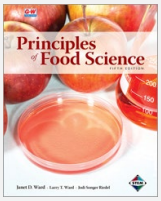
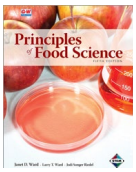
Goodheart-Willcox Publisher
18604 West Creek Drive • Tinley Park, IL 60477-6243
Web www.g-w.com
Orders 800.323.0440
Phone 708.687.5000
Fax 708.687.5068

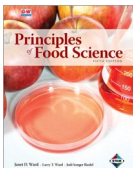
**Goodheart-Willcox**
**Correlation Principles of Food Science (2022)**
**Texas Essential Knowledge And Skills For Career Development**
**And Career And Technical Education**
**Hospitality And Tourism**
**Course Name and Number: 127.482 Food Science (Grade 9-12)**



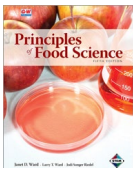

| Standards | Correlating Text Pages |
|---|---|
| **(c) Introduction** | |
| (1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and 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 Science, students examine the nature and properties of foods, food microbiology, and the principles of science in food production, processing, preparation, and preservation; use scientific methods to conduct laboratory and field investigations; and make informed decisions using critical thinking and scientific problem solving. This course provides students a foundation for further study that leads to occupations in food and beverage services; the health sciences; agriculture, food, and natural resources; and human services. | |
| (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 currently scientifically testable. | |
| (5) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.<br>(A) 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; and<br>(B) 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. | |
| (6) Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.<br>(A) Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.<br>(B) Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models. | |



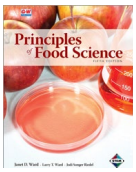

| Standards | Correlating Text Pages |
|---|---|
| (7) Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information). | |
| (8) Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. 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, while models allow for boundary specification and provide a tool for understanding the ideas presented. 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. | |
| (9) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations. | |
| (10) 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. | |
| **(d) Knowledge and Skills** | |
| (1) The student demonstrates professional standards/employability skills as required by the food service business and industry. The student is expected to: | |
| (A) apply interpersonal communication skills in the food service business and industry settings; | 545 |
| (B) explain and recognize the value of collaboration within the workplace; | 544 |
| (C) examine the importance of time management to succeed in the workforce; | 544 |
| (D) identify work ethics and professionalism in a job setting; | 544 |
| (E) describe problem-solving and critical-thinking skills used in the workplace; and | 544-545 |



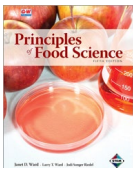

| Standards | Correlating Text Pages |
|---|---|
| (F) explore careers and professions in food science. | 527-536, 528 (2019 Employment in Food-Related Occupations) 531 (Food Features) |
| (2) The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to: | |
| (A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations; | 525-526 |
| (B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems; | 525-526 |
| (C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards; | 11-12, 14-15, 34, 35(Lab Safety), 97-98, 364-369 364 (Food Features), 365 (STEM Matters), 367 (Food Features) |
| (D) use appropriate tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, metric rulers, electronic balances, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, and models, diagrams, or samples of biological specimens or structures, vacuum sealer, oven, cook top, cookware, bakeware, cutlery, and measuring cups and spoons; | 505-519, 506 (STEM Matters), 507 (Historical Highlight), 512 (Food Product Research Team Members), 513 ( Growing Foods That Are Out of This World), 515 (Research and development Tasks, 518 (Nutrition News) |
| (E) collect quantitative data using the International System of Units (SI) and United States customary units and qualitative data as evidence; | 513-514 |
| (F) organize quantitative and qualitative data using lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports; | 514 |



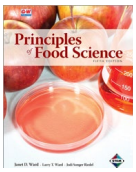

| Standards | Correlating Text Pages |
|---|---|
| (G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and | 514 |
| (H) distinguish between scientific hypotheses, theories, and laws. | 514 |
| (3) The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to: | |
| (A) identify advantages and limitations of models such as their size, scale, properties, and materials; | 514 |
| (B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations; | 514 |
| (C) use mathematical calculations to assess quantitative relationships in data; and | 514 |
| (D) evaluate experimental and engineering designs. | 514 |
| (4) The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to: | |
| (A) develop explanations and propose solutions supported by data and models consistent with scientific ideas, principles, and theories; | 514 |



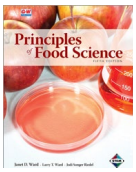

| Standards | Correlating Text Pages |
|---|---|
| (B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and | 514 |
| (C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence. | 514 |
| (5) The student knows the contributions of scientists and engineers and recognizes the importance of scientific research and innovation on society. The student is expected to: | |
| (A) analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student; | 514, 514 (Examining the Effectiveness of a Study on the Ability of Ginkgo Biloba to Slow Cognitive Decline) |
| (B) relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists and engineers as related to the content; and | 514, 514 (Examining the Effectiveness of a Study on the Ability of Ginkgo Biloba to Slow Cognitive Decline) |
| (C) research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics or food science field. | 33-34, 511-513 |
| (6) The student analyzes household and commercial sustainability and regulatory practices in food production. The student is expected to: | |
| (A) research and investigate resource use, sustainability, and conservation in food production such as with water, land, and oceans; | 12-15, 445-446 |
| (B) analyze the effect of food on the decomposition cycle, including composting, recycling, and disposal; and | 448 (Farm Futures), 498 (Going Green) |




| Standards | Correlating Text Pages |
|---|---|
| (C) demonstrate appropriate methods for sorting and disposing of food waste, including fats and oils, and packaging waste from food production. | 448 (Farm Futures) |
| (7) The student analyzes the role of acids and bases in food science. The student is expected to: | |
| (A) evaluate physical and chemical properties of acids and bases; and | 93-101, 97 (STEM Matters), 98 (pH of Some Common Foods), 99 (Characteristics of Acids and Bases) |
| (B) analyze the relationship of pH to the properties, safety, and freshness of food. | 98-107, 98 (pH of Some Common Foods), 99 (Characteristics of Acids and Bases), 100 (Farm Futures) |
| (8) 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; | 309-312, 356-360, 357 (Food Features), 358 (STEM Matters), 361 (Relevant Research), 364-366, 365 (STEM Matters), 367 (Food Features) |
| (B) compare food intoxication and food infection; | 352-360 354 (Going Green), 356 (STEM Matters), 357 (Food Features), 358 (STEM Matters), 361 (Relevant Research) |
| (C) examine methods to destroy or inactivate harmful pathogens in foods; | 397- 402, 404-417, 405 (STEM Matters), 408 (FDA-Approved Food Irradiation Dosage Levels |
| (D) compare beneficial and harmful microorganisms, including lactic acid bacteria, acetic acid bacteria, various baking and brewing yeasts, E. coli, Staphylococcus, Clostridium botulinum, Clostridium perfringens, Salmonella, Listeria, and Shigella; | 336-341, 337 (STEM Matters), 338 (Farm Futures), 339 (Relevant Research), 352-359, 357 (Food Features) |
| (E) analyze sanitary food-handling practices such as personal hygiene or equipment sanitation; and | 364-366, 365 (STEM Matters), 366 (Food Fact) |

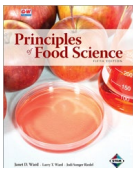



| Standards | Correlating Text Pages |
|---|---|
| (F) prepare for a state or national food manager sanitation certification or alternative credential within the field of food science technology. | 366-369, 367 (HACCP Principles), 367 (Food Features) |
| (9) The student examines the chemical properties of food. The student is expected to: | |
| (A) describe acids, bases, salts, carbohydrates, lipids, proteins and other elements, compounds, and mixtures related to food science; | 61-65, 61(Form Futures), 62 (Periodic Table of the Elements), 93 96, 95 (Nutrition News), Salt in the Diet, 135-136, 186-191, 187 (Relevant Research), 213 214 |
| (B) compare heterogeneous and homogeneous mixtures; | 66-67 |
| (C) analyze chemical and physical changes in food; and | 67-69, 405-407, 406 (The Development of Food Irradiation) |
| (D) use chemical symbols, formulas, and equations in food science such as oxidation of sugars in a cut apple or fermentation in the production of yogurt. | 69 |
| 10. 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 various solutions such as brines; | 67, 467-473, 468 (The Science Behind a Hard-Cooked Egg), 472 (Food Fact), 491-493, 492 Food Fact) |
| (B) compare unsaturated, saturated, and supersaturated solutions, including their effects on boiling and freezing points in food preparation such as when making candy or ice cream; | 144-145, 178, 179 (Fatty Acids in Common Fats and Oils), 190-191, 294 (Historical Highlight), 469 |
| (C) calculate the concentration of a solution using mass percent such as the concentration of sugar needed for crystallization; | 470 471 471 (STEM Matters) |

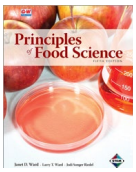



| Standards | Correlating Text Pages |
|---|---|
| (D) describe the properties of colloidal dispersions such as gelatin, mayonnaise, or milk; | 473-475, 475 (Comparison of Milk Products) |
| (E) differentiate between and give examples of temporary, semi-permanent, and permanent emulsions; | 475-477, 476 (Food Features) |
| (F) investigate the relationships between the three parts of a permanent emulsion; and | 475-477, 476 (Food Features) |
| (G) create temporary, semi-permanent, and permanent food emulsions. | 475-477, 476 Food Features |
| 11. 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, including cheese-making, the enzymatic tenderization of meat, and oxidation of sugars in fruit; | 221-224 222 (Historical! Highlight), 222 (STEM Matters, 225 (Farm Futures] |
| (B) explain the relationship between an enzyme and a substrate; | 222-223, 226 |
| (C) analyze the functions of enzymes in digestion, including the factors that influence enzyme activity, and relate enzymatic activity in digestion to dietary restrictions; and | 101-103, 222 (STEM Matters), 224, 233 |
| (D) analyze enzyme reactions in food preparation, including cheese-making, the enzymatic tenderization of meat, and oxidation of sugars in fruit. | 229 (Uses of Enzymes in Food Production) |

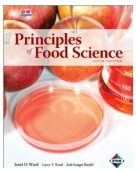
Goodheart-Willcox Publisher
18604 West Creek Drive • Tinley Park, IL 60477-6243
Web www.g-w.com
Orders 800.323.0440
Phone 708.687.5000
Fax 708.687.5068



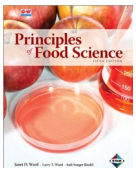

| Standards | Correlating Text Pages |
|---|---|
| 12. The student evaluates the role of fermentation in food science. The student is expected to:: | |
| (A) analyze modern and historical reasons food is fermented; | 334 - 343, 338 (Farm Futures) 339 (Relevant Research) 343 (What Microbes Do to Food Value) |
| (B) describe the conditions under which bacterial fermentation of food occurs and use chemical equations to describe the products of fermentation; and | 336 - 341, 338 (Farm Futures), 339 (Relevant Research) |
| (C) prepare various fermented food products. | 334 - 343, 338 (Farm Futures) 339 (Relevant Research) 343 (What Microbes Do to Food Value) |
| 13. The student assesses the reaction of leavening agents in baked products. The student is expected to: | |
| (A) describe the physical and chemical changes that occur in leavening; | 104, 119, 315 |
| (B) identify various leavening agents and describe their functions in food production; | 104, 119, 315 |
| (C) use chemical equations to describe how acids act as leavening agents; | 104, 119, 315 |
| (D) conduct laboratory experiments with various types and amounts of leavening agents to compare the doughs and batters produced; and | 104, 119, 315 |
| (E) create baked products using various leavening agents. | 104, 119, 315 |




| Standards | Correlating Text Pages |
|---|---|
| 14. 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; | 309 - 319, 313 (Natural Coloring Agents), 314 (Food Facts), 316 (Maturing and Bleaching Agents), 317 Nutrition News), 319 (Benefits of Food Additives) |
| (B) investigate the various functions of food additives such as preserving food, increasing nutritive value, and enhancing sensory characteristics; and | 309 - 319, 313 (Natural Coloring Agents), 314 (Food Facts), 316 (Maturing and Bleaching Agents), 319 (Benefits of Food Additives) |
| (C) research local, state, national, and international agencies involved in regulating food additives. | 306 |
| 15. The student analyzes the effects of heat energy transfer in food production. The student is expected to: | |
| (A) analyze the relationship between molecular motion and temperature; | 85-86 |
| (B) compare heat transfer processes, including conduction, convection, and radiation; | 84-86 |
| (C) investigate the role of phase changes in food production, including crystallization, coagulation, and reduction; and | 67-68, 86-87 |
| (D) demonstrate rates of reaction using various temperatures and describe the effects of temperature on the characteristics of food products. | 84-87, 203 |

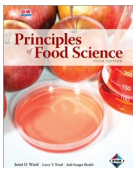



| Standards | Correlating Text Pages |
|---|---|
| 16. The student evaluates the properties of carbohydrates in food and their effects on food production. The student is expected to: | |
| (A) identify the physical properties and chemical structures of simple and complex carbohydrates; | 135-136 |
| (B) describe the functions of carbohydrates such as caramelization, crystallization, and thickening agents in food production; | 143 - 147, 143 (Relative Sweetness of Sugar), 144 (STEM Matters) |
| (C) describe the processes of gelatinization and retrogradation in food production; and | 162, 203-204, 206 (STEM Matters), 230 (Food Fact), 316-317 |
| (D) create food products using simple and complex carbohydrates. | 143 - 147, 143 (Relative Sweetness of Sugar), 144 STEM Matters), 162, 203-204, 206 (STEM matters), 230 (Food Fact) |
| 17. The student evaluates the properties of fats in food and their effects on food production. The student is expected to: | |
| (A) identify the physical properties and chemical structures of saturated and unsaturated fats; | 183-186, 184 (Smoke Points of Fats and Oils) |
| (B) describe the functions of different types of fats in food production; | 78-79, 78 (STEM Matters) |
| (C) demonstrate methods for controlling fat oxidation; | 183-184, 184 (Smoke Points of Fats and Oils) |

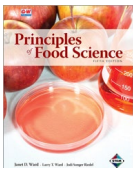



| Standards | Correlating Text Pages |
|---|---|
| (D) analyze the effects of temperature on fats in food preparation; | 183-186, 184 (Smoke Points of Fats and Oils) |
| (E) conduct laboratory experiments using the scientific processes to explore the functions of fats in food production; and | 183-184, 184 (Smoke Points of Fats and Oils) |
| (F) create food products using saturated and unsaturated fats. | 178, 294 (Historical Highlight) |
| 18. The student evaluates the properties of proteins and their effects on food production. The student is expected to: | |
| (A) identify the physical properties and chemical structures of proteins; | 78-79 |
| (B) explain the processes of protein denaturation, coagulation, and syneresis; | 162, 203-205, 417, 478 |
| (C) describe the functions and uses of proteins such as in emulsions, foams, and gluten formation; | 205-209, 205 (Food Fact) |
| (D) analyze the effects of moisture and temperature on protein in food production such as moist and dry heat methods for preparation; and | 209-211, 209 (Food Fact), 209 (STEM Matters), 211 (FOOD Features) |
| (E) create food products using protein. | 209-211, 209 (Food Fact), 209 (STEM Matters), 211 (FOOD Features) |

Goodheart-Willcox Publisher
18604 West Creek Drive • Tinley Park, IL 60477-6243
Web www.g-w.com
Orders 800.323.0440
Phone 708.687.5000
Fax 708.687.5068




| Standards | Correlating Text Pages |
|---|---|
| 19. The student evaluates the properties of vitamins and minerals and their interrelationships in food production. The student is expected to compare the effects of food production on water- and fat-soluble vitamins and minerals. | |
| 20. The student evaluates the properties of water and their effects on food production. The student is expected to: | |
| (A) identify the properties of water, including as a solvent or medium, and its effects on food production; and | 117-125, 118 (Farm Futures), 119 (STEM Matters), 120 (Historical Highlight), 121 (Food Fact), 124 (Water Activity of Common Foods) |
| (B) compare the effects of hard and soft water on food production. | 126 |
| 21. The student explains nutritional aspects of food production. The student is expected to: | |
| (A) describe how variations in human digestion and metabolism affect dietary modifications; | 101-103, 221-222, 122 (STEM Matters), 224, 233, 498-499 |
| (B) identify common and special dietary modifications such as for food allergies, intolerances, or medical conditions; | 459, 459 (Vitamin and Mineral Deficiency Diseases) |
| (C) develop and modify recipes for dietary differences such as allergies and intolerances or for personal health preferences such as low-fat or sugar-free; and | 459 |
| (D) plan and create a dining experience using the most recent USDA dietary guidelines. | 34 (Nutrition News), 439, 456-458, 458 (Choose My Plate.gov) |
| 22. The student analyzes processes that manage bacteria to safe levels during food production. The student is expected to investigate processes that manage food bacteria such as dehydration, pasteurization, and food irradiation | |
| 23. The student examines packaging and labeling guidelines. The student is expected to: | |
| (A) research and evaluate federal food packaging regulations, including the information required on a food label; | 49 (Food Fact) |




| Standards | Correlating Text Pages |
|---|---|
| (B) compare global food packaging regulations to those of the United States; and | 447-456, 447 (Milestones in Government Food Regulations) 449 (Food Labeling Requirements), 454 Nutrient Content Claims), 455 (Health Claims on Food Product Labels). |
| (C) analyze the effectiveness of commercial food packaging for specific foods. | 452-452, 453( Nutrition Facts) 454 (Nutrient Content Claims), 455 (Health Claims on Food Product Labels) |
| 24. The student analyzes food preservation processes. The student is expected to: | |
| (A) describe the benefits of food preservation; | 7, 397 |
| (B) compare various methods of household and commercial dehydration, canning, and freezing; and | 397-417, 403 (Food Fact), 403 (Safe-Home Canning Practices), 411 (Preferred Refrigeration Temperatures for Perishable Foods) |
| (C) create a food product using a selected preservation method. | 397-417, 403 (Food Fact), 403 (Safe-Home Canning Practices), 411 (Preferred Refrigeration Temperatures for Perishable Foods) |