

ATTACHMENT IV
Text of Proposed New 19 TAC

Chapter 130. Texas Essential Knowledge and Skills for Career and Technical Education

Subchapter I. Hospitality and Tourism

§130.256. Food Chemistry (One Credit), Adopted 2015.

- (a) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisites: three units of science, including chemistry and biology. Recommended prerequisite: Principles of Hospitality and Tourism. Students ~~[To receive credit in science, students]~~ must meet the 40% laboratory and fieldwork requirement ~~[identified in §74.3(b)(2)(C) of this title (relating to Description of a Required Secondary Curriculum)]~~. This course satisfies a high school science graduation requirement ~~[including the fourth science credit]~~. Students shall be awarded one credit for successful completion of this course.
- (b) Introduction.
- (1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
 - (2) The Hospitality and Tourism Career Cluster focuses on the management, marketing, and operations of restaurants and other food/beverage services, lodging, attractions, recreation events, and travel-related services.
 - (3) In Food Chemistry students conduct laboratory and field investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving. Food Science is the study of the nature of foods, the causes of deterioration, the principles underlying food processing, and the improvement of foods for the consuming public.
 - (4) Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable.
 - (5) Scientific inquiry is the planned and deliberate investigation of the natural world. Scientific methods of investigation are experimental, descriptive, or comparative. The method chosen should be appropriate to the question being asked.
 - (6) Scientific decision making is a way of answering questions about the natural world. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).
 - (7) A system is a collection of cycles, structures, and processes that interact. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.
 - (8) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
 - (9) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.
- (c) Knowledge and skills.
- (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

- (A) apply interpersonal communication skills in business and industry settings;
 - (B) explain and recognize the value of collaboration within the workplace;
 - (C) examine the importance of time management to succeed in the workforce;
 - (D) identify work ethics/professionalism in a job setting; and
 - (E) develop problem-solving and critical-thinking skills.
- (2) The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:
- (A) demonstrate safe practices during laboratory and field investigations; and
 - (B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.
- (3) The student uses scientific methods and equipment during laboratory and field investigations. The student is expected to:
- (A) know the definition of science and understand that it has limitations, as specified in subsection (b)(4) of this section;
 - (B) know that hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories;
 - (C) know scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but they may be subject to change as new areas of science and new technologies are developed;
 - (D) distinguish between scientific hypotheses and scientific theories;
 - (E) plan and implement descriptive, comparative, and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology;
 - (F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures;
 - (G) analyze, evaluate, make inferences, and predict trends from data; and
 - (H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.
- (4) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:
- (A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;
 - (B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;

- (C) draw inferences based on data related to promotional materials for products and services;
 - (D) evaluate the impact of scientific research on society and the environment;
 - (E) evaluate models according to their limitations in representing biological objects or events; and
 - (F) research and describe the history of biology and contributions of scientists.
- (5) The student analyzes the role of acids and bases in the food sciences. The student is expected to:
- (A) evaluate physical and chemical properties of acids and bases; and
 - (B) analyze the relationship of pH to the properties, safety, and freshness of food.
- (6) The student evaluates the principles of microbiology and food safety practices. The student is expected to:
- (A) investigate the properties of microorganisms that cause food spoilage;
 - (B) compare food intoxication and food infection;
 - (C) examine methods to destroy or inactivate harmful pathogens in foods;
 - (D) compare beneficial and harmful organisms;
 - (E) analyze sanitary food-handling practices; and
 - (F) prepare for a state or national food manager's sanitation certification or alternative credential within the field of food science technology.
- (7) The student examines the chemical properties of food. The student is expected to:
- (A) describe elements, compounds, mixtures, and formulas related to food science;
 - (B) compare heterogeneous and homogeneous mixtures;
 - (C) use chemical symbols, formulas, and equations in food science; and
 - (D) analyze chemical and physical changes in food.
- (8) The student analyzes solutions, colloids, solids, gels, foams, and emulsions in food science. The student is expected to:
- (A) identify the solvent and solute in a given solution;
 - (B) compare unsaturated, saturated, and supersaturated solutions, including boiling and freezing points;
 - (C) calculate the concentration of a solution using mass percent;
 - (D) describe the properties of colloidal dispersions;
 - (E) investigate the relationship of the three parts of an emulsion; and
 - (F) create various food emulsions.
- (9) The student analyzes the functions of enzymes in food science. The student is expected to:
- (A) describe the role of enzymes as catalysts in chemical reactions of food;
 - (B) explain the relationship between an enzyme and a substrate;
 - (C) analyze the functions of enzymes in digestion; and
 - (D) analyze enzyme reactions in food preparation.
- (10) The student evaluates the role of fermentation in food science. The student is expected to:
- (A) analyze reasons food is fermented;
 - (B) assess the role of bacteria in food fermentation;

- (C) conduct laboratory experiments with various fermentation processes using the scientific processes; and
 - (D) prepare various fermented food products.
- (11) The student assesses the reaction of leavening agents in baked products. The student is expected to:
- (A) identify various leavening agents and describe their role in baked products;
 - (B) analyze the role of acids as leavening agents in baked products;
 - (C) compare doughs and batters used in baked products;
 - (D) conduct laboratory experiments with various leavening agents using the scientific processes; and
 - (E) create baked products using various leavening agents.
- (12) The student explores the roles of food additives. The student is expected to:
- (A) evaluate the various types of food additives such as incidental, intentional, natural, and artificial;
 - (B) investigate the various roles of food additives such as food preservation, nutritive value, and sensory characteristics;
 - (C) research agencies involved in regulating food additives; and
 - (D) conduct laboratory experiments using the scientific processes to compare sensory characteristics of additives in food products.
- (13) The student analyzes the processes of energy production in food. The student is expected to:
- (A) discuss molecular motion and temperature;
 - (B) examine heat transfer processes such as conduction, convection, and radiation;
 - (C) investigate phase changes in food production such as latent heat, crystallization, and condensation;
 - (D) analyze rates of reaction using various temperatures;
 - (E) conduct laboratory experiments using the scientific processes to compare phase changes in food production; and
 - (F) conduct laboratory experiments using the scientific processes to compare rates of reaction using various temperatures.
- (14) The student evaluates the properties of carbohydrates and their effects on food production. The student is expected to:
- (A) discuss photosynthesis;
 - (B) identify the chemical structures of carbohydrates;
 - (C) describe the functions of carbohydrates in food production such as a caramelizing agent, crystallizing agent, and thickening agent;
 - (D) compare the structures of simple and complex carbohydrates and how these structures affect food production;
 - (E) describe various process such as gelatinization, retrogradation, and syneresis in food production;
 - (F) conduct laboratory experiments using the scientific processes to explore the functions of carbohydrates in food production; and
 - (G) create food products using simple and/or complex carbohydrates.

- (15) The student evaluates the properties of fats and their effects on food production. The student is expected to:
- (A) identify the chemical structure of saturated and unsaturated fats;
 - (B) compare the properties of saturated and unsaturated fats;
 - (C) examine the functions of fats in food production;
 - (D) explore methods for controlling fat oxidation;
 - (E) analyze the effects of temperature on fats in food preparation;
 - (F) conduct laboratory experiments using the scientific processes to explore the functions of fats in food production; and
 - (G) create food products using saturated and unsaturated fats.
- (16) The student evaluates the properties of proteins and amino acids and their effects on food production. The student is expected to:
- (A) identify the elements of an amino acid;
 - (B) describe the chemical structure of various amino acids;
 - (C) explain the processes of protein denaturation and coagulation;
 - (D) examine the functions of proteins in food productions such as emulsifiers, foams, and gluten formation;
 - (E) analyze the effect of temperature on protein in food production and storage;
 - (F) explore moist and dry heat methods for preparing protein rich foods;
 - (G) conduct laboratory experiments using the scientific processes to explore the functions of protein in food production; and
 - (H) create food products using protein.
- (17) The student evaluates the properties of vitamins and minerals and their effects on food production. The student is expected to:
- (A) discuss the functions of vitamins and minerals in food production;
 - (B) compare the effects of food production on water- and fat-soluble vitamins;
 - (C) assess the interrelationships among vitamins and minerals in food production; and
 - (D) conduct laboratory experiments using the scientific processes to explore the effects of food production on soluble vitamins and minerals.
- (18) The student evaluates the properties of water and their effects on food production. The student is expected to:
- (A) identify the properties of water;
 - (B) compare the effects of hard and soft water on food production;
 - (C) analyze the phases of water and their effects on food production;
 - (D) explain the functions of water in food production such as a heat medium and a solvent;
 - (E) conduct laboratory experiments using the scientific processes to explore the functions of water in food productions; and
 - (F) create food products using water as a heat medium or a solvent.
- (19) The student analyzes processes that destroy bacteria during food production. The student is expected to:

- (A) examine the food irradiation process; and
 - (B) investigate the pasteurization process.
- (20) The student examines packaging and labeling guidelines. The student is expected to:
 - (A) research federal food packaging guidelines;
 - (B) analyze components of appropriate commercial food containers;
 - (C) describe controlled-atmosphere packaging; and
 - (D) investigate information required on a food label.
- (21) The student analyzes food preservation processes. The student is expected to:
 - (A) describe reasons for food preservation;
 - (B) compare methods of dehydration;
 - (C) analyze various methods of personal and commercial food canning;
 - (D) examine the various methods of personal and commercial food freezing;
 - (E) investigate safe practices for personal and commercial food preservation;
 - (F) conduct laboratory experiments using the scientific processes to demonstrate food preservation processes; and
 - (G) create food products using food preservation processes.