Tennessee CTE

Agriscience

Agriscience Safety and Careers 1

1.1 Safety: Identify and explain general laboratory safety procedures including, but not limited to, prevention and control procedures in agriscience laboratories. Demonstrate safety procedures and complete safety test with 100 percent accuracy. 1.1

1.2 Careers: Explore and compare local, regional, state, national, and global career opportunities in the agriscience industry. Use multiple print, online, and/or personal interview sources, to capture at minimum the following: 1.2

- A Job description 1.2A
- B Essential knowledge and skills 1.2B
- C Program or path of study to reach occupational goals, starting with high school through postsecondary and/or military options 1.2C
- D Credentialing and/or licensure requirements 1.2D
- E Non-educational job requirements such as minimum age, experience in the field, physical fitness tests, background checks or other notable evaluations 1.2E
- F Resume writing 1.2F

Agriscience Investigation and Overview 2

2.1 Overview: Articulate important historical and current events impacting the agricultural industry and agricultural youth development. Include landmark laws, theories, and practices such as, but not limited to, the Morrill Act, the Smith-Lever Act, the Smith-Hughes Act, and influential figures such as John Deere, Henry Groseclose, Booker T. Washington, and important government agencies in the promotion of knowledge and technology of agricultural science, biotechnology, and key technological developments. 2.1

2.2 **Economic Impact: Analyze information to summarize the agricultural industry's economic impact. Explain the major agriculture commodity trends and its importance to Tennessee, the United States, and the global economy. Develop a foundational Supervised Agricultural Experience program that provides growth into an immersion SAE with an opportunity to implement multiple science and engineering practices:** 2.2

- A AQDP – asking questions and developing problems 2.2A
- B MOD – developing and using models 2.2B
- C PCI – planning and carrying out investigations 2.2C
- D AID – analyzing and interpreting data 2.2D
- E UMCT - using mathematics and computational thinking 2.2E
- F CEDS – constructing explanations (for science) and designing solutions (for engineering) 2.2F
- G EAE – engaging in argument from evidence 2.2G
- H OECI – obtaining, evaluating, and communicating information 2.2H

2.3 **Solutions: Define the criteria for successful solutions to common agricultural problems and identify relevant constraints (including social and political constraints). Include problems at the local, state, national, and global level. Evaluate solutions to these problems and how the solutions meet the defined criteria and constraints. For example, how to grow larger quantities of safe high-quality food on less land to feed the growing population.** 2.3

Fundamentals of Environmental Systems 3

3.1 **Systems: Research a variety of controlled environment systems including, but not limited to , aquaponic systems, from recycled bottles, hydroponic setups, wildlife habitats, greenhouses, etc. Design a controlled environment that accounts for the inputs, outputs, and stability of flows of matter from the major biogeochemical cycles – such as carbon, nitrogen, phosphorus, and water.** 3.1

3.2 **Models: Develop models for the flow of energy and matter (inorganic forms and overall biomass) in various ecosystems impacting agricultural and environmental systems. Using these models, calculate rates of productivity by analyzing the major components of a food chain. Employ mathematical models to explain growth patterns and rates, both density-dependent and density-independent factors, observed in ecosystems energy and nutrients flow.** 3.2

3.3 **Biodiversity: Evaluate the impact of habitat fragmentation, destruction, and other environmental pressures, such as invasive species, overharvesting, pollution, and climate change on local and global biodiversity (genetic, species, and ecosystems.) Distinguish between types of pollution (point and not-point sources) and their sources to predict the effects on environmental conditions (e.g., water, soil, and air), animal populations, and plant populations from various kinds of human activity.** 3.3

Fundamentals of Cell Structures and Processes 4	**4.1 Cell Structures: Explain the major events of the eukaryotic cell cycle which accounts for a single cell growing into a multicellular plant or animal that may have its own reproductive capacity. Compare and contrast cell division in various eukaryotic cell types in plants and animals.** 4.1
	4.2 Processes: Gather evidence to support that the arrangement of cells into tissues, organs, and systems meets the needs of an entire organism. For example distribution of water and nutrients to all cells in plants and animals. 4.2
Fundamentals of Genetics, Genomics, and Heredity 5	**5.1 Role of Genetics and Genomics: Evaluate the roles of genetics and genomics in understanding health and disease. Describe the impact genomics has made in the plant and animal science industry. Compare and contrast the important connections between these advancements, including, but not limited, to the clustered regularly interspaced short palindromic repeater (CRISPR) technology and agricultural consumer's views about the way these technologies impact food products.** 5.1
	5.2 Genetic Data: Analyze and interpret data (e.g., pedigrees, genetic markers, birth weights) that supports how sexual and asexual reproduction in plants and animals contributes or limits to genetic variation in populations. 5.2
Fundamentals of Anatomy and Physiology 6	**6.1 Animal Systems: Identify and describe the major animal body systems (skeletal, muscular, respiratory, digestive, nervous, circulatory, and reproductive). Develop explanations for the relationships between the structure of individual parts and their function in the larger system for common livestock, companion animal, and wildlife species. (E.g., Tendons transfer muscle movements to the skeletal system by attaching bones and muscles together.)** 6.1
	6.2 Form and Function: Apply the selection of specific traits to common animal breeds with different intended or domesticated uses, such as but not limited to draft horse versus light horse, meat cattle versus dairy cattle. Explain the form of domestic and wild animals to their intended uses or to their adaptive environmental niche. 6.2
Fundamentals of the BioChemistry of Animal Digestion 7	**7.1 Digestion: Explain the sequential organization of the different types of digestive systems in domestic animals and compare and contrast anatomical and physiological differences between monogastric and ruminants and herbivores versus carnivores. Analyze the stages of digestion and associated processes, including enzymes and hormones, for a simple and multi-chambered stomach.** 7.1
	7.2 Nutritional Deficiencies: Develop a solution to eliminate dietary deficiencies identified through the analysis of feedstuffs. Solutions should adhere to specified criteria for proper nutrition based on animal purpose, age, lifespan, and relevant constraints such as environmental factors and expense. 7.2
	8 Fundamentals of Plant and Soil Science 8

8.1 Fundamentals of Plant Growth: Apply concepts related to the basic cellular and biochemical process in plants to demonstrate the following: 8.1

- A Create a graphic illustration of the parts and functions of plant cells. 8.1A
- B Use quantitative reasoning to balance chemical equations related to plant processes. 8.1B
- C Interpret the role of physics within the cohesion/tension theory and its significance to plant life. 8.1C
- D Examine the roles of photopigments and the effects of different colors of light on plant growth. 8.1D

8.2 Fundamentals of Soil Science: Analyze models to explain the correlation between plant nutrient deficiencies and soil composition. Conduct basic soil analysis to determine the chemical elements and nutritional levels available in various soils that are essential for plant growth. Predict the ability of soils to meet the nutritional requirements of plants based on chemical composition, physical structure, and biological activity. 8.2

Fundamentals of Plant and Animal Reproductive Systems 9

9.1 Fundamentals of Plant Reproductive Systems: Compare and contrast the basic reproductive structures of plants, drawing out key differences between sexual and asexual reproduction processes used in plant reproduction. 9.1

9.2 Seed Anatomy: Using various seed models, analyze the structure and function of each to predict their roles in plant reproduction and propagation. 9.2

9.3 Fundamentals of Animal Reproduction Systems: Identify and describe the organs of the male and female animal reproductive systems that provide physiological functions. Compare and contrast the differences of the reproductive systems between small and large animal species. 9.3

Fundamentals of Power and Energy Systems 10

10.1 Energy: Use models to evaluate the changes in energy in agricultural applications. 10.1

- A Define types of energies and objects present in a system. 10.1A
- B Analyze the relations between changes in energy and work done on/by the system. 10.1B
- C Use evidence to support that simple machines use a tradeoff in force for distance to accomplish the same amount of work, while obeying the law of conservation of energy. 10.1C
- D Evaluate inefficiencies in designed systems that result from energy transfers to the surroundings. 10.1D
- E Explain energy transfers through radiation and how energy transferred from the sun can be stored and transferred for later use. 10.1E

	10.2 **Safety: Identify different models of producing electrical energy. Discuss the safety hazards as well as prevention and control methods relevant to electrical power models. Predict strategies to prevent or manage electrical hazards and evaluate the efficacy of the prevention measures.** 10.2
	10.3 **Energy Consumption: Summarize methods and compare units used to benchmark energy use. Utilize the appropriate instruments needed to calculate and measure voltage, amperage, resistance, and wattage.** 10.3
Fundamentals of Engines 11	**11.1** **Engine cycles: Develop models that explain how changes in chemical energy, thermal energy and states of matter allow the operation of small gasoline and diesel engine cycles.** 11.1
	11.2 **Horsepower: Using mathematical models, calculate horsepower and thermal efficiency for a variety of internal combustion engines.** 11.2