA Organization. Back to Question
8	C	**Option C is correct.** Robert's Rules of Order state that motions must be taken in order of priority or precedence. Order of business is the usual agenda that an organization will follow in conducting its meetings. Orders of the day is a privileged motion used when the agenda is not being followed. Point of order is an incidental motion used to stop incorrect actions and to insist on the enforcement of parliamentary rules. Back to Question
9	D	**Option D is correct.** Learning through applying acquired skills while acquiring new skills in a specialized area is the primary purpose of SAE programs. Back to Question

Question Number	Correct Answer	Rationale
10	A	**Option A is correct.** Clostridium botulinum is a spore-forming, strictly anaerobic bacteria. Active clostridium botulinum produce a potent neurotoxin known as botulinum toxin that causes food-borne botulism. Clostridium tetani is also anaerobic but is not food borne. Bacteria in options C and D are not anaerobic. Back to Question
11	B	**Option B is correct.** Biotechnology companies will patent new varieties of plants. Option A is incorrect because new seeds will cost more as biotechnology companies attempt to recover their investment in developing new varieties. Option C is incorrect because genetic variety does not increase within a field, as the plants in the field will be the same genetically. Option D is incorrect because the oversight and regulation will be the same or stricter than those for nongenetically modified plants. Back to Question
12	A	**Option A is correct.** A grayish, milky fluid is indicative of water in the hydraulic system. Back to Question

Question Number	Correct Answer	Rationale
13	B	**Option B is correct.** Removing the spark plug is an important safety procedure before working on or near the lawn mower blade, because doing so will prevent accidental starting of the mower. Back to Question
14	D	**Option D is correct.** The portable circular saw is the best power hand tool for a job requiring a straight cut. Since the blade teeth move up through the wood, the lower-quality C side of the plywood should be the upper surface in order to avoid splinter damage to the more valuable A side. Back to Question
15	B	**Option B is correct.** Bloat is the visible distention of the belly in ruminants due to excess buildup of gases in the rumen**.** Back to Question

Question Number	Correct Answer	Rationale
16	C	**Option C is correct.** Electric fence wire should be placed at the height where it can be easily touched by the animal's nose. The nose is often damp and thus is especially sensitive to electricity. However, the wire must not be so high or so low that the animal can pass underneath or jump over without touching the wire. Recommended wire heights for cattle and horses are 30 to 40 inches; for hogs and sheep, 6 to 18 inches. Because the stock to be kept in the field are mature cattle and sheep, two wires should be used, at the 18-inch and 40-inch levels. Back to Question
17	A	**Option A is correct.** Natural seeding is the least expensive because it requires the least labor and machine costs. Back to Question
18	A	**Option A is correct.** Without some type of predator, a pond can quickly become overpopulated with bream. Bass feed on bream and help keep their numbers under control. Back to Question

Question Number	Correct Answer	Rationale
19	D	**Option D is correct.** In a closed hydraulic system, no fluid can enter or exit the system. The fluid volume must remain constant throughout all processes, so the volume is always at 100%. Back to Question
20	C	**Options C and D are correct.** Conservation tillage conserves soil by leaving sufficient crop residue to cover the soil surface, and contour farming is plowing and planting across sloped contour lines of consistent elevation. Both of these practices reduce soil losses from surface erosion and runoff. Back to Question
21	D	**Option C is correct.** The Pearson square or box method provides a procedure to determine balanced rations. Using this method, the soybean protein percentage would go in the top left of the square and the corn protein percentage in the bottom left of the square. Eighteen will be placed in the middle of the square because it represents the desired percentage of protein. The top right of the square has a figure that represents the absolute value of the difference between the corn protein percentage and the desired percentage, and the bottom right of the square has a figure that represents the absolute value of the difference between the soybean protein and the desired percentage. The sum of the top right and the bottom right of the square is 35. The percentage required for the soybean is the value of the top right of the square divided by the sum of the value in the top right side of the square plus the value in the bottom right side multiplied by 100%, which equals $(8/35)\times 100\% \approx 23\%$ open parenthesis, 8 divided by 35, close parenthesis, times 100%, which is approximately equal to 23%. The percentage required for the corn is the value of the bottom right of the square divided by the sum of the value in the top right side of the square plus the value in the bottom right side multiplied by 100%, which equals $(27/35)\times 100\% \approx 77\%$. Back to Question

Question Number	Correct Answer	Rationale
22	A	**Option A is correct.** Permeability refers to the ability of air and water to pass through the subsoil. Coarse-textured soils have larger particles (sand) and larger spaces between the particles that facilitate the passage of water and air. The smaller particles characteristic of soils with medium and fine textures provide more of a barrier to air and water movement. Back to Question
23	C	**Option C is correct.** Water drains rapidly out of light-textured soils, leaving the root zone dry. Moderate, frequent applications of water will provide more consistent moisture in the root zone than will infrequent, heavy watering. Back to Question
24	A	**Option A is correct.** Transpiration is the release of water vapor from living plants. Back to Question

Question Number	Correct Answer	Rationale
25	A	**Option A is correct.** The subsoil is easily penetrated by plant roots, and its depth is included in the effective depth measurement. Depending on the makeup of the parent material, effective depth may end at the beginning of the parent material. Very often, however, the parent material is nonrestrictive in the upper portion and is therefore included in the effective depth. The O horizon is the organic layer on the surface of the soil. Back to Question
26	A	**Option A is correct.** Soil structure is defined as the arrangement of soil particles. Back to Question
27	B	**Option D is correct.** There are four strokes of a four-cycle engine. During the compression stroke, the piston begins at its lowest point and then moves upward to its highest point. In order to compress the air-fuel mixture, the two valves, intake and exhaust, have to be closed. Back to Question

Question Number	Correct Answer	Rationale
28	A	**Option A is correct.** The beater on a combine is a device for threshing (separating) the grain from the straw and chaff. Options B, C, and D are not parts of a combine; they are associated with other types of farm equipment. Back to Question
29	D	**Option D is correct.** Only option D illustrates xeriscaping, which refers to a set of landscaping practices that conserve moisture and reduce the water needs of a landscape. Back to Question

Preparation Resources

The resources listed below may help you prepare for the GACE assessment 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 of these materials to obtain information on specific topics for study and review.

Guide to Taking a GACE Computer-delivered Assessment

This guide explains how to navigate through a GACE assessment and how to answer different types of test questions. This free download is available in the Test Preparation Resources section of the GACE website at ***www.gace.ets.org/prepare***.

Reducing Test Anxiety

This guide provides practical help for people who suffer from test anxiety. Designed specifically for GACE test takers, but useful to anyone who has to take tests, this guide reviews the major causes of test anxiety and offers practical advice for how to counter each one. Download this guide for free from the Test Preparation Resources section of the GACE website at ***www.gace.ets.org/prepare***.

Study Tips: Preparing for a GACE Assessment

This document contains useful information on preparing for selected-response and constructed-response tests. The instruction, tips, and suggestions can help you become a better-prepared test taker. See the Test Preparation Resources section of the GACE website at ***www.gace.ets.org/prepare*** for this free download.

Journals

Agricultural Economics: The Journal of the International Association of Agricultural Economics

The Agricultural Education Magazine

Journal of Agricultural Education, American Association for Agricultural Education — www.jae-online.org

Journal of Natural Resources and Life Sciences Education, American Association for Agricultural Education — www.jnrlse.org

Association for Career and Technology Education — www.acteonline.org

Other Resources

Cooper, E. L., and Burton, D. L. (2009). *Agriscience: Fundamentals and Applications*. Albany, N.Y.: Thomson Delmar Learning.

Deal, K. H. (2003). *Wildlife and Natural Resource Management*. Clifton Park, N.Y.: Thomson Delmar Learning.

Drummond, H. E., and Goodwin, J. W. (2004). *Agricultural Economics*, Second Edition. Upper Saddle River, N.J.: Prentice Hall.

Ekarius, C. (2004). *How to Build Animal Housing*. North Adams, Mass.: Storey Press.

Ess, D., and Morgan, M. (2003). *Precision Farming Guide for Agriculturalists*. Davenport, Iowa: John Deere Publishing.

Gillespie, J. R. (2009). *Modern Livestock and Poultry Production*, Seventh Edition. Clifton Park, N.J.: Thomson Delmar Learning.

Herren, R. V., and Cooper, E. L. (2005). *Agricultural Mechanics: Fundamentals and Applications*. Albany, N.Y.: Thomson Delmar Learning.

McMahon, M. J., Kofranek, A. M., and Rubatzky, V. (2006). *Hartmann's Plant Science*, Third Edition, Upper Saddle River, N.J.: Prentice Hall.

Plaster, E. J. (2009). *Soil Science and Management*, Fourth Edition. Clifton Park, N.J.: Thomson Delmar Learning.

Poincelot, R. P. (2004). *Sustainable Horticulture Today and Tomorrow*. Upper Saddle River, N.J.: Prentice Hall.

Nelson, P. V. (2012). *Greenhouse Operation and Management*, Sixth Edition. Upper Saddle River, N.J.: Prentice Hall.

Online Resources

Agriculture in the Classroom — ***www.agclassroom.org***

AgrowKnowledge, The National Center for Agriscience and Technology Education — ***http://atecenters.org/agrowknowledge***

Association for Career and Technology Education — ***www.acteonline.org***

National FFA Organization — ***www.ffa.org/index.html***

United States National Agriculture Library — ***www.nal.usda.gov***