

ACHIEVEMENT LEVEL DESCRIPTORS

FOR THE PLANT SYSTEMS ASSESSMENT

Please note: Students performing at the Meets Expectations level also meet all standards at the Approaches Expectations level, and students performing at the Exceeds Expectations level also meet all standards at the Approaches Expectations level.

APPROACHES EXPECTATIONS

Students performing at the Approaches Expectations level can explain systems used to classify plants, the basic process of photosynthesis and its importance to life on Earth, and the functions and components of seeds and fruit. They can describe the morphological characteristics used to identify agricultural plants and diagram a typical plant cell. Students can identify plant cell organelles and their functions, the components and the functions of plant stems, the components of a flower, the functions of a flower, the functions of flower components, and the five groups of naturally occurring plant hormones as well as synthetic plant growth regulators. These students can identify the components, the types, and the functions of plant roots. They are able to discuss leaf morphology and the functions of leaves. They can explain cellular respiration and its importance to plant life. These students can define primary growth and the role of the apical meristem. They can compare and contrast the effects of transpiration, translocation, and assimilation on plants. They are able to research and summarize the importance of pest- and disease-free propagation material as well as list and determine seeding rate need for specified plant population or desired quantity of finished plants. They can list and summarize the reasons for preparing growing media before planting. Additionally, these students can observe and record environmental conditions during the germination, growth, and development of a crop.

Students who perform at this level can describe the qualities of light that affect plant growth, the effects of air, temperature, and water on plant metabolism and growth, the damage caused by plant pests and diseases, and pest control strategies associated with integrated pest management. These students can collect soil and plant tissue samples for testing and interpret the test results. They are able to discuss the influence of pH and cation exchange capacity on the availability of nutrients. They can identify the essential nutrients for plant growth and development and their major function as well as the types of plant pests, diseases, and pest control strategies associated with integrated pest management. They can identify fertilizer sources for essential plant nutrients, explain fertilizer formulations, and describe different methods of fertilizer application. Students at this level can explain the risks and benefits associated with the materials and methods used in plant pest management.

Students performing at this level can explain pollination, cross-pollination, and self-pollination of flowering plants. They are able to explain the principles behind recombinant DNA technology and the basic steps in the process. They can explain the importance of starting with pest- and disease-free propagation material and the reasons for preparing growing media before planting. These students can describe optimal conditions for asexual propagation and demonstrate techniques used to propagate plants by cuttings, division, separation, and layering as well as proper planting procedures and post-planting care. They are able to define micropropagation, discuss advantages associated with the practice, and outline the four main stages of the

process. They can observe and record environmental conditions during the germination, growth, and development of a crop. They can identify storage methods for plants and plant products. Students performing at this level can explain the reasons for controlling plant growth, calculate crop yield and loss, and explain the reasons for preparing plants and plant products for distribution.

Students approaching expectations are able to identify the categories of soil water. They can discuss how water moves into and through soil and how it is retained. They can identify and summarize the components within agriculture, food, and natural resource systems (Animal Systems: health, nutrition, and genetics; Natural Resources Systems: soil and water). Additionally, these students are able to define and summarize societies on local, state, national, and global level and describe how they relate to agriculture, food, and natural resource systems. They can examine and summarize the components of the agricultural economy (such as environmental, crops, and livestock), the principles of recombinant DNA technology, and the basic steps in the process. These students can explain sustainable agriculture and objectives associated with the strategy.

Finally, students performing at the Approaching Expectations level can identify the major components of growing media and the components of soil (water, mineral particles, air, and organic matter). They can describe how growing media support plant growth and the main types of soil peds. They are able to define the difference between soil texture from structure as well as soil pH and how it relates to soil health and productivity. These students can diagram the carbon cycle and collect, document, submit, or test a composite soil sample. They can state the sources of N, P, and K in a soil and recognize the USDA soils survey system. They can also discuss why soils varies from place to place.

MEETS EXPECTATIONS

Students performing at the Meets Expectations level can compare and contrast the hierarchical classification of agricultural plants and compare and contrast mitosis and meiosis. They can identify agriculturally important plants by common names, root tissues, the major types of fruit, and the different types of flowers and flower forms. They are able to explain the pathway of water and nutrients into and through the root tissues. Students can describe the processes of translocation and explain how leaves capture light energy and allow for the exchange of gases. They are able to explain factors that affect cellular respiration, describe the process of secondary plant growth, and list the requirements necessary for photosynthesis to occur. They can identify the products and byproducts of photosynthesis and cellular respiration as well as the plant responses to plant growth regulators and different forms of tropism. These students can identify and analyze the factors affecting transpiration, translocation, and assimilation rate and products. They are able to inspect propagation material for evidence of pests or disease and prepare soil and growing media for planting with the addition of amendments. Additionally, students can apply pre-plant treatments required of seeds and plants and evaluate the results. They can monitor the progress of plantings and determine the need to adjust environmental conditions.

Students performing at this level are able to describe plant responses to light color, intensity, duration, and nutrient deficiency symptoms as well as recognize environmental causes of nutrient deficiencies. They are able to determine the optimal air, temperature, and water conditions for plant growth, types of pesticide controls and formulations, as well as the nutrient content of soil using appropriate laboratory procedures and prescribe fertilization based on results. Students can contrast pH and cation exchange capacity between mineral soil and soilless growing media. They can calculate the amount of fertilizer to be applied and calibrate equipment to apply the prescribed amount of fertilizer. They are able to identify major local weeds, insect

pests, and infectious and noninfectious plant diseases. Students performing at this level can diagram the life cycles of major plant pests and diseases. Additionally, these students can explain procedures for the safe handling, use, and storage of pesticides and summarize pest control strategies associated with integrated pest management.

Students who perform at the Meets Expectations level are able to diagram the process of sexual reproduction of flowering plants. They can demonstrate proper procedures in budding or grafting selected material, perform aseptic micropropagation techniques, and handle seed to overcome seed dormancy mechanisms in order to maintain seed viability and vigor. They are able to provide examples of the risks and advantages associated with genetically modified plants. These students can inspect propagation material for evidence of pests or disease. They can prepare soil for planting with the addition of amendments. They can apply pre-plant treatments required of seeds and plants and evaluate the results. They are able to monitor the progress of plantings and determine the need to adjust environmental conditions. Students performing at this level are able to demonstrate proper techniques to control and manage plant growth through mechanical, cultural, or chemical means as well as assess the stage of growth to determine crop maturity or salability. They can demonstrate proper harvesting techniques. They can evaluate crop yield and loss data and explain the proper conditions to maintain the quality of plants and plant products held in storage. These students can demonstrate techniques for grading, handling, and packaging plants and plant products for distribution.

Students who perform at this level are able to discuss how soil drainage and water-holding capacity can be improved. They can describe how water is lost to evapotranspiration, explain sustainable agriculture practices, and compare the ecological effects of traditional agricultural practices with those of sustainable agriculture. These students can assess components within agriculture, food, and natural resource systems. They can assess how people within societies on local, state, national, and global levels interact with agriculture, food, and natural resource systems on daily, monthly, or yearly basis; assess the economic impact of an agriculture, food, and natural resource system on a local, state, national, and global level; and analyze relationships between systems. They are able to compare and contrast the potential risks and advantages associated with genetically modified plants.

Finally, students performing at the Meets Expectations level can describe the physical characteristics of growing media and the process of soil formation through the five soil forming factors—time, topography, weathering, soil organisms, and climate. These students can describe how soil structure is related to soil treatment (such as plowing, cultivation, and organic matter amendments) and how soil treatment is related to the degradation or improvement of soil structure. They can explain the influence they have on plant growth. They are able to determine the ideal pH for most plants and how pH can affect the solubility/availability of certain nutrients. They can describe the various forms carbon takes in the carbon cycle. Additionally, they can diagram and explain the N, P, and K cycle. These students are able to interpret a USDA soil survey, the results of a soil test, and state the soil type that is shown for a parcel in the soil survey.

EXCEEDS EXPECTATIONS

Students performing at the Exceeds Expectations level can classify agricultural plants according to the hierarchical classification system, life cycles, plant use, and as monocotyledons or dicotyledons. They are able to identify agriculturally important plants by scientific names. These students can apply concepts associated with translocation to the management of plants, the knowledge of flower structures to plant breeding, production, and use, and the knowledge of seed and fruit structures to plant culture and use. They can explain the relationships between leaf structure and functions and plant management practices, the light-dependent

and light-independent reactions that occur during photosynthesis, and apply the knowledge to plant management. They are able to demonstrate the knowledge of cell differentiation and the functions of the major types of cells to plant systems. Additionally, they are able to relate the active and passive transport of minerals into and through the root system for plant nutrition. These students can explain the four stages of aerobic respiration and relate cellular respiration to plant growth, crop management, and postharvest handling as well as relate the principles of primary and secondary growth to plant systems. They are able to devise plans for plant management that applies knowledge of transpiration, translocation, and assimilation on plant growth. They can select plant growth regulators to produce desired responses from plants and analyze how mechanical planting equipment performs soil preparation and seed placement. They are able to produce pest- and disease-free propagation material. Students performing at this level can demonstrate knowledge of adjustment and calibration of mechanized seeding and planting equipment for desired seed application rate. They are able to prepare and implement a plant production schedule based on predicted environmental conditions and desired market target (such as having plants ready to market on a specific day like Mother's Day, organic production, or low maintenance landscape plants).

Students who exceed expectations are able to evaluate plant responses to varied light color, intensity, and duration as well as environmental and consumer concerns regarding pest management strategies. They can design, implement, and evaluate a plan to maintain optimal conditions for plant growth and a crop scouting program. They are able to predict pest and disease problems based on environmental conditions and life cycles. They can diagnose plants for signs of nutrient deficiencies and prepare a scouting report. These students are able to determine the nutrient content of plant tissue samples using appropriate laboratory procedures and prescribe fertilization based on results. They can adjust the pH of growing media and use variable-rate technology to apply fertilizers to meet crop nutrient needs. They are able to employ pest management strategies to manage pest populations, assess the effectiveness of the plan, and adjust the plan as needed. Additionally, students performing at this level are able to summarize pest control strategies associated with integrated pest management and the importance of determining economic thresholds.

Students who perform at the Exceeds Expectations level are able to design and implement a plan to control the pollination of plants. They can evaluate asexual propagation practices based on productivity and efficiency as well as the performance of genetically modified crops. They are able to conduct tests associated with seed germination rates, viability, and vigor. These students can prepare growing media for planting and prepare and implement a plant production schedule based on predicted environmental conditions. They can propagate plants by micropropagation and can produce pest- and disease-free propagation material. Students at this level are able to create and implement a plan to control and manage plant growth as well as implement plans to reduce crop loss. They can operate mechanized planting and harvesting equipment. They are able to monitor environmental conditions in storage facilities for plants and plant products as well as evaluate techniques for grading, handling, and packaging plants and plant products.

Students performing at this level are able to determine the hydraulic conductivity for soil and how the results influence irrigation practices. They can determine how soil drainage and water-holding capacity can be improved. They can predict the amount of water lost to evapotranspiration when given specific data on soil moisture retention and irrigation practices. They are able to evaluate how society traditions, customs, or policies have resulted from practices with agriculture, food, and natural resource systems as well as how positive or negative changes in the local, state, national, or global economy impacts agriculture, food, and natural resource systems. These students can devise and implement a strategy for explaining components of agriculture, food, and natural resource systems to audiences with limited knowledge. They can prepare and implement a plan for an agricultural enterprise that involves practices in support of sustainable agriculture. They are able to evaluate the impact of using genetically modified crops on other production practices.

Finally, students performing at the Exceeds Expectations level are able to formulate and prepare growing media for specific plants or crops. They can differentiate soils based on soil horizons and parent material. Students are able to diagnose and prescribe treatments for potential plant growth related problems associated with soil structure (such as pans or compaction). They are able to analyze how pH can be adjusted (for example, by liming, acid injection, or sulfur application). These students can discuss the ecological importance of the various forms of carbon in the carbon cycle and can describe how nutrients are "gained" and "lost" in the soil nutrient cycle. They can utilize soil survey to determine the best land uses (such as crop land or homesite) and make recommendations to improve soil after interpreting the soil test.