



**MASSACHUSETTS**  
**DEPARTMENT of**  
**EDUCATION**

**Vocational Technical Education  
Framework**

**Agriculture and Natural Resources  
Cluster**

***Horticulture***

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## **Strand 1: Safety and Health Knowledge and Skills**

### **1.A Define health and safety regulations.**

- 1.A.01a Identify and apply OSHA and other health and safety regulations that apply to specific tasks and jobs in the occupational area.
- 1.A.02a Identify and apply EPA and other environmental protection regulations that apply to specific tasks and jobs in the occupational area.
- 1.A.03a Identify and apply Right-To-Know (Hazard Communication Policy) and other communicative regulations that apply to specific tasks and jobs in the occupational area.
- 1.A.04a Explain procedures for documenting and reporting hazards to appropriate authorities.
- 1.A.05a List penalties for non-compliance with appropriate health and safety regulations.
- 1.A.06a Identify contact information for appropriate health and safety agencies and resources.
- 1.A.07 Describe procedures of the Worker Protection Standard.

### **1.B Demonstrate health and safety practices.**

- 1.B.01a Identify, describe and demonstrate the effective use of Material Safety Data Sheets (MSDS).
- 1.B.02a Read chemical, product, and equipment labels to determine appropriate health and safety considerations.
- 1.B.03a Identify, describe and demonstrate personal, shop and job site safety practices and procedures.
- 1.B.04a Demonstrate safe dress and use of relevant safety gear and personal protective equipment (PPE), including wrist rests, adjustable workspaces and equipment, gloves, boots, earplugs, eye protection, and breathing apparatus.
- 1.B.05a Illustrate appropriate safe body mechanics, including proper lifting techniques and ergonomics.
- 1.B.06a Locate emergency equipment in your lab, shop, and classroom, including (where appropriate) eyewash stations, shower facilities, sinks, fire extinguishers, fire blankets, telephone, master power switches, and emergency exits.
- 1.B.07a Demonstrate the safe use, storage, and maintenance of every piece of equipment in the lab, shop, and classroom.
- 1.B.08a Describe safety practices and procedures to be followed when working with and around electricity.
- 1.B.09a Properly handle, store, dispose of, and recycle hazardous, flammable, and combustible materials.
- 1.B.10a Demonstrate proper workspace cleaning procedures.
- 1.B.11c Demonstrate proper spacing distance from others when using tools.

### **1.C Demonstrate responses to situations that threaten health and safety.**

- 1.C.01a Illustrate First Aid procedures for potential injuries and other health concerns in the occupational area.
- 1.C.02a Describe the importance of emergency preparedness and an emergency action plan.

- 1.C.03a Illustrate procedures used to handle emergency situations and accidents, including identification, reporting, response, evacuation plans, and follow-up procedures.
- 1.C.04a Identify practices used to avoid accidents.
- 1.C.05a Identify and describe fire protection, precautions and response procedures.
- 1.C.06a Discuss the role of the individual and the company/organization in ensuring workplace safety.
- 1.C.07a Discuss ways to identify and prevent workplace/school violence.

**Performance Example:**

1. Describe a safety plan for employees under your supervision in the workplace or at a job site. Include factors related to protecting the environment.
2. Given a specific task, describe or demonstrate proper safety procedures/methods.

## **Strand 2: Technological Knowledge and Skills**

### **2.A Select and use the appropriate tool to perform a given task.**

- 2.A.01c Select tools and equipment.
- 2.A.02c Identify standard tools, equipment, and safety procedures.
- 2.A.03c Follow operating instructions.
- 2.A.04c Set up/adjust tools and equipment.
- 2.A.05c Demonstrate proper maintenance of all tools.
- 2.A.06c Store tools properly.

#### **Performance Example:**

1. Demonstrate operation of a specific tool or piece of equipment.
2. Given a specific task, describe the tool/equipment required, the safety issues and training required, how to operate, and basic maintenance functions to be performed by the operator.

### **2.B Illustrate the scientific principles important to the growth, maintenance, and commercial production of plants in the industry.**

- 2.B.01 Define and explain photosynthesis.
- 2.B.02 Define and explain transpiration.
- 2.B.03 Define and explain respiration.
- 2.B.04 Define and explain nutrition and fertilization.
- 2.B.05 Define and explain plant anatomy, identification of basic plant parts.
- 2.B.06 Define and explain sexual reproduction.
- 2.B.07 Define soil structure and texture as they relate to plant anatomy and physiology.
- 2.B.08 Distinguish monocots from dicots.
- 2.B.09 Distinguish angiosperms from gymnosperms.
- 2.B.10 List the rules for plant nomenclature.
- 2.B.11 Give common and scientific names for plants.
- 2.B.12 Identify leaf types (simple vs. compound).
- 2.B.13 Identify leaf arrangements (alternate, opposite, and whorled).
- 2.B.14 Describe the use of a key or reference guide to identify plants.

### **2.C Choose and apply appropriate plant health care and pest management practices.**

- 2.C.01 Define and describe importance of plant health care (PHC).
- 2.C.02 Describe the optimum environmental growing conditions for a variety of plants.
- 2.C.03 Describe and demonstrate methods of soil testing.
- 2.C.04 Identify pests and diseases that affect specific plants and growing conditions (greenhouses, fields, turfgrass, etc).
- 2.C.05 Examine plants and recognize and report damage resulting from disease and insects.
- 2.C.06 Recognize insects by the damage they cause (chewing, piercing/sucking, leafminer, borer, shredder, filter feeder).
- 2.C.07 Identify and remove diseased plants grown in beds, pots, or frames in the greenhouse or shadehouse.
- 2.C.08 Compare and contrast chemical and organic plant nutrients and pest management.
- 2.C.09 Select appropriate control of plant pests.

- 2.C.10 Discuss the pros, cons, and procedures of integrated pest management.
- 2.C.11 Measure, mix, and apply a recommended chemical for control of a specific pest (using simulations where appropriate).
- 2.C.12 Differentiate between weeds and desired plants.
- 2.C.13 Define problems caused by invasive plants.
- 2.C.14 Identify and manually remove weeds using recommended procedures.
- 2.C.15 Demonstrate the ability to clean spray equipment after use according to approved practices.
- 2.C.16 Repair and/or replace nonfunctional hoses, pipes, lines or nozzles on spray equipment.
- 2.C.17 List state pesticide regulations and protections under the federal worker protection act.

**2.D Safely operate and maintain basic industry equipment.**

- 2.D.01 Define equipment and maintenance terms.
- 2.D.02 Identify the basic components of small engines.
- 2.D.03 Differentiate between the component functions of two- and four- cycle engines.
- 2.D.04 Differentiate between gas and diesel engines.
- 2.D.05 Identify maintenance procedures recommended for diesel engines.
- 2.D.06 Discuss the differences between fuels and lubricants used in diesel and gasoline engines.
- 2.D.07 Identify types of and operating procedures for a variety of mowers.
- 2.D.08 List the proper maintenance procedures used on a variety of mowers.
- 2.D.09 Demonstrate daily maintenance on a four-cycle engine (check fuel, air filter, oil, ignition).
- 2.D.10 Demonstrate daily maintenance on a two-cycle engine (check proper fuel mixture, air filter, ignition).
- 2.D.11 Demonstrate safe operating procedures for a two-cycle handheld gas powered string trimmer.
- 2.D.12 Demonstrate how to operate and maintain a handheld pump sprayer.
- 2.D.13 Identify the components of a sprayer used in specific applications.
- 2.D.14 Discuss the process of calibrating a sprayer used in specific applications.
- 2.D.15 Explain the maintenance procedure used on sprayers used in specific applications.
- 2.D.16 Demonstrate use, inspection, and repair of garden hoses.
- 2.D.17 Demonstrate operation of a power drill and power screwdriver.
- 2.D.18 Grease tractors or other equipment using specifications listed in the operator's manual.
- 2.D.19 Oil electric motors according to specifications listed in the operator's manual.
- 2.D.20 Identify tools used on maintenance of equipment.

**2.E Identify plants by their growth habits.**

- 2.E.01 Identify bulbs (daffodil, tulip, gladiola, dahlia, Easter lily, wild Lily of the Valley).
- 2.E.02 Identify annuals (impatiens, geraniums, marigolds).
- 2.E.03 Identify biennials (hollyhock, chard, parsley, carrots).

- 2.E.04 Identify perennials (hemerocallis, rudbeckia, delphinium, trout lily).
  - 2.E.05 Identify deciduous shrubs (forsythia, viburnum, lilac, sweet pepperbush).
  - 2.E.06 Identify needled evergreen shrubs (yew, juniper, cypress).
  - 2.E.07 Identify broadleaf evergreen shrubs (azaleas, rhododendrons, mt. laurel).
  - 2.E.08 Identify coniferous trees (pine, spruce, fir, Atlantic white cedar).
  - 2.E.09 Identify deciduous trees (maple, oak, birch).
  - 2.E.10 Identify deciduous-coniferous trees (larch, dawn redwood, bald cypress).
- 2.F Identify plants by their leaf types.**
- 2.F.01 Identify simple leaf plants (birch, elm).
  - 2.F.02 Identify a compound leaf plant (leaf which has leaflets).
  - 2.F.03 Identify non-hardy or tropical plants (ficus, palm, rubber tree).
- 2.G Identify animals and wildlife and their relationship to horticulture.**
- 2.G.01 Identify species of birds and their habitats.
  - 2.G.02 Identify species of mammals and their habitats.
  - 2.G.03 Identify species of fish and their habitats.
  - 2.G.04 Identify species of reptiles and amphibians and their habitats.
  - 2.G.05 Identify the benefits and harms of specific animals to a planned or natural environment.
- 2.H Demonstrate proper propagation and installation of plants using current industry recommendations.**
- 2.H.01 List the types of plant propagation.
  - 2.H.02 List the environmental factors necessary for germination.
  - 2.H.03 Cite the characteristics of a good germination medium.
  - 2.H.04 Prepare soils and planting media.
  - 2.H.05 Explain the importance of proper stage of growth for transplanting seedlings.
  - 2.H.06 Outline the process involved in division of plants.
  - 2.H.07 Compare the types of layering.
  - 2.H.08 Transplant seedlings, plugs, and cuttings.
  - 2.H.09 Select and plant seasonal bulbs (Spring, Fall, Greenhouse).
  - 2.H.10 Select and plant seeds and follow planting instructions (Grass, Herbaceous, Woody Plants).
  - 2.H.11 Seed a flat or individual container using recommended procedures.
  - 2.H.12 Perform asexual plant propagation techniques (Leaf cuttings, Soft cuttings, Air layering).
  - 2.H.13 Install bedding plants (annuals, perennials).
  - 2.H.14 Install trees and shrubs according to the American Nurseryman's Standards (ANS).
  - 2.H.15 Plant a selected crop of rooted cuttings using recommended procedures.
  - 2.H.16 Identify the varieties of flowering and non-flowering plants that are most profitably grown in the local community.
  - 2.H.17 Package and label plants for shipment.

- 2.I Maintain plants using industry recommended methods.**
- 2.I.01 Explain water requirements.
  - 2.I.02 Demonstrate pruning techniques following ANSI A300 standards.
  - 2.I.03 Demonstrate ability to maintain bedding plants, (perennials, annuals).
  - 2.I.04 Prepare soil samples for soil testing.
  - 2.I.05 Read and identify components of a soil test result for pH and N-P-K.
  - 2.I.06 Select and apply fertilizer (liquid, granular).
  - 2.I.07 Demonstrate winter protection techniques (mulching, hardiness, antidesiccant).
- 2.J Demonstrate cultural and environmental control practices.**
- 2.J.01 Demonstrate procedures used to control and manage the growth of flowering plants by pinching, disbudding, or pruning according to recommended procedures.
  - 2.J.02 Apply growth regulating chemicals to plants using recommended procedures (using substitutes where appropriate).
  - 2.J.03 Cultivate soils using recommended practices.
  - 2.J.04 Explain the importance and applicable practices of soil aeration.
  - 2.J.05 Stake and tie flowering plants that require support using recommended procedures.
  - 2.J.06 Apply granular and liquid fertilizer to flower beds and floral crops at a pre-selected rate using recommended procedures.
  - 2.J.07 Explain the factors that contribute to undesirable soil conditions.
  - 2.J.08 Explain benefits of using mulches.
- 2.K Identify and explain basic irrigation procedures.**
- 2.K.01 Define irrigation terms.
  - 2.K.02 Compare and contrast irrigation systems.
  - 2.K.03 Identify types of sprinklers used to irrigate an area.
  - 2.K.04 Demonstrate the ability to hand irrigate plants using recommended procedures.
- 2.L Explain concepts fundamental to greenhouse horticulture.**
- 2.L.01 Discuss the role greenhouses play in the agricultural industry.
  - 2.L.02 List basic greenhouse styles.
  - 2.L.03 Discuss the effect of tissue culture on the greenhouse industry.
- 2.M Explain concepts fundamental to turfgrass and lawn management.**
- 2.M.01 Compare types of turf and their functions.
  - 2.M.02 Explain the practices used in maintaining a lawn.
  - 2.M.03 Explain how a lawn is established or renovated.
  - 2.M.04 Calculate a lawn area and the amount of seed or fertilizer a lawn would need.
  - 2.M.05 Describe the types of fertilizers used on lawns.
  - 2.M.06 Describe the basic lawn fertilization process.
  - 2.M.07 Discuss and explain thatch.
  - 2.M.08 Explain the relationship between plant physiology and mowing practices.
  - 2.M.09 Identify surveying equipment.

**2.N Explain concepts fundamental to basic arboriculture.**

- 2.N.01 Identify different chainsaws, to determine appropriate safe and applications for each.
- 2.N.02 Tie basic knots used in arboriculture.
- 2.N.03 Describe the procedures for and applications of a variety of pruning cuts.

**2.O Explain concepts fundamental to floriculture and floral design.**

- 2.O.01 Evaluate the basic principles of floral design.
- 2.O.02 Examine the basic floral design shapes used in the floral industry.
- 2.O.03 Utilize line, space, texture, and color harmony principles to design various floral arrangements.
- 2.O.04 Examine the use of cut flowers, greenery and indoor plants, based on form and shape.
- 2.O.05 Evaluate the effect of environmental conditions on floral arrangement longevity.

**2.P Explain concepts fundamental to natural resources.**

- 2.P.01 Discuss types and physiology of forest stands.
- 2.P.02 Identify characteristics of a watershed.
- 2.P.03 Discuss predator/prey relationships.
- 2.P.04 Discuss major issues of park and trail management.
- 2.P.05 Describe major ecological cycles.

**2.Q Demonstrate effective agribusiness and retail practices.**

- 2.Q.01 Describe the scope and effect of agribusiness in the local economy.
- 2.Q.02 Identify factors affecting prices and pricing strategies.
- 2.Q.03 Compute and estimate fixed and variable expenses.
- 2.Q.04 Compare and contrast methods of inventory control.
- 2.Q.05 Create a plan to market goods and services (including promotional materials and displays).
- 2.Q.06 Illustrate how different seasons affect products and services offered.
- 2.Q.07 Identify markets, customers, and dist. products and services, including supplying information, distribution channels.
- 2.Q.08 Describe ways to inform customers making recommendations, and demonstrating use.
- 2.Q.09 Demonstrate the ability to process sales and taxes using a variety of tender.
- 2.Q.10 Demonstrate procedures used to receive and handle merchandise.
- 2.Q.11 Demonstrate procedures used to ship and deliver merchandise.

## **Horticulture Concentration: Arboriculture**

- 2.R \* Demonstrate safe use of equipment used in arboriculture.**
- 2.R.01\* Demonstrate proper use of Personal Protective Equipment with chainsaws, limbing, felling, bucking, chippers, and pruning.
  - 2.R.02\* Inspect all equipment for proper maintenance and safety.
  - 2.R.03\* List modern safety features specific to each piece of equipment, such as chainsaws and chippers.
- 2.S \* Properly and safely use a chainsaw.**
- 2.S.01\* Explain kickback and reactive forces.
  - 2.S.02\* Label common parts of a chainsaw.
  - 2.S.03\* Demonstrate the safe procedure to start a chainsaw.
  - 2.S.04\* Demonstrate leglock procedure.
  - 2.S.05\* Demonstrate upper, under, and bore cuts using a chainsaw.
  - 2.S.06\* Demonstrate proper bar and chain maintenance.
  - 2.S.07\* Properly mix 2-cycle fuel.
  - 2.S.08\* Explain carburetor adjustments.
  - 2.S.09\* Adjust chain tension on a chainsaw.
- 2.T \* Demonstrate proper limbing, felling, and bucking techniques.**
- 2.T.01\* Identify trees and woody shrubs common to the local geographic area.
  - 2.T.02\* Measure tree height using a variety of methods.
  - 2.T.03\* Estimate tree lean.
  - 2.T.04\* Evaluate a tree for hazards.
  - 2.T.05\* Evaluate a felling site for obstacles.
  - 2.T.06\* Formulate a felling plan.
  - 2.T.07\* Identify escape routes from a site.
  - 2.T.08\* Describe felling or gunning sights.
  - 2.T.09\* Describe barberchairs.
  - 2.T.10\* Explain the use of felling wedges or lever.
  - 2.T.11\* Demonstrate proper and safe methods of limbing.
  - 2.T.12\* Explain pressure and undercuts.
  - 2.T.13\* Safely rig and lower a limb.
  - 2.T.14\* Demonstrate proper bucking methods.
  - 2.T.15\* Evaluate and measure a tree for lumber and firewood.
- 2.U \* Demonstrate proper climbing techniques.**
- 2.U.01\* Perform a pre-climb inspection.
  - 2.U.02\* Compare methods of rope installation.
  - 2.U.03\* Install a climbing line.
  - 2.U.04\* Install a false-crotch / cambium saving device.
  - 2.U.05\* Describe proper ladder safety.
  - 2.U.06\* Explain 2-n-1 lanyard use.
  - 2.U.07\* Demonstrate body thrusting on a closed system.
  - 2.U.08\* Demonstrate modified footlock.
  - 2.U.09\* Demonstrate secured footlock.
  - 2.U.10\* Describe open systems of ascent.
  - 2.U.11\* Describe single line technique.

- 2.U.12\* Explain the proper use of mechanical ascenders.
  - 2.U.13\* List the limitations of all ascent techniques.
  - 2.U.14\* Demonstrate the use of climbing spurs while on belay.
  - 2.U.15\* Demonstrate safe lanyard use.
  - 2.U.16\* Advance a rope with the use of a lanyard.
  - 2.U.17\* Demonstrate safe limb walking techniques.
  - 2.U.18\* Explain double crotching.
  - 2.U.19\* Explain the use of re-direct.
  - 2.U.20\* Demonstrate safe descent on a friction hitch.
  - 2.U.21\* Demonstrate safe use of a mechanical descender.
  - 2.U.22\* Explain and follow ANSI Z-133 Standards.
  - 2.U.23\* Demonstrate proper groundworking skills.
- 2.V \* Demonstrate proper use of a chipper.**
- 2.V.01\* Distinguish between disc and drum chippers.
  - 2.V.02\* List safety features and identify danger zones relating to chippers.
  - 2.V.03\* Properly maintain knives and other parts of a chipper.
  - 2.V.04\* Demonstrate proper feeding technique when using a chipper.
  - 2.V.05\* Demonstrate use of clean-up tools.
  - 2.V.06\* Properly attach a chipper to a truck.
  - 2.V.07\* Demonstrate proper road safety precautions.
- 2.W \* Properly use and care for ropes and lines.**
- 2.W.01\* Identify parts of a working line.
  - 2.W.02\* Differentiate between 3, 12, 16, and 24 strand line.
  - 2.W.03\* Explain the importance of and differences between climbing line lengths and diameters.
  - 2.W.04\* Explain limitations of synthetic rope.
  - 2.W.05\* Compare bagging and coiling line.
  - 2.W.06\* Explain strength loss of knots and splices.
  - 2.W.07\* Inspect and care for ropes.
  - 2.W.08\* Compare and contrast whipping, taping, and dipping.
  - 2.W.09\* Demonstrate tying, dressing, and setting knots.
  - 2.W.10\* Tie, dress, and set the following knots and hitches:  
Bowline, Figure of 8, Tautline, Prossik, Fisherman's, Blakes, Running Bowline, Timber, Clove, Half, Sheet Bend, Bowline and Bight, and Bullet.
  - 2.W.11\* Describe the limitations of the previous knots.
  - 2.W.12\* Explain and compare static and dynamic loads.
  - 2.W.13\* Compare the safe working load against the tensile strength of a rope.
  - 2.W.14\* Compare weight against force.
- 2.X \* Properly prune trees and woody brush.**
- 2.X.01\* Identify common pruning tools.
  - 2.X.02\* List reasons for pruning.
  - 2.X.03\* Explain tree structure in relation to pruning.
  - 2.X.04\* Explain how a tree reacts to pruning.
  - 2.X.05\* Describe crown cleaning.
  - 2.X.06\* Describe crown thinning.
  - 2.X.07\* Describe crown raising.
  - 2.X.08\* Describe crown reduction.

- 2.X.09\* Describe crown restoration.
- 2.X.10\* Describe utility pruning.
- 2.X.11\* Explain thinning cuts.
- 2.X.12\* Explain heading cuts.
- 2.X.13\* Identify branch bark ridge and collar.
- 2.X.14\* Explain callus and woundwood tissue.
- 2.X.15\* Discuss wound dressing.
- 2.X.16\* Demonstrate proper pruning cuts on a small limb.
- 2.X.17\* Demonstrate proper pruning cuts on a large or heavy limb (three cut method).
- 2.X.18\* Discuss specialty pruning methods.

## **Horticulture Concentration: Greenhouse Management and Floriculture**

- 2.Y \*** **Demonstrate advanced procedures used in floriculture and floral design.**
- 2.Y.01\* Illustrate the history of floral design.
  - 2.Y.02\* Compare the differences between eastern Asia and Western Hemisphere floral design history.
  - 2.Y.03\* Illustrate basic floral construction principles.
  - 2.Y.04\* Evaluate design software that can be used in the floral industry.
  - 2.Y.05\* Utilize color intensity, shape and form to design floral arrangements.
  - 2.Y.06\* Prepare examples of each of the floral design principles and identify each principle of the design.
  - 2.Y.07\* Prepare drawings that illustrate basic floral design shapes.
  - 2.Y.08\* Propose a floral arrangement, price out its components, and assemble the design components.
  - 2.Y.09\* Analyze traits of the most commonly used cut flowers and indoor plants.
  - 2.Y.10\* Evaluate the seasonal availability of flowers, foliage and indoor plants.
  - 2.Y.11\* Relate colors in which flowers are available to seasonal demands for floral arrangements.
  - 2.Y.12\* Compare the keeping quality of various flowers.
  - 2.Y.13\* Evaluate the use of the most common indoor flowering and foliage plants.
  - 2.Y.14\* Examine techniques for using indoor plants for decoration.
  - 2.Y.15\* Determine the advantages of using various flowers and greenery in floral arrangements.
  - 2.Y.16\* Recommend uses for indoor plants in a commercial or home setting.
  - 2.Y.17\* Determine the requirements for a live plant to reflect the mood of an indoor setting.
  - 2.Y.18\* Evaluate the use of a dish garden in an indoor setting.
  - 2.Y.19\* Evaluate the processes of design, preservation and care of dried and permanent materials.
  - 2.Y.20\* Compare commonly used materials used in dried floral arrangements.
  - 2.Y.21\* Select materials needed for silk, dried and permanent flowers.
  - 2.Y.22\* Evaluate methods for drying and preserving floral materials.
  - 2.Y.23\* Use the principles of design and color harmony in arranging dried and permanent materials.
  - 2.Y.24\* Create designs incorporating materials students have dried, preserved and collected.
  - 2.Y.25\* Differentiate between the quality of materials needed for silk, dried and permanent flowers.
  - 2.Y.26\* Demonstrate methods for preserving and caring for dried and permanent materials.
- 2.Z \*** **Demonstrate advanced procedures used in greenhouse management.**
- 2.Z.01\* Design greenhouse structures and suggest equipment.
  - 2.Z.02\* List examples of the uses of greenhouse ranges in commercial greenhouse production.
  - 2.Z.03\* Compare the basic types of greenhouse coverings.
  - 2.Z.04\* List common framing materials used for greenhouses.

- 2.Z.05\* Manipulate greenhouse environmental conditions.
- 2.Z.06\* Compare commonly used heating systems.
- 2.Z.07\* Discuss commonly used cooling systems.
- 2.Z.08\* Compare commonly used ventilation systems.
- 2.Z.09\* Describe commonly used watering systems.
- 2.Z.10\* Describe the use of hotbeds.
- 2.Z.11\* Describe the uses of cold frames.
- 2.Z.12\* Describe the uses of shade structures.
- 2.Z.13\* Compare the advantages and disadvantages of glass as a covering.
- 2.Z.14\* Describe the advantages and disadvantages of nonrigid plastic as a covering.
- 2.Z.15\* Analyze the advantages and disadvantages of rigid plastic as a covering.
- 2.Z.16\* List the environmental factors necessary for germination.
- 2.Z.17\* Cite the characteristics of a good germination medium.
- 2.Z.18\* Prepare soils and planting media.
- 2.Z.19\* Explain the importance of using sterilized media for seedlings.
- 2.Z.20\* Explain the importance of proper stage of growth for transplanting seedlings.
- 2.Z.21\* Discuss the factors to consider in selecting greenhouse crops.
- 2.Z.22\* Explain seasonal markets for greenhouse crops.
- 2.Z.23\* Implement bedding and vegetable crop production and management strategies.
- 2.Z.24\* Maintain, operate, and repair facilities and equipment.
- 2.Z.25\* Replace or repair plastic or polyethylene covers for a greenhouse using recommended procedures.

## **Horticulture Concentration: Landscaping**

### **2.AA \* Demonstrate advanced procedures used in landscaping and landscape management.**

- 2.AA.01\* Select and grade trees and shrubs using American Nurseryman's Standards.
- 2.AA.02\* Demonstrate appropriate staking and guying techniques.
- 2.AA.03\* Install bedding plants and groundcovers.
- 2.AA.04\* Select appropriate grass seed for site conditions and use.
- 2.AA.05\* Install grass, both by seeding and laying sod.
- 2.AA.06\* Explain watering requirements for a variety of plants.
- 2.AA.07\* Properly prepare a variety of plants for overwintering.
- 2.AA.08\* Demonstrate advanced pruning techniques.
- 2.AA.09\* Properly maintain bedding plants, perennials, and groundcovers.
- 2.AA.10\* Explain the watering requirements for turf.
- 2.AA.11\* Explain appropriate weed control methods.
- 2.AA.12\* Grade a site in preparation for lawn installation.
- 2.AA.13\* Identify materials and construction methods for walls, patios, walks, and drives.
- 2.AA.14\* Identify materials and construction methods for wood structures.
- 2.AA.15\* Identify the main components of an irrigation system.
- 2.AA.16\* Describe installation features for water features.

- 2.AA.17\* Measure, record, and sketch site dimensions using basic survey equipment.
- 2.AA.18\* Calculate square area.
- 2.AA.19\* Convert site measurements to scale dimensions.
- 2.AA.20\* Describe the effects of sun, wind, moisture, and sound to a landscape site.
- 2.AA.21\* Identify current and future site use.
- 2.AA.22\* Identify existing utilities.
- 2.AA.23\* Demonstrate appropriate customer service skills.
- 2.AA.24\* Read a landscape plan.
- 2.AA.25\* Select appropriate plants for a landscape plan.
- 2.AA.26\* Design a landscape plan, including site analysis.
- 2.AA.27\* Create a landscape using appropriate drawing tools, including computerized tools.
- 2.AA.28\* Use lettering techniques and graphic symbols appropriate to landscape design.
- 2.AA.29\* Properly determine measurements using an Architects' and Engineers' scale ruler.
- 2.AA.30\* Identify the components of an estimate.
- 2.AA.31\* Calculate labor costs for a job.
- 2.AA.32\* Calculate equipment and rental costs for a job.
- 2.AA.33\* Calculate material costs for a job.
- 2.AA.34\* Calculate subcontractor expenses for a job.
- 2.AA.35\* Calculate disposal costs for a job.
- 2.AA.36\* Calculate overhead for a job.
- 2.AA.37\* Calculate markups for a job.
- 2.AA.38\* Create a full budget for a job.
- 2.AA.39\* Present a landscape proposal to a client or audience.
- 2.AA.40\* Identify plants listed on the appropriate plant list.

## **Horticulture Concentration: Natural Resources and Park Management**

### **2.BB \* Identify resource management components to establish relationships in natural resource systems.**

- 2.BB.01\* Identify natural resources.
- 2.BB.02\* Identify organizations and agencies involved in resource management.
- 2.BB.03\* Identify impacts by humans on natural resources.
- 2.BB.04\* Describe ecosystem relationships.

### **2.CC \* Apply cartographic skills to natural resource activities.**

- 2.CC.01\* Describe different types of maps.
- 2.CC.02\* Interpret map features and legend.
- 2.CC.03\* Determine map scale and actual distance.
- 2.CC.04\* Determine direction from map.
- 2.CC.05\* Determine elevation and terrain features from topographic maps.
- 2.CC.06\* Use directional tools with map to locate position.
- 2.CC.07\* Use land survey and coordinate system.
- 2.CC.08\* Interpret photos and images.

### **2.DD \* Monitor natural resource status to obtain planning data.**

- 2.DD.01\* Conduct resource inventory and population studies.
- 2.DD.02\* Establish sample plots and points.
- 2.DD.03\* Locate and identify resources.
- 2.DD.04\* Collect data concerning resource availability and health.
- 2.DD.05\* Maintain databases of resource data.
- 2.DD.06\* Use a Geographic Information System to analyze resource data.

### **2.EE \* Employ environmental and wildlife knowledge to demonstrate natural resource enhancement techniques.**

- 2.EE.01\* Describe the relationship of harvest levels to long-term availability of resources.
- 2.EE.02\* Demonstrate stream enhancement techniques.
- 2.EE.03\* Demonstrate forest stand improvement techniques.
- 2.EE.04\* Demonstrate wildlife habitat enhancement techniques.
- 2.EE.05\* Demonstrate range enhancement techniques.
- 2.EE.06\* Demonstrate recreation area enhancement techniques.

### **2.FF \* Examine weather and other criteria to recognize dangers related to work in an outdoor environment.**

- 2.FF.01\* Recognize weather-related dangers.
- 2.FF.02\* Recognize hazards as they relate to terrain.
- 2.FF.03\* Recognize poisonous plants and animals.
- 2.FF.04\* Recognize hazardous situations at the work location.
- 2.FF.05\* Demonstrate mitigation techniques.

**2.GG \* Examine biological and physical characteristics, to identify and classify natural resources.**

- 2.GG.01\* Identify tree species and other woody vegetation common to a geographical region.
- 2.GG.02\* Identify grass and shrub species common to a geographical region.
- 2.GG.03\* Identify wildlife species common to a geographical region.
- 2.GG.04\* Identify fish species common to a geographical region.
- 2.GG.05\* Identify rocks, minerals and soil types common to a geographical region.

**2.HH \* Examine natural cycles and related phenomena to describe ecologic concepts and principles.**

- 2.HH.01\* Describe the hydrologic cycle.
- 2.HH.02\* Describe the nitrogen cycle.
- 2.HH.03\* Describe the carbon cycle.
- 2.HH.04\* Describe nutrient cycles.
- 2.HH.05\* Describe succession.
- 2.HH.06\* Describe population dynamics.
- 2.HH.07\* Describe primary and secondary producers.
- 2.HH.08\* Describe predator-prey relationships.
- 2.HH.09\* Identify potential pollution sources.
- 2.HH.10\* Define watershed boundaries.
- 2.HH.11\* Use stream classification system.
- 2.HH.12\* Describe the influence of weather and climatic factors.
- 2.HH.13\* Describe how natural resource products are produced, harvested, processed and used.
- 2.HH.14\* Describe forest harvest techniques and procedures.
- 2.HH.15\* Describe wildlife harvest techniques and procedures.
- 2.HH.16\* Describe fish harvest techniques and procedures.
- 2.HH.17\* Describe how minerals and ores are extracted and processed.
- 2.HH.18\* Describe how oil is extracted and processed.
- 2.HH.19\* Describe hydroelectric generation techniques and procedures.
- 2.HH.20\* Describe how public recreation use is a product.

**2.II \* Explain proper health and safety practices relating to natural environments.**

- 2.II.01\* Identify techniques and equipment needed to prevent wildfire.
- 2.II.02\* Demonstrate personal fire prevention precautions while working in natural environments.
- 2.II.03\* List appropriate techniques and equipment when working with bio-hazards.
- 2.II.04\* Explain law enforcement procedures to manage public gatherings and to gain entry into secure, closed or restricted areas.
- 2.II.05\* Describe precautions to use when interfacing with the public concerning regulations and law enforcement.
- 2.II.06\* Describe security issues for closed and restricted areas.
- 2.II.07\* Describe solutions to issues concerning public protection.
- 2.II.08\* Identify appropriate law enforcement authorities relating to natural resources spaces.

**2.JJ \* Explain procedures relating to preventing disease and infestation.**

- 2.JJ.01\* Recognize insect types and available controls to prevent insect infestation.
- 2.JJ.02\* Identify insect damage signs.
- 2.JJ.03\* Apply materials to treat for insect infestation, using substitutions where appropriate.
- 2.JJ.04\* Recognize symptoms of animal and plant diseases and use appropriate techniques to prevent their spread.
- 2.JJ.05\* Identify observable diseases impacting plants and animals.
- 2.JJ.06\* Describe how to report observance of infestations.

## **Horticulture Concentration: Turf Management**

### **2.KK \* Demonstrate advanced procedures used in lawn, turfgrass, and sports field management.**

- 2.KK.01\* Identify and describe the major parts of a typical turf-grass plant.
- 2.KK.02\* Describe the three growth habits of turf grasses.
- 2.KK.03\* List and describe the major factors affecting turf grass growth.
- 2.KK.04\* Identify and describe cool- and warm-season turf grasses.
- 2.KK.05\* Describe the characteristics of each of the cool-season turf grasses.
- 2.KK.06\* List key factors influencing mowing quality.
- 2.KK.07\* Discuss chemical mowing.
- 2.KK.08\* Explain how fertilizer requirements are determined.
- 2.KK.09\* Compare the different watering requirements of turf grasses.
- 2.KK.10\* Explain the use of plant-growth regulators.
- 2.KK.11\* Describe the functions of wetting agents.
- 2.KK.12\* Identify the main types of sports fields.
- 2.KK.13\* Explain the critical features in sports field management.
- 2.KK.14\* Cite the dimensions of a football field, baseball field, and soccer field.
- 2.KK.15\* Identify major turf grasses used for sports fields.
- 2.KK.16\* Describe the major characteristics of each sports turf grass.
- 2.KK.17\* Explain the process of layout and flagging a course to survey, using traditional methods.
- 2.KK.18\* Explain the process of layout and flagging a course to survey, using GPS technology.
- 2.KK.19\* Define golf course management terms.
- 2.KK.20\* Discuss the major aspects of golf course management.
- 2.KK.21\* Label the layers of the putting green structure.
- 2.KK.22\* Describe the management requirements of putting greens, tees, and fairways.
- 2.KK.23\* List stressful conditions affecting putting greens.
- 2.KK.24\* Describe the functions of roughs, bunkers, and hazards.
- 2.KK.25\* Outline the major management practices used for roughs, bunkers, and hazards.
- 2.KK.26\* Compare the fertilization programs of greens, tees, fairways, and roughs.
- 2.KK.27\* Discuss the basic requirements of mowing greens.
- 2.KK.28\* List the mowing height ranges of greens, tees, and fairways.
- 2.KK.29\* List the type of pesticides used on golf courses.
- 2.KK.30\* List the major components of a golf course irrigation system.
- 2.KK.31\* List the key factors influencing irrigation quality.
- 2.KK.32\* Map out an irrigation plan.
- 2.KK.33\* List the questions utility companies and municipal authorities should be asked regarding home irrigation installation.

## **Strand 3: Embedded Academic Knowledge and Skills**

### **3.A English Language Arts**

<b>VTE #</b>	<b>Acad #</b>	<b>Standard</b>	<b>Grade</b>	<b>Topic</b>
3.A.01c	2.4	Integrate relevant information gathered from group discussions and interviews for reports.	Pre-9 <sup>th</sup>	Language
3.A.02c	13.19	Identify and use knowledge of common graphic features (charts, maps, diagrams).	Pre-9 <sup>th</sup>	Reading
3.A.03c	19.21	Write reports based on research that includes quotations, footnotes or endnotes, and a bibliography.	Pre-9 <sup>th</sup>	Composition
3.A.04c	24.4	Apply steps for obtaining information from a variety of sources, organizing information, documenting sources, and presenting research in individual projects:	Pre-9 <sup>th</sup>	Composition
3.A.05c	24.5	Formulate open-ended research questions and apply steps for obtaining and evaluating information from a variety of sources, organizing information, documenting sources in a consistent and standard format, and presenting research.	9/10	Composition
3.A.06c	3.17	Deliver formal presentations for particular audiences using clear enunciation and appropriate organization, gestures, tone, and vocabulary.	11/12	Language
3.A.07c	4.27	Use general dictionaries, specialized dictionaries, thesauruses, histories of language, books of quotations, and other related references as needed.	11/12	Language
3.A.08c	19.27	For informational/expository writing: Write well-organized research papers that prove a thesis statement using logical organization, effective supporting evidence, and variety in sentence structure.	11/12	Composition
3.A.09c	24.6	Formulate original, open-ended questions to explore a topic of interest, design and carry out research, and evaluate the quality of the research paper in terms of the adequacy of its questions, materials, approach, and documentation of sources.	11/12	Composition

3.A.10c		Read technical manuals, guides, resource books and technical literature to gain information and solve problems (Operator's manual, service manuals and databases etc).		Voc
3.A.11c		Read, comprehend, and follow written technical directions for repairs, procedures and processes.		Voc

### 3.B Mathematics

VTE #	Acad #	Standard	Grade	Topic
3.B.01c	7.M.2	Given the formulas, convert from one system of measurement to another. Use technology as appropriate.	Pre-9 <sup>th</sup>	Measurement
3.B.02c	7.P.4	Solve linear equations using tables, graphs, models, and algebraic methods.	Pre-9 <sup>th</sup>	Patterns, relations, algebra
3.B.03c	7.P.6	Use linear equations to model and analyze problems involving proportional relationships. Use technology as appropriate.	Pre-9 <sup>th</sup>	Patterns, relations, algebra
3.B.04c	8.M.2	Given the formulas, convert from one system of measurement to another. Use technology as appropriate.	Pre-9 <sup>th</sup>	Measurement
3.B.05c	8.N.1	Compare, order, estimate, and translate among integers, fractions and mixed numbers (i.e., rational numbers), decimals, and percents.	Pre-9 <sup>th</sup>	Numbers
3.B.06c	10.D.1	Select, create, and interpret an appropriate graphical representation (e.g., scatterplot, table, stem-and-leaf plots, box-and-whisker plots, circle graph, line graph, and line plot) for a set of data and use appropriate statistics (e.g., mean, median, range, and mode) to communicate information about the data. Use these notions to compare different sets of data.	9/10	Data Analysis, Probability and Statistics
3.B.07c	10.M.4	Describe the effects of approximate error in measurement and rounding on measurements and on computed values from measurements.	9/10	Measurement
3.B.08c	10.P.8	Solve everyday problems that can be modeled using systems of linear equations or inequalities. Apply algebraic and graphical methods to the solution. Use technology when appropriate. Include mixture, rate, and work problems.	9/10	Patterns, relations, algebra

3.B.09	7.G.5	Use a ruler, protractor, and compass to draw polygons and circles.	Pre-9	Geometry
3.B.10	10.G.10	Demonstrate the ability to visualize solid objects and recognize their projections and cross sections.	9/10	Geometry
3.B.11	10.G.8	Find linear equations that represent lines either perpendicular or parallel to a given line and through a point, e.g., by using the "point-slope" form of the equation.	9/10	Geometry
3.B.12	10.M.1	Calculate perimeter, circumference, and area of common geometric figures such as parallelograms, trapezoids, circles, and triangles.	9/10	Measurement
3.B.13	12.G.5	Apply properties of angles, parallel lines, arcs, radii, chords, tangents, and secants to solve problems.	11/12	Geometry
3.B.14	12.M.1	Describe the relationship between degree and radian measures, and use radian measure in the solution of problems, in particular, problems involving angular velocity and acceleration.	11/12	Measurement
3.B.15	12.M.2	Use dimensional analysis for unit conversion and to confirm that expressions and equations make sense.	11/12	Measurement
3.B.16	12.P.8	Solve a variety of equations and inequalities using algebraic, graphical, and numerical methods, including the quadratic formula; use technology where appropriate. Include polynomial, exponential, logarithmic, and trigonometric functions; expressions involving absolute values; trigonometric relations; and simple rational expressions.	11/12	Patterns, relations, algebra
3.B.17	12.P.9	Use matrices to solve systems of linear equations. Apply to the solution of everyday problems.	11/12	Patterns, relations, algebra
3.B.18		Find for distances and area on land, survey and topographical maps.		Voc

### 3.C Science and Engineering/Technology

VTE #	Acad #	Standard	Grade	Topic
3.C.01c	2	Recognize that all organisms are composed of cells, and that many organisms are single-celled (unicellular), e.g., bacteria, yeast. In these single-celled organisms, one cell must carry out all of the basic functions of life.	Pre-9	Life Science
3.C.02c	3	Compare and contrast plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, cytoplasm, chloroplasts, mitochondria, vacuoles).	Pre-9	Life Science
3.C.03c	4	Recognize that within cells, many of the basic functions of organisms (e.g., extracting energy from food and getting rid of waste) are carried out. The way in which cells function is similar in all living organisms.	Pre-9	Life Science
3.C.04c	10	Give examples of ways in which genetic variation and environmental factors are causes of evolution and the diversity of organisms.	Pre-9	Life Science
3.C.05c	2.3	Distinguish between plant and animal cells.		Biology
3.C.06c	2.4	Describe how cells function in a narrow range of physical conditions, such as temperature and pH, to perform life functions that help to maintain homeostasis.		Biology
3.C.07c	2.7	Provide evidence that the organic compounds produced by plants are the primary source of energy and nutrients for most living things.		Biology
3.C.08c	1.1	Identify the earth's principal sources of internal and external energy, e.g., radioactive decay, gravity, solar energy.		Earth Science
3.C.09c	1.1	Identify and explain the steps of the engineering design process, i.e., identify the problem, research the problem, develop possible solutions, select the best possible solution(s), construct a prototype, test and evaluate, communicate the solution(s), and redesign.		Eng/Tech
3.C.10c	1.5	Interpret plans, diagrams, and working drawings in the construction of a prototype.		Eng/Tech

3.C.11c	3.1	Differentiate between open (e.g., irrigation, forced hot air system) and closed (e.g., forced hot water system, hydroponics) fluid systems and their components such as valves, controlling devices, and metering devices.		Eng/Tech
3.C.12c	3.3	Explain the relationship among temperature change in a substance for a given amount of heat transferred, the amount (mass) of the substance, and the specific heat of the substance.		Eng/Tech
3.C.13c	4.2	Give examples of how conduction, convection, and radiation are used in the selection of materials, e.g., home and vehicle thermostat designs, circuit breakers.		Eng/Tech
3.C.14c	4.3	Identify the differences between open and closed thermal systems, e.g., humidity control systems, heating systems, cooling systems.		Eng/Tech
3.C.15c	4.4	Explain how environmental conditions influence heating and cooling of buildings and automobiles.		Eng/Tech
3.C.16c	4.5	Identify and explain the tools, controls, and properties of materials used in a thermal system, e.g., thermostats, R Values, thermal conductivity, temperature sensors.		Eng/Tech
3.C.17c	5.3	Explain the relationship between resistance, voltage, and current (Ohm's Law).		Eng/Tech
3.C.18c	2.4	Describe the relationship among energy, work, and power both conceptually and quantitatively.		Physics
3.C.19c	2.6	Identify appropriate standard international units of measurement for energy, work, power, and momentum.		Physics
3.C.20c	5.4	Develop a qualitative and quantitative understanding of current, voltage, resistance, and the connection between them.		Physics
3.C.21c	5.5	Identify appropriate units of measurement for current, voltage, and resistance, and explain how they are measured.		Physics
3.C.22	15	Explain how dead plants and animals are broken down by other living organisms and how this process contributes to the system as a whole.	Pre-9	Life Science

3.C.23	16	Recognize that producers (plants that contain chlorophyll) use the energy from sunlight to make sugars from carbon dioxide and water through a process called photosynthesis. This food can be used immediately, stored for later use, or used by other organisms.	Pre-9	Life Science
3.C.24	1.1	Explain the significance of carbon in organic molecules.		Biology
3.C.25	1.2	Recognize the six most common elements in organic molecules (C, H, N, O, P, S).		Biology
3.C.26	1.3	Describe the composition and functions of the four major categories of organic molecules (carbohydrates, lipids, proteins, and nucleic acids).		Biology
3.C.27	1.4	Describe how dehydration synthesis and hydrolysis relate to organic molecules.		Biology
3.C.28	2.5	Explain the role of cell membranes as a highly selective barrier (diffusion, osmosis, and active transport).		Biology
3.C.29	2.6	Identify the reactants and products in the general reaction of photosynthesis. Describe the use of isotopes in this identification.		Biology
3.C.30	2.8	Identify how cellular respiration is important for the production of ATP.		Biology
3.C.31	2.9	Explain the interrelated nature of photosynthesis and cellular respiration.		Biology
3.C.32	6.1	Explain how biotic and abiotic factors cycle in an ecosystem (water, carbon, oxygen, and nitrogen).		Biology
3.C.33	6.2	Use a food web to identify and distinguish producers, consumers, and decomposers, and explain the transfer of energy through trophic levels.		Biology
3.C.34	6.3	Identify the factors in an ecosystem that influence fluctuations in population size.		Biology
3.C.35	6.4	Analyze changes in an ecosystem resulting from natural causes, changes in climate, human activity, or introduction of non-native species.		Biology

3.C.36	6.5	Explain how symbiotic behavior produces interactions within ecosystems.		Biology
3.C.37	1.1	Describe the various conditions associated with frontal boundaries and cyclonic storms (e.g., thunderstorms, winter storms [nor'easters], hurricanes, and tornadoes) and their impact on human affairs, including storm preparations.		Earth Science
3.C.38	1.13	Explain what causes the tides and describe how they affect the coastal environment.		Earth Science
3.C.39	1.14	Explain how scientists study the earth system through the use of a combination of ground-based observations, satellite observations, and computer models of the earth system, and why it is necessary to use all of these tools together.		Earth Science
3.C.40	3.1	Explain that weather is the most significant source of erosion and how both physical and chemical weathering lead to the formation of sediments and soils, affect the shape of rocks, and create specific landscapes depending on what weathering process is dominant under a specific climate.		Earth Science
3.C.41	3.2	Describe how glaciers, gravity, wind, temperature changes, waves, and rivers cause weathering and erosion. Give examples of how the effects of these processes can be seen in our local environment.		Earth Science
3.C.42	3.3	Explain the nitrogen and carbon cycles and their roles in the improvement of soils for agriculture.		Earth Science
3.C.43	3.6	Explain how water flows into and through a watershed, e.g., aquifers, wells, porosity, permeability, water table, capillary water, runoff.		Earth Science
3.C.44	3.7	Compare and contrast the processes of the hydrologic cycle including evaporation, condensation, precipitation, surface runoff and groundwater percolation, infiltration, and transpiration.		Earth Science
3.C.45	3.8	Describe the rock cycle, and the processes that are responsible for the formation of igneous, sedimentary, and metamorphic rocks. Compare the physical properties of these rock types.		Earth Science

## **Strand 4: Employability Knowledge and Skills**

### **4.A Develop employability skills to secure and keep employment in chosen field.**

- 4.A.01a Evaluate industries, organizations, and careers based on multiple sources of research and information.
- 4.A.02a Assess interest areas to determine potential career pathways, including career ladders.
- 4.A.03a Develop a career plan with alternatives.
- 4.A.04a Complete job applications and related employment documents (e.g. W-4).
- 4.A.05a Create professional cover letters, resumes, and portfolios in a variety of formats (print and electronic).
- 4.A.06a Apply job search skills to seek, evaluate, apply for, and accept employment.
- 4.A.07a Demonstrate good interviewing skills.
- 4.A.08a Demonstrate employability skills needed to get and keep a job.
- 4.A.09a Assess alternative occupational choices (e.g. working conditions, benefits, and opportunities to change).

#### **Performance Examples:**

1. Research positions open within a variety of companies and compare/contrast their descriptions, duties, and expectations.
2. Prepare responses to standard interview questions.
3. Participate in a mock-interview with industry professionals.

### **4.B Communicate in multiple modes to address needs within the career and technical field.**

- 4.B.01a Apply strategies to enhance effectiveness of all types of communications in the workplace.
- 4.B.02a Apply reading skills and strategies to work-related documents.
- 4.B.03a Locate information from books, journals, magazines, and the Internet.
- 4.B.04a Apply basic writing skills to work-related communication.
- 4.B.05a Write work-related materials.
- 4.B.06a Explain information presented graphically.
- 4.B.07a Use writing/publishing/presentation applications.
- 4.B.08a Apply basic skills for work-related oral communication.
- 4.B.09a Explain proper telephone etiquette and skills.
- 4.B.10a Lead formal and informal group discussions.
- 4.B.11a Demonstrate effective negotiation and conflict management.
- 4.B.12a Apply active listening skills to obtain and clarify information.
- 4.B.13a Communicate with others in a diverse workforce.

#### **Performance Examples:**

1. Review a professional journal; choose one article to summarize.
2. Call the publisher for free products in journal.
3. Develop an oral presentation regarding an article in a journal.
4. Summarize trends presented in a graph.

**4.C Solve problems using critical thinking.**

- 4.C.01a Demonstrate skills used to define and analyze a given problem.
- 4.C.02a Explain the importance and dynamics of individual and teamwork approaches of problem solving.
- 4.C.03a Describe methods of researching and validating reliable information relevant to the problem.
- 4.C.04a Explain strategies used to formulate ideas, proposals and solutions to problems.
- 4.C.05a Select potential solutions based on reasoned criteria.
- 4.C.06a Implement and evaluate solution(s).

**4.D Demonstrate positive work behaviors.**

- 4.D.01a Identify time management and task prioritization skills.
- 4.D.02a Explain the importance of following workplace etiquette/protocol.
- 4.D.03a Demonstrate willingness to learn and further develop skills.
- 4.D.04a Demonstrate self-management skills.
- 4.D.05a List causes of stress and effective stress management techniques.
- 4.D.06a Describe the importance of having a positive attitude and techniques that boost morale.
- 4.D.07a Show initiative by coming up with unique solutions and taking on extra responsibilities.
- 4.D.08a Explain the importance of setting goals and demonstrate the ability to set, reach, and evaluate goals.
- 4.D.09a Explain the importance of taking pride in work accomplished and extrinsic and intrinsic motivators that can be used to increase pride.
- 4.D.10a Value the importance of professionalism, including reliability, honesty, responsibility, and ethics.
- 4.D.11a Demonstrate a respect for diversity and its benefit to the workplace.
- 4.D.12c Meet company attendance punctuality expectations.
- 4.D.13c Demonstrate effective negotiation skills.
- 4.D.14c Demonstrate conflict management with management/co-workers/others.
- 4.D.15c List the characteristics of a rational/responsible employee.

**4.E Identify the standards and qualifications that must be met to pursue careers in Agriculture and Natural Resources.**

- 4.E.01c Explain what types of skills or knowledge are necessary to work in a specific field of study.
- 4.E.02c Describe what type of degree or certification is required to enter a desired job/career.

**Performance Example:**

1. Student describes a career path progression including educational training, necessary work experience, and knowledge attainment to pursue careers within the Agriculture and Natural Resources Cluster. Include the major career areas and examples of post-secondary opportunities.

## **Strand 5: Management and Entrepreneurship Knowledge and Skills**

### **5.A Analyze basic business practices required to start and run a company/organization.**

- 5.A.01a Define entrepreneurship.
- 5.A.02a Describe the relationship between suppliers, producers, and consumers.
- 5.A.03a Compare and contrast types of businesses, including sole proprietorships, small businesses, companies, corporations, governmental agencies, and non-profit organizations.
- 5.A.04a Describe practices that ensure quality customer service.
- 5.A.05a Explain the value of competition in business/field.

#### **Performance Examples:**

1. Prepare a business plan for a new company in your community..
2. Participate in a discussion with members of a local small-business incubator or chamber of commerce, identifying opportunities and summarizing best practices of new companies..
3. Create an equipment list, with costs, of equipment required for doing specific tasks..
4. Identify local zoning and environmental laws that apply to businesses in your industry..

### **5.B Manage all resources related to a business/organization.**

- 5.B.01a Identify a company's/organization's chain of command and organizational structure.
- 5.B.02a Define and demonstrate leadership and teamwork skills.
- 5.B.03a Explain ways a company or organization can market itself, including choosing a name, designing logos and promotional materials, advertising, and the importance of word-of-mouth.
- 5.B.04a Identify methods to track inventory, productivity, income, expenses, and personnel.
- 5.B.05a Explain the importance of written operating procedures and policies.
- 5.B.06a Identify professional organizations and their benefits.
- 5.B.07a Explain methods to effectively run a meeting.

#### **Performance Examples:**

1. Create a plan to keep track of tools and supplies in your classroom/shop.
2. Work as a team to complete a project, including running and participating in problem-solving meetings.
3. Contact a relevant professional organization and request information about its benefits, membership requirements, and costs.
4. Clip print advertisements from local companies, identifying common themes and contrasting different styles.

### **5.C Describe methods for managing, organizing, retrieving and reporting financial data.**

- 5.C.01a Explain the role of small businesses in the economy.
- 5.C.02a Extract and extrapolate data from financial documents, such as a pay-stub, budget, tax statement, and financial report.

**Performance Examples:**

1. Create and follow a budget for an in-class project.
2. Identify equipment in your shop/lab that are considered as capital.
3. From a pay-stub, determine gross salary, deductions, and net pay for a calendar year.
4. Create a rate card or other list of standardized costs for services provided, based on research of local rates and practices.

**5.D Apply labor and civil rights law and guidelines to business practice and decisions.**

- 5.D.01a List federal and state mandated employee rights.
- 5.D.02a Describe proper working conditions for your industry.
- 5.D.03a Explain the role of labor organizations.
- 5.D.04a Discuss the importance of diversity and list methods of encouraging diversity in the workplace.
- 5.D.05a Describe standard forms of employment contracts applicable to your industry.
- 5.D.06a State the current minimum wage, as well as wages for common jobs found within the field.
- 5.D.07a List opportunities for continual professional development.

**Performance Examples:**

1. Participate in and summarize a discussion with a member of a labor organization.
2. Participate in and summarize a discussion with a member of a civil rights organization.
3. While participating in a group project, write and follow job descriptions for each member of the team.
4. Evaluate a shop/lab in terms of safety, ergonomics, and workflow.

**5.E Evaluate the effects of community relations on companies and the industry.**

- 5.E.01a Describe the role that the industry/organization plays in different communities.
- 5.E.02a Describe the role that community interests play in a company's/organization's decision-making process.

**Performance Example:**

1. Participate in a service project or community-centered event.

**5.F Apply legal requirements and ethical considerations to business practice and decisions**

- 5.F.01a Identify laws that regulate businesses/organizations in your field.
- 5.F.02a Define the requirements for and protections given by copyright and trademark law.
- 5.F.03a Define the impact of the Americans with Disabilities Act and other civil rights legislation on your business/organization, employees, and customers.
- 5.F.04a Define ethical business practices for your field.
- 5.F.05a Identify trade-specific practices that support clean energy technologies and encourage environmental sustainability.

- 5.F.06 State local ordinances, zoning, and permitting laws and regulations relating to horticulture.

**Performance Examples:**

1. Research the ethical guidelines set forth by a professional organization related to your industry and participate in a debate over how to apply these guidelines to a variety of situations.
2. Create a portfolio of a variety of completed contracts and their uses.
3. Participate in and summarize a discussion with a lawyer, consumer advocate, or other legal professional.
4. Create a quick reference outline listing legal topics and related resources.

**5.G Demonstrate knowledge of ethical and legal issues as they related to the stewardship of natural resources.**

- 5.G.01c Explain how personal responsibility and choices are related to natural resource sustainability.
- 5.G.02c Explain how personal workplace actions can affect the resource.
- 5.G.03c Identify sources for regulatory information.

**Performance Example:**

1. Describe examples of environmental impact by agricultural endeavors and the responsibility we have to minimize the impact. Include some of the methods we have at our disposal to sustain our resources.

## **Strand 6: Technological Knowledge and Skills**

### **6.A Demonstrate proficiency in the use of computers and applications as well as an understanding of concepts underlying hardware, software, and connectivity.**

- 6.A.01a Select and utilize the appropriate technology to solve a problem or complete a task.
- 6.A.02a Demonstrate file management skills (e.g., install new software, compress and expand files as needed, download files as appropriate).
- 6.A.03a Differentiate between different operating systems and demonstrate use of at least one to open and switch between programs and files.
- 6.A.04a Identify and demonstrate resolutions to simple hardware and software problems as they occur (e.g., frozen screen, disk error, printing problems).
- 6.A.05a Save, retrieve, load, format, and import data into, and export a variety of electronic documents (word processing, spreadsheet, database, AND desktop publishing).
- 6.A.06a Demonstrate the proper use of a variety of external peripherals and how they connect to a computer.
- 6.A.07a Illustrate methods of selecting and using search engines.
- 6.A.08a Send, receive, and manage electronic correspondence and files, in accordance with school policy.
- 6.A.09a Demonstrate proper use of electronic proofreading tools and explain reasons why these shouldn't be relied upon solely.
- 6.A.10c Perform efficient keyboarding techniques.
- 6.A.11c Demonstrate the use of formulas in a spreadsheet application.

#### **Performance Example:**

1. In the development of work-based projects, students demonstrate computer skills inherent in the word processing techniques used, the organization of data, use of photographic representation, research projects, and other relevant project based activities.

### **6.B Demonstrate responsible use of technology and an understanding of ethics and safety issues in using electronic media.**

- 6.B.01a Identify ways in which technology is used in the workplace and in society.
- 6.B.02a Summarize the rights and responsibilities of the school's Acceptable Use Policy.
- 6.B.03a Explain laws restricting use of copyrighted materials on the Internet.
- 6.B.04a Discuss the concerns about electronic communications, privacy and security, including protection from spyware and viruses.

#### **Performance Example:**

1. Describe how computers are used to increase efficiency, accuracy, and professionalism in the industry.

### **6.C Demonstrate ability to use technology for research, problem solving, and communication.**

- 6.C.01a Locate, evaluate, collect, and process information from a variety of electronic sources.

- 6.C.02a Demonstrate the use of telecommunications and other media to interact or collaborate with peers, experts, and other audiences.
- 6.C.03a Demonstrate the use of appropriate electronic sources to conduct research (e.g., Web sites, online periodical databases, and online catalogs).
- 6.C.04a Demonstrate proper style (with correct citations) when integrating electronic research results into a research project.
- 6.C.05a Collect, organize, analyze, and graphically present data using the most appropriate tools.
- 6.C.06a Present information, ideas, and results of work using any of a variety of communications technologies (e.g., multimedia presentations, Web pages, videotapes, desktop-published documents).
- 6.C.07a Identify capabilities of technology resources and describe how they can be used for lifelong learning.
- 6.C.08a Demonstrate the proper use of electronic tools and office communications equipment (telephone, fax, copier, etc.).

**Performance Example:**

1. Student is able to effectively use various technologies in the workplace.