Tennessee CTE

Greenhouse Management

Introduction to the Greenhouse Industry 1

1.1 Impact and Advancements: Summarize the historical development of the greenhouse production industry. Analyze the global nature of the horticulture industry and explain the economic impact and technological advancements associated with the greenhouse industry. 1.1

1.2 Recordkeeping and SAE: Accurately maintain an active recordkeeping system and apply proper financial recordkeeping skills as they relate to a greenhouse industry. Demonstrate the ability to develop, analyze records, generate reports, and completing related applications and reports. (i.e., employment applications, efficiency reports, SAE applications, and profit and loss statements). 1.2

1.3 Safety: Apply the concepts of occupational safety and safety prevention and control standards by interpreting industry manuals information. 1.3

- A Assess and explain the concepts of the worker protection standards. 1.3A
- B Review common laboratory safety procedures for tool and equipment operation in horticulture laboratories, including but not limited to accident prevention and control procedures. Demonstrate the ability to follow safety and operational procedures in a lab setting and complete a safety test with 100 percent accuracy. 1.3B

Greenhouse Design, Construction, and Components 2

2.1 Structures: Classify structures by comparing and contrasting their controlled environment system (greenhouse, high tunnel, cold frame, vertical farming, hydroponics, etc.), and construction materials including but not limited to frames, coverings, and glazing materials. Justify the selection of the structure's construction materials based on cost- effectiveness, stability, maintenance, and function. 2.1

2.2 Planning and Design: Describe characteristics of successful greenhouses and create a list of factors for planning and designing greenhouse facilities. Factors must include physical location, market potential, utilities, climatic conditions, and production goals. 2.2

2.3 Design: Create an annotated model representing research-based practices in greenhouse planning and design and justify the process outlined for specific crops. The design must include at least the following items: structure materials, layout, lighting, bench arrangements, traffic flow, and physical location. 2.3

2.4 **Structure Maintenance: Compare general maintenance and upkeep requirements for a variety of greenhouses in relation to the type of structural framework and associated systems. Explain prescribed maintenance, preventative maintenance, monitoring, and troubleshooting schedules for greenhouse facilities and equipment. Demonstrate the mechanical skills needed for the general maintenance and repair of greenhouse structures and associated systems:(such as framework, equipment, electric motors, basic wiring, plumbing, and general construction).** 2.4

Growing Media 3

3.1 **Types of Growing Media: Explain the types and utility of the attributes of growing media. Describe the major components of soil and other growing media, and identify basic physical and chemical characteristics including structure, texture, alkalinity, water holding capacity, and drainage.** 3.1

3.2 **Plant Nutrients and Formulations: Identify the effects of soil and soilless compositions (pH, organic matter content, and mineral content) on plant health and growth. Perform basic soil sampling and testing techniques and interpret test data to formulate corrective actions as needed.** 3.2

3.3 **Preparation of Growing Media: Explain the principles of media preparation; develop a check sheet to guide media preparation. Describe the purpose, methods, and importance of sterilizing media. Compare and contrast the cost-effectiveness of premix and personal mix media to soil mix.)** 3.3

Plant Structure, Function, and Growth 4

4.1 **Plant Identification: Apply concepts of scientific taxonomy and industry-specific terminology in distinguishing different species and types of plants grown in a controlled environment:** 4.1

- A common vegetable plants, 4.1A
- B common bedding plants, and 4.1B
- C common herb plants. 4.1C

4.2 **Plant Structure and Function: Determine the basic plant structure components that affect plant growth and development. Differentiate between the:** 4.2

- A relationship between form and function for major plant structures and 4.2A
- B anatomical and physiological differences of specific plant species. 4.2B

4.3 **Processes for Plant Life: Explain the interrelationships between light, temperature, and water to the plant life processes (such as photosynthesis, respiration, and transpiration), plant growth, and maintenance.** 4.3

4.4 **Growth Regulators: Compare and contrast current industry approved methods to regulate plant growth including, but not limited to, environmental, physical, genetic, and chemical.** 4.4

Plant Nutrition 5	**5.1** Nutrient Requirements and Deficiencies: Analyze the nutrient requirements of plants and assess the importance of the 17 essential plant nutrients for plant health. Identify the chemical and biological processes needed to make nutrients available for growth and maintenance, and distinguish among nutrient deficiency and toxicity signs and symptoms in plants. 5.1
	5.2 Fertilizer Safety: Determine the significant safety hazards associated with fertilizer use. Evaluate the use of different precautions for the prevention or management of hazards and evaluate the efficacy of prevention measures. 5.2
	5.3 Fertilizer Application: Identify the basic types of fertilizers and their applications for greenhouse production crops. Differentiate the effects of fertilizer ratios on plant growth and health to hypothesize possible outcomes of each ratio. Calculate proper formulations of fertilizers based upon label directions using systems of equations. Demonstrate the ability to follow fertilizer label procedures precisely as they pertain to the selection, handling, application, storage, and disposal. 5.3
Plant Propagation 6	**6.1** Plant Propagation Methods: Differentiate between the methods of sexual and asexual plant propagation. Compare and contrast the following techniques of propagation, explaining the advantages and disadvantages of each: cutting, budding, layering, sowing, germination rate calculation, and seed viability. 6.1
Environmental Control Systems 7	**7.1** Controlled Environment Production: Assess the procedures required for producing multiple commercial plant species in a controlled environment, and apply these procedures to produce a variety of specific greenhouse crops. Evaluate environmental factors that affect greenhouse crops to justify management methods. 7.1
	7.2 Climate Contol Equipment: Evaluate the greenhouse climate and recommend the proper climate control equipment to maintain an optimum growing climate, including but not limited to ventilation, humidifiers, heating, cooling, and shading. Provide written justification for each recommendation. 7.2
	7.3 Water Management: Demonstrate effective methods to meet water requirements for healthy plant growth. Examine and explain how water pH influences plant growth. Research from multiple technical texts the function and operating principles of greenhouse irrigation systems (such as misting, drip, and overhead systems) to meet watering requirements to maintain the optimum moisture level for a variety of plants. 7.3
Diseases, Disorders, and Pests 8	**8.1** Identification, Prevention, Treatment, and Control: Determine the economic and aesthetic impact of plant diseases, disorders, and pests. Identify and diagnose the symptoms of common plant diseases, disorders, and pests, and summarize methods of prevention, treatment, and control by drawing evidence from informational texts and relevant scientific literature. 8.1

	8.2 Pesticide Application: Identify the types of pesticides and their applications for greenhouse production. Research the safety hazards associated with pesticide use for multiple greenhouse pesticides. Calculate proper formulations of pesticides based upon label directions for specific pests by creating systems of equations that describe numerical relationships. 8.2
	8.3 Pesticide Safety: Demonstrate the ability to follow pesticide procedures precisely according to label and safety guidelines, including selection, handling, personal protective equipment (PPE), application, storage, and disposal. 8.3
	8.4 Integrated Pest Management: Evaluate the basic principles and assess the overall effectiveness of integrated pest management (IPM) for controlling greenhouse pests and diseases. Compare with traditional chemical controls. 8.4
Hydroponic Applications 9	**9.1** Hydroponic Systems: Examine the types of hydroponic systems in greenhouse crop production. Describe essential elements of hydroponic systems; explore recent trends and advancements to design a hydroponic system for a specific greenhouse crop. 9.1
	9.2 Soilless Media Systems: Compare hydroponic and soil-based growing methods for providing nutrients to plants. Summarize the advantages and disadvantages of using soilless media systems to evaluate the efficacy for specific crops. 9.2
Greenhouse Business Management 10	**10.1** Business Operations: Debate laws and regulations affecting horticulture businesses. Demonstrate the use of general business, recordkeeping skills, and spreadsheet skills necessary to manage a horticultural business, including but not limited to marketing, advertising, product displays, scheduling, inventory control, merchandise handling, price point projections, and profit and loss statements. 10.1
	10.2 Production Schedules: Research, develop, and implement greenhouse production schedules for a representative sampling of greenhouse crops that includes at least the following: plant selection, plant material cost (seed, plug, cuttings), growth media, fertilizers, water, testing kits, pricing guides, profit margin, labor, and other expenses. 10.2