
**NEW YORK STATE TEACHER
CERTIFICATION EXAMINATIONS™**

**FIELD 68: AGRICULTURE
TEST FRAMEWORK**

June 2003

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Subarea

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Agricultural Education and Career Development
Plant Science
Animal Science
Agricultural Business Management, Economics, and Marketing
Agricultural Mechanics and Technology
Agriculture and the Environment
Agricultural Education and Career Development: Constructed-Response Assignment

The New York State agricultural educator has the knowledge and skills necessary to teach effectively in New York State public schools. The agriculture teacher has a broad understanding of the goals and procedures of agricultural education and is familiar with the principles of agricultural economics, management, and entrepreneurship. The agriculture teacher understands the fundamental concepts of plant and animal science and recognizes the relevance of these fields to the agricultural industry. Finally, the agriculture teacher demonstrates an appreciation of the role of mechanical science and technology in contemporary agriculture and of the impact of agricultural activities on the natural environment.

SUBAREA I—AGRICULTURAL EDUCATION AND CAREER DEVELOPMENT

0001 Understand the foundations of agricultural education as an intracurricular relationship of classroom agricultural content, student leadership development (FFA), and experiential learning opportunities (SAE).

For example:

- demonstrating knowledge of the history, philosophy, and goals of agricultural education
- demonstrating an understanding of the application of scientific principles and methods to solve problems in agriculture
- identifying sources for learning about new developments in agriculture and agricultural education (e.g., in-service workshops, state and national professional organizations, the Internet)
- identifying characteristics and functions of agricultural education advisory committees and applying strategies to encourage student, community, and industry involvement in agricultural education programs
- identifying organizations and strategies to promote lifelong learning and agricultural literacy in the community (e.g., Food for America, New York Agriculture in the Classroom, public education campaigns)

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0002 Understand policies and procedures for ensuring safety in the classroom, laboratory, and field.

For example:

- applying procedures for selecting and maintaining appropriate equipment, materials, and technology used in agricultural education
- demonstrating knowledge of proper safety techniques for using agricultural equipment and materials in the educational setting
- demonstrating knowledge of the proper use, storage, and disposal of chemicals, biological specimens, and other materials
- identifying potential hazards in the classroom, laboratory, and field and applying procedures for minimizing hazards and responding to accidents
- identifying sources of safety-related information (e.g., Material Safety Data Sheets); federal and state regulations concerning safety; and local, state, and federal agencies responsible for maintaining safety in schools (e.g., New York State Education Department, Occupational Safety and Health Administration, Environmental Protection Agency)
- identifying a safe learning environment and applying strategies for incorporating safety training into the instructional content of the agricultural education program

0003 Understand career opportunities and requirements in agriculture, student leadership development organizations, and the importance of school-to-career experiences in agricultural education.

For example:

- identifying job specializations in agriculture and related fields and recognizing the knowledge and skills (e.g., degree requirements, advancement skills) necessary for a broad range of careers in agriculture
- applying strategies for career planning in agriculture and identifying sources of information about careers in agriculture-related fields (e.g., extension services, professional organizations, the Internet)
- demonstrating knowledge of procedures for applying for, obtaining, and maintaining employment in agriculture and related fields
- identifying characteristics and functions of the National FFA Organization and other student leadership development organizations (e.g., 4-H, Skills USA–VICA, Junior Achievement, Junior Horticulture Association) and applying strategies to encourage student participation in these organizations
- recognizing the importance of experiential learning in agricultural education and identifying characteristics and purposes of a Supervised Agricultural Experience (SAE)

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SUBAREA II—PLANT SCIENCE

0004 Understand principles of soil science.

For example:

- demonstrating knowledge of the formation, classification, and physical properties of soil (e.g., texture, particle density, structure, pore space) and identifying soil characteristics with regard to site and location
- identifying major soil constituents, analyzing their interrelationships, and demonstrating an understanding of their role in supporting plant growth
- comparing and contrasting the composition (e.g., clay content, organic matter content) and characteristics (e.g., drainage, pH, fertility) of different types of soil and evaluating the suitability of different types of soil for the production of various crops
- identifying methods and procedures for testing and evaluating the organic content, nutrient availability, and pH of soil and for applying the results of soil tests
- demonstrating knowledge of the use of different formulations (e.g., N, P, K) and types of fertilizers (e.g., organic vs. inorganic, timed-release) and procedures for improving the quality of soil (e.g., lime or fertilizer applications, additions of organic matter)

0005 Understand plant classification, morphology, and physiology.

For example:

- applying basic principles of taxonomy to plant classification and identifying distinguishing features of major plant groups
- recognizing requirements for plant growth and development (e.g., water, light, carbon dioxide, various nutrients) and how they are obtained and used by different types of plants
- identifying parts of plants, relating the structure of these parts to their functions, and analyzing differences in structure and function in different plant species
- demonstrating knowledge of physiological processes in plants (e.g., photosynthesis, respiration, transpiration, transport) and how these processes vary in different plant species
- analyzing the effects of various environmental factors (e.g., light intensity and duration, temperature) on plant growth and development

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0006 Understand reproduction, propagation, and selective breeding of plants.

For example:

- demonstrating knowledge of plant reproductive physiology and processes of plant reproduction (e.g., flowers and seeds, vegetative reproduction)
- demonstrating knowledge of methods and techniques used in the sexual propagation of plants (e.g., pollination, seed collection, storage, germination, testing, sowing)
- demonstrating knowledge of methods and techniques of asexual propagation of plants (e.g., cell cultures, cuttings, budding, grafting, layering) and recognizing reasons for using each technique
- identifying basic principles of plant genetics and their application to agriculture (e.g., selective breeding, hybridization)

0007 Understand plant production and management of crops grown in New York State.

For example:

- identifying types, varieties, characteristics, and uses of crops such as fruits (e.g., apples, grapes), tree crops (e.g., nuts, maple syrup), vegetables (e.g., sweet corn, cabbage, onions), and forage and field crops (e.g., potatoes, silage corn, alfalfa, timothy, pastures) grown in New York State
- demonstrating an understanding of methods and techniques of soil preparation (e.g., tillage, seed bed preparation), water management (e.g., irrigation, mulching), and rotation in the production of crops
- analyzing the effects of environmental factors (e.g., soil characteristics, temperature, humidity, wind) on crops
- demonstrating knowledge of procedures and techniques for selecting, planting, caring for, harvesting, and storing crops and managing pastures
- demonstrating an understanding of the effects of pests, diseases, weeds, and nutrient deficiencies on crop production

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0008 Understand principles and techniques of greenhouse and nursery management, floriculture, and landscaping.

For example:

- demonstrating knowledge of methods for controlling the greenhouse environment (e.g., climate control, automatic watering systems, cold frames)
- identifying characteristics and uses of crops grown in greenhouses, nurseries, and turf farms
- demonstrating knowledge of procedures and techniques for preparing and using different types of growth media (e.g., soil, hydroponic solutions)
- demonstrating knowledge of procedures and techniques for selecting, propagating, planting, and caring for horticultural crops
- demonstrating an understanding of the effects of pests, diseases, weeds, and nutrient deficiencies on turf, greenhouse, and nursery crops
- demonstrating knowledge of basic principles of floral design and techniques for the preparation and handling of flowers
- demonstrating an understanding of basic principles of landscape design and tools, equipment, methods, and techniques used in landscaping

SUBAREA III—ANIMAL SCIENCE

0009 Understand anatomy, physiology, and reproduction of animals.

For example:

- identifying characteristics (e.g., type, history of development, production levels, appearance) of various animal breeds, and products derived from domestic animals (e.g., milk, meat, eggs, leather)
- demonstrating an understanding of the anatomy of major organs and organ systems in various animals (e.g., livestock, poultry, companion animals, fish)
- demonstrating an understanding of physiological processes (e.g., digestion, respiration, circulation, reproduction) of various animals
- demonstrating knowledge of natural and artificial animal-breeding practices
- applying basic principles of genetics (e.g., dominant and recessive genes, independent assortment of traits) to the selective breeding of animals

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0010 Understand principles and practices of animal husbandry.

For example:

- identifying the purposes and methods of specific animal management practices (e.g., feeding, medicating, castrating, identifying, grooming)
- demonstrating knowledge of symptoms, prevention, and treatment of common diseases and disorders of various animals
- identifying procedures for measuring production and for making decisions about selecting, purchasing, selling, and culling individual animals
- demonstrating an understanding of animal nutrition (e.g., nutrients and deficiencies, schedules, feed selection, feed additives) for various animals
- demonstrating knowledge of the care and safe handling of animals throughout the life cycle
- demonstrating an understanding of social and ethical concerns regarding animal welfare

0011 Understand the design, construction, and management of animal facilities.

For example:

- identifying different types, characteristics, and purposes of facilities for various animals
- demonstrating knowledge of appropriate environments for housing animals (e.g., temperature, humidity, space, ventilation)
- identifying facilities and demonstrating knowledge of procedures for processing and packaging animal products (e.g., preventing contamination)
- applying procedures and practices for managing animal waste and maintaining sanitation
- demonstrating knowledge of environmental issues associated with animal facilities

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**SUBAREA IV—AGRICULTURAL BUSINESS MANAGEMENT, ECONOMICS, AND
MARKETING**

0012 Understand agricultural entrepreneurship and the effects of economic factors and government policies on agricultural business.

For example:

- demonstrating an understanding of basic economic principles (e.g., risk, supply and demand, economy of scale, diminishing returns) and how economic factors (e.g., commodity prices, fuel costs, taxes, competition) influence agricultural business decisions (e.g., crop mix, production levels)
- evaluating the role of entrepreneurship in agricultural business and recognizing the knowledge, skills, and procedures needed for starting an agricultural business
- identifying distinguishing characteristics and purposes of different types of agricultural business ownership (e.g., proprietorship, partnership, corporation)
- identifying the effects of government policies (e.g., crop subsidies, NAFTA, trade initiatives) and current economic events on agricultural businesses in New York State
- identifying local, state, and national agencies with regulatory responsibilities in agriculture and the effect of state and federal regulations on agricultural business practices

0013 Understand management of an agricultural business.

For example:

- demonstrating knowledge of basic principles of agricultural business management (e.g., planning, organizing, setting goals and priorities)
- applying procedures (e.g., cost/price analysis, input/output levels) for adjusting and scheduling production and managing risk in agricultural business
- applying methods of financial analysis (e.g., types of budgeting and their uses, trend analysis, capital investment analysis, balance sheets) and record keeping in agricultural business
- demonstrating knowledge of types, sources, and uses of credit, security instruments, appraisals, and insurance in agricultural business
- demonstrating an understanding of principles and procedures of labor management in agricultural business (e.g., hiring, training, and supervising personnel; setting wages and benefits; fostering teamwork)
- demonstrating an understanding of the role of computer technology in agricultural business (e.g., business-related hardware and software, computer applications for business planning and communication)

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0014 Understand marketing principles and practices in agricultural business.

For example:

- identifying types and characteristics of domestic and international markets for agricultural products produced in New York State
- applying strategies for marketing agricultural products and services (e.g., direct marketing to consumers, agricultural cooperatives)
- analyzing how different marketing strategies affect agricultural business decisions
- identifying factors that influence the pricing of agricultural goods and services
- demonstrating an understanding of strategies for evaluating consumer behavior and of the uses, benefits, and costs of different types of merchandising and advertising
- demonstrating an understanding of the role of government regulations in marketing agricultural products (e.g., labeling, quality standards)

SUBAREA V—AGRICULTURAL MECHANICS AND TECHNOLOGY

0015 Understand the principles and applications of agricultural mechanics.

For example:

- demonstrating knowledge of the design, components, and construction of small-engine, high-compression gas engine, and diesel machinery and power equipment used in agriculture
- demonstrating knowledge of principles of physics as they apply to agriculture (e.g., pulleys, levers, inclined planes)
- demonstrating knowledge of basic construction techniques used in agricultural enterprises (e.g., carpentry, masonry, plumbing, electrical work, measuring, drafting, surveying)
- demonstrating knowledge of the use of electronics, welding, and hydraulics in agriculture

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0016 Understand the safe operation and maintenance of agricultural tools, machinery, and power equipment.

For example:

- identifying common fasteners, hand tools, and power tools and their uses in agriculture
- demonstrating knowledge of servicing, maintaining, and operating agricultural tools and equipment
- demonstrating knowledge of procedures for troubleshooting and repairing agricultural machinery and power equipment
- identifying safety regulations, policies, and procedures for the operation, maintenance, and repair of agricultural tools, machinery, and power equipment

0017 Understand the use of technology in agriculture.

For example:

- demonstrating knowledge of the integration of computer technology systems in agricultural production (e.g., product yield, breeding stock selection, environmental monitoring)
- demonstrating knowledge of the use of computer technology for agricultural record keeping (e.g., maintenance schedules, production yields, client data base)
- demonstrating knowledge of the use of technology systems to collect and analyze agricultural information (e.g., diagnostics, trends)
- demonstrating knowledge of the application of emergent technologies to agriculture
- demonstrating knowledge of the application of global positioning systems (GPS) and geographic information systems (GIS) in agriculture

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0018 Understand agricultural applications of biotechnology and genetic engineering.

For example:

- demonstrating knowledge of historical uses of biotechnology in animal and plant selection and food processing
- identifying agricultural applications of biotechnology and genetic engineering (e.g., cold tolerance and herbicide resistance in plants, production of bovine and porcine somatotropin by bacteria)
- demonstrating an understanding of basic principles of gene mapping and manipulation, cloning, and DNA fingerprinting
- demonstrating an understanding of laboratory techniques used in biotechnology and genetic engineering (e.g., cell cultures, electrophoresis, gene splicing)
- demonstrating an understanding of social, political, economic, ethical, and religious implications of agricultural use of biotechnology and genetic engineering (e.g., environmental concerns, human health concerns, transgenic manipulation)

SUBAREA VI—AGRICULTURE AND THE ENVIRONMENT

0019 Understand natural resources and principles of air, land, and water management.

For example:

- recognizing the importance of natural resources (e.g., land, water, petroleum) to agriculture and comparing and contrasting renewable and nonrenewable resources
- analyzing the effects of resource availability, pricing, and depletion on agriculture (e.g., oil price hikes, loss of farmland to nonfarm uses, biofuels)
- identifying types of land and water use (e.g., recreation, agricultural production, development) and management (e.g., strip cropping, streambank protection, nutrient management) in New York State
- applying strategies for conserving and renewing land, water, and other natural resources (e.g., methods of erosion control, recycling, incorporation of composted manure as soil treatment)
- analyzing the role of government agencies and public service organizations in air, land, and water conservation and management

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0020 Understand how agricultural practices affect the environment and food safety.

For example:

- demonstrating knowledge of how agricultural production practices affect air, soil, and water quality and identifying strategies to reduce the deleterious effects of these practices
- demonstrating knowledge of how air, soil, and water pollution affect agricultural production (e.g., effects of ozone on crop growth, salinization of cropland)
- demonstrating knowledge of the economic costs of environmental degradation and the costs and benefits of measures for reducing pollution and cleaning up the environment
- demonstrating knowledge of the methods used to ensure the safety of crops and animal products used for human consumption (e.g., biosecurity, pesticide residues, random testing of products, facilities inspections)
- identifying local, state, and national environmental protection agencies (e.g., EPA, local boards of health and conservation) and regulations (e.g., wetlands protection, pesticide restrictions) that affect agricultural activities

0021 Understand basic ecological concepts.

For example:

- demonstrating an understanding of basic ecological concepts, the flow of matter and energy through ecosystems, and the interactions of organisms with the physical environment and other organisms
- recognizing the importance of habitat conservation, maintaining a high level of biodiversity within ecosystems, and ecosystem diversity within geographical areas
- demonstrating knowledge of the impact of agricultural activities on ecosystems

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0022 Understand methods of forest management and fishery and wildlife conservation.

For example:

- identifying major forest products and important species of fish and wildlife in New York State
- demonstrating knowledge of principles and practices of forest management and fish and wildlife conservation
- identifying strategies for managing the effects of agriculture on fish and wildlife and their habitats
- identifying the economic, social/cultural, and political issues affecting forest management and fish and wildlife conservation

**SUBAREA VII—AGRICULTURAL EDUCATION AND CAREER DEVELOPMENT:
CONSTRUCTED-RESPONSE ASSIGNMENT**

The content to be addressed by the constructed-response assignment is described in Subarea I, Objectives 01–03.