

**Course Description:**

Discover different ways to preserve food. Create an original food product, technique, or process to be used in the food industry. Learn biology, chemistry, and physics as you continue to investigate principles of food processing and food science. Topics to be covered include food safety and regulations, processing and preservation, product development, and nutritional content of various foods. The course places emphasis on hands-on lab activities and discussion. Integration of the Family and Consumer Sciences co-curricular student organization, Family, Career and Community Leaders of America (FCCLA), greatly enhances this course.

**CIP CODE:** 190501

**Course Code:** 5758

**Credit:** 1(120), 2(240), 3(360)

**National Certification:** Food Science Fundamentals  
AAFCS

[http://aafcs.org/CredentialingCenter/PrePAC .asp](http://aafcs.org/CredentialingCenter/PrePAC.asp)

**Recommended grades:** 11, 12

**Prerequisite:** Physical Science and/or Foods and Nutrition 1, and/or Sports Nutrition 1

**Textbook Information:** Principles of Food Science Author: Janet Ward  
Copyright 2007 Grades: 11 – 12  
ISBN: 13:978-1-59070-653-4

**Employment Opportunities:**

**Secondary Education:** product packager, product grader, produce worker

**Postsecondary Education:** food inspector assistant, packaging manager, sales and service manager

**Postgraduate Education:** food inspector, quality control technician, food scientist, product developer

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## **B. SAFETY AND SANITATION**

### **B1. Evaluate safety and sanitation procedures.**

1. Qualify for food safety and sanitation certification.
2. Demonstrate safe use of lab equipment.
3. Integrate safe lab techniques and procedures.
4. Implement sanitation practices in the lab, home, organizational systems, and the larger environment.

### **B2. Determine the economic and ethical advantages and disadvantages of using biotechnology.**

1. Discuss the benefits and/or threats of biotechnology to the world's food supply.
2. Identify the epidemiological studies associated with life experiences.

## **C. SCIENTIFIC METHODS**

### **C1. Demonstrate scientific method procedures.**

1. Analyze scientific methods used and factors involved in the processing of foods.
2. Explain why accurate scientific measurements are required for scientific investigations.
3. Implement the scientific method and science process skills (hypothesis and theory) through research design.
4. Interpret, analyze, and report data.

## **D. BIOORGANIC CHEMISTRY**

### **D1. Analyze the metabolic impact of nutrients on the body.**

1. Differentiate the functions of the macro- and micronutrients.
2. Analyze enzyme reactions in foods.
3. Describe the functions of acids and bases in foods.
4. Explain the effect of hydrolysis and dehydration synthesis.

## **E. FOOD PRODUCTION**

### **E1. Evaluate various methods of food processing and preservation.**

1. Compare dehydration methods.
2. Explore methods used to freeze foods.
3. Demonstrate canning techniques.
4. Explain irradiation practices on foods.

### **E2. Analyze the advantages and disadvantages of microbes.**

1. Identify the characteristics of microbes.

2. Describe the effects of microbes on food.
3. Explain the effects of microbes in fermentation process. (i.e. soy sauce, yogurt, etc.)
4. Differentiate the types of pasteurization used in food productions.
5. Differentiate the types of food borne illnesses.
6. Describe the ways pathogens enter food supplies.

## **F. CAREERS IN FOOD SCIENCE AND DIETETICS**

### **F1. Analyze career paths in food science and dietetics.**

1. Demonstrate knowledge, skills, and practices required for careers in food science and dietetics.
2. Identify co-curricular student organizations related to food science and dietetics.
3. Analyze professional organizations related to food science and dietetics.
4. Maintain an employment portfolio.

## A. Academic Standards

### English Language Arts

**A1.** The student will read and comprehend a variety of literary **texts** in print and nonprint formats (E4-1)

**Indicator(s):**

- Create responses to literary **texts** through a variety of methods, (for example, written works, oral and auditory presentations, discussions, media productions, and the visual and performing arts).
- Read independently for extended periods of time for pleasure.

**A2.** The student will read and comprehend a variety of informational **texts** in print and nonprint formats. (E4-2)

**Indicator(s):**

- Evaluate theses within and across informational **texts**.
- Analyze informational **texts** for author **bias** (including **word choice**, the exclusion and inclusion of particular information, and unsupported opinion).
- Create responses to informational **texts** through a variety of methods (for example drawings, written works, oral and auditory presentations, discussions, and media productions).
- Evaluate the impact that **text elements** have on the meaning of a given informational **text**.
- Evaluate information from **graphic features** (for example, charts and graphs in informational **texts**).
- Evaluate **propaganda techniques** and rhetorical devices in informational **texts**.
- Read independently for extended periods of time to **gain information**.

**A3.** The student will use word analysis and vocabulary strategies to read fluently. (E4-3)

**Indicator(s):**

- Use **context clues** to determine the meaning of technical terms and other unfamiliar words.
- Analyze the meaning of words by using Greek and Latin roots and **affixes**. (See Instructional Appendix: Greek and Latin Roots and **Affixes**.)

**A4.** The student will create written work that has a clear focus, sufficient detail, coherent organization, effective use of **voice**, and correct use of the conventions of written **Standard American English**. (E4-4)

**Indicator(s):**

- Organize written works using prewriting techniques, discussions, **graphic organizers**, models, and outlines.
- Use complete sentences in a variety of types (including simple, compound, complex, and compound-complex).
- Create multiple-paragraph compositions that have an introduction and a conclusion, include a coherent **thesis**, and use support (for example, definitions and descriptions).
- Use grammatical conventions of written **Standard American English** to clarify and enhance meaning including
  - subject-verb agreement,
  - pronoun-antecedent agreement,
  - agreement of nouns and their modifiers,
  - verb formation,
  - pronoun case,
  - formation of comparative or superlative adjectives and adverbs, and
  - idiomatic usage.

(See Instructional Appendix: Composite Writing Matrix.)

- **Revise** writing to improve clarity, **tone**, **voice**, content, and the development of ideas. (See Instructional Appendix: Composite Writing Matrix.)

- **Edit** for the correct mechanics and usage of written **Standard American English** including
  - internal and end of sentence punctuation,
  - commas to indicate appositives,
  - word placement to avoid ambiguity,
  - appropriate coordination and subordination,
  - relationship between and among clauses,
  - placement of modifiers, and
  - shifts in construction.

(See Instructional Appendix: Composite Writing Matrix.)

**A5.** The student will write for a variety of purposes and **audiences**. (E4-5)

**Indicator(s):**

- Create clear and concise career-oriented and technical writings (for example, memos, business letters, résumés, technical reports, and information analyses).
- Create narratives (for example, personal essays, memoirs, and narrative poems) that use descriptive language to enhance **voice** and **tone**.
- Create descriptive pieces (for example, personal essays, travel writing, or restaurant reviews) that use sensory images and vivid **word choice**.
- Create **persuasive writings** (for example, editorials, essays, speeches, or reports) that address a specific **audience** and use logical **arguments** supported by facts or expert opinions.
- Create technical pieces (for example, proposals, instructions, and process documentation) that use clear and precise language appropriate for the purpose and **audience**.

**A6.** The student will access and use information from a variety of sources. (E4-6)

**Indicator(s):**

- Clarify and refine a research topic.
- Use direct quotations, paraphrasing, or summaries to incorporate into written, oral, auditory, or visual works the information gathered from a variety of research sources.
- Use a standardized system of documentation (including a list of sources with full publication information and the use of in-text citations) to properly credit the work of others.
- Use vocabulary (including **Standard American English**) that is appropriate for the particular **audience** or purpose.
- Create written works, oral and auditory presentations, and visual presentations that are designed for a specific **audience** and purpose.
- Select appropriate graphics, in print or electronic form, to support written works, oral presentations, and visual presentations.
- Use a variety of print and electronic reference materials.
- Design and carry out research projects by selecting a topic, constructing inquiry questions, accessing resources, evaluating credibility, and organizing information.

**Educational Technology**

**A7.** Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. (ISTE 1)

**Indicator(s):**

- Apply existing knowledge to generate new ideas, products, or processes.
- Create original works as a means of personal or group expression.
- Use models and simulations to explore complex systems and issues.
- Identify trends and forecast possibilities.

**A8.** Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. (ISTE 2)

**Indicator(s):**

- Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media.
- Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- Develop cultural understanding and global awareness by engaging with learners of other cultures.
- Contribute to project teams to produce original works or solve problems.

**A9.** Students apply digital tools to gather, evaluate, and use information. (ISTE 3)

**Indicator(s):**

- Plan strategies to guide inquiry.
- Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
- Evaluate and select information sources and digital tools based on the appropriateness to specific tasks.
- Process data and report results.

**A10.** Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. (ISTE 4)

**Indicator(s):**

- Identify and define authentic problems and significant questions for investigation.
- Plan and manage activities to develop a solution or complete a project.
- Collect and analyze data to identify solutions and/or make informed decisions.
- Use multiple processes and diverse perspectives to explore alternative solutions.

**A11.** Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. (ISTE 5)

**Indicator(s):**

- Advocate and practice safe, legal, and responsible use of information and technology.
- Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.
- Demonstrate personal responsibility for lifelong learning.
- Exhibit leadership for digital citizenship.

**A12.** Students demonstrate a sound understanding of technology concepts, systems, and operations. (ISTE 6)

**Indicator(s):**

- Understand and use technology systems.
- Select and use applications effectively and productively.
- Troubleshoot systems and applications.
- Transfer current knowledge to learning of new technologies.

**Health and Safety Education**

**A13.** The student will comprehend concepts related to health promotion to enhance health. (HSE-1)

**Indicator(s):**

- Describe laws and regulations related to safety and personal injury.
- Discuss ways to reduce the risk of intentional and unintentional injuries in the home, school, community, workplace, and roadways.
- Differentiate between health-endangering and health-promoting behaviors.
- Examine ways that the environment and personal health are interrelated.
- Explain how the federal dietary guidelines are useful in planning healthy diets.

**A14.** The student will analyze the influence of family, peers, culture, media, technology, and other factors on health behaviors. (HSE-2)

**Indicator(s):**

- Analyze ways that the family, peers, culture, and the media influence the mental, emotional, and social health of individuals.
- Describe ways that environmental factors can affect the health of the community.
- Examine ways that public health policies, government regulations, and socioeconomic issues affect health promotion and disease prevention.
- Examine ways that the media, advertising, and marketing practices affect the nutrition and physical activity level of individuals.
- Analyze ways that the family, peers, culture, and the media influence the mental, emotional, and social health of individuals.
- Analyze the influence of family, peers, culture, the media, technology, and other factors on health behaviors.
- Analyze ways that emotions and feelings influence the food choices, eating behavior, and physical activity of individuals.
- Analyze ways that unhealthy eating behaviors and an inactive lifestyle contribute to chronic disease.

**A15.** The student will demonstrate the ability to access valid information and products and services to enhance health. (HSE-3)

**Indicator(s):**

- Analyze local sources of valid information on nutrition and physical activity.
- Locate community programs and services that help others gain access to affordable healthy foods.

**A16.** The student will demonstrate the ability to use interpersonal communication skills to enhance health and avoid or reduce health risks. (HSE-4)

**Indicator(s):**

- Demonstrate ways to communicate care, consideration, and respect for him- or herself and others.
- Demonstrate ways to ask for assistance to enhance his or her own health and ways to offer assistance to enhance the health of others.

**A17.** The student will demonstrate the ability to use decision-making skills to enhance health. (HSE-5)

**Indicator(s):**

- Justify when individual or collaborative decision making is appropriate.
- Distinguish healthy from unhealthy foods on a variety of restaurant menus.
- Determine when it is necessary to seek help and/or to leave an unhealthy relationship or situation

**A18.** The student will demonstrate the ability to use goal-setting skills to enhance health. (HSE-6)

**Indicators**

- Develop and implement a personal stress management plan.
- Create a long-term personal health plan that is adaptable to changing health needs based on genetics, family history, and personal health behaviors.
- Set a goal to maintain a healthy diet.
- Set a goal to attain the federally recommended levels of physical activity and physical fitness for Americans.

**A19.** The student will demonstrate the ability to practice health-enhancing behaviors and to avoid or reduce health risks. (HSE-7)

**Indicator(s):**

- Perform appropriate first aid and other emergency procedures for a given scenario.
- Demonstrate a variety of health practices and behaviors that will maintain or improve the health of him- or herself and others.
- Develop injury prevention and treatment strategies for personal and family health.
- Demonstrate strategies for solving interpersonal conflicts without harming him- or herself or others.
- Demonstrate a variety of health practices and behaviors that will maintain or improve the health of him- or herself and others.
- Develop and implement a wellness plan that meets the federal dietary guidelines and the federal physical activity guidelines for Americans.

**A20.** The student will demonstrate the ability to advocate for personal, family, and consumer health. (HSE-8)

**Indicator(s):**

- Advocate for disaster preparedness in the home, school, and community.
- Advocate for the promotion and protection of a healthy environment.
- Examine ways to encourage others to make healthy eating choices and to increase their level of physical activity.

**Elementary Algebra**

**A21.** The student will understand and utilize the mathematical processes of problem solving, reasoning and proof, communication, connections, and representation. (EA-1)

**Indicator(s):**

- Communicate a knowledge of algebraic relationships by using mathematical terminology appropriately.
- Connect algebra with other branches of mathematics.
- Apply algebraic methods to solve problems in real-world contexts.
- Judge the reasonableness of mathematical solutions.
- Demonstrate an understanding of algebraic relationships by using a variety of representations (including verbal, graphic, numerical, and symbolic).
- Understand how algebraic relationships can be represented in concrete models, pictorial models, and diagrams.
- Understand how to represent algebraic relationships by using tools such as handheld computing devices, spreadsheets, and computer algebra systems (CASs).

**Intermediate Algebra**

**A21.** The student will understand and utilize the mathematical processes of problem solving, reasoning and proof, communication, connections, and representation. (IA-1)

**Indicator(s):**

- Apply algebraic methods to solve problems in real-world contexts.
- Understand how to represent algebraic relationships by using tools such as handheld computing devices, spreadsheets, and computer algebra systems (CASs).
- Communicate a knowledge of algebraic relationships by using mathematical terminology appropriately.
- Apply algebraic methods to solve problems in real-world contexts.
- Demonstrate an understanding of algebraic relationships by using a variety of representations (including verbal, graphic, numerical, and symbolic).

**Geometry**

**A23.** The student will understand and utilize the mathematical processes of Problem solving, reasoning and proof, communication, connections, and representation. (G-1)

**Indicator(s):**

- Communicate knowledge of geometric relationships by using mathematical terminology appropriately.
- Demonstrate an understanding of how geometry applies to in real-world contexts (including architecture, construction, farming, and astronomy).
- Demonstrate an understanding of geometric relationships (including constructions through investigations by using a variety of tools such as straightedge, compass, Patty Paper, dynamic geometry software, and handheld computing devices).

**Precalculus**

**A24.** The student will understand and utilize the mathematical processes of Problem solving, reasoning and proof, communication, connections, and Representation. (PC-1)

**Indicator(s):**

- Apply algebraic methods to solve problems in real-world contexts.
- Judge the reasonableness of mathematical solutions.
- Demonstrate an understanding of algebraic and trigonometric relationships by using a variety of representations (including verbal, graphic, numerical, and symbolic).
- Understand how algebraic and trigonometric relationships can be represented in concrete models, pictorial models, and diagrams.
- Understand how to represent algebraic and trigonometric relationships by using tools such as handheld computing devices, spreadsheets, and computer algebra systems (CASs).

**Data Analysis and Probability**

**A25.** The student will understand and utilize the mathematical processes of Problem solving, reasoning and proof, communication, connections, and representation. (DA-1)

**Indicator(s):**

- Execute procedures to find measures of probability and statistics by using tools such as handheld computing devices, spreadsheets, and statistical software.
- Apply the principles of probability and statistics to solve problems in real-world contexts.
- Communicate a knowledge of data analysis and probability by using mathematical terminology appropriately.
- Judge the reasonableness of mathematical solutions on the basis of the source of the data, the design of the study, the way the data are displayed, and the way the data are analyzed.
- Compare data sets by using graphs and summary statistics.

**A26.** The student will demonstrate through the mathematical processes an understanding of the design of a statistical study. (DA-2)

**Indicator(s):**

- Classify a data-collection procedure as a survey, an observational study, or a controlled experiment.
- Compare various random sampling techniques (including simple, stratified, cluster, and systematic).
- Analyze a data-collection procedure to classify the technique used as either simple cluster, systematic, or convenience sampling.
- Critique data-collection methods and describe how bias can be controlled.

**A27.** The student will demonstrate through the mathematical processes an understanding of the methodology for collecting, organizing, displaying, and interpreting data. (DA-3)

**Indicator(s):**

- Use manipulatives, random number tables, and technology to collect data and conduct experiments and simulations.
- Organize and interpret data by using pictographs, bar graphs, pie charts, dot plots, histograms, time-series plots, stem-and-leaf plots, box-and-whiskers plots, and scatterplots.
- Select appropriate graphic display(s) from among pictographs, bar graphs, pie charts, dot plots, histograms, time-series plots, stem-and-leaf plots, box-and whiskers plots, and scatterplots when given a data set or problem situation.
- Represent frequency distributions by using displays such as categorical frequency distributions/Pareto charts, histograms, frequency polygons, and cumulative frequency distributions/ogives

**A28.** The student will demonstrate through the mathematical processes an understanding of basic statistical methods of analyzing data. (DA-4)

**Indicators**

- Use control charts to determine whether a process is in control.

**A29.** The student will demonstrate through the mathematical processes an understanding of the basic concepts of probability. (DA-5)

**Indicator(s):**

- Construct a sample space for an experiment and represent it as a list, chart, picture, or tree diagram.
- Carry out a procedure to compute conditional probability by using two-way tables.

## **United States History and the Constitution**

**A30.** The student will demonstrate an understanding of the westward movement and the resulting regional conflicts that took place in America in the nineteenth century. (USHC-3).

**Indicator(s):**

- Compare economic development in different regions of the country during the early nineteenth century, including agriculture in the South, industry and finance in the North, and the development of new resources in the West.

**A31.** The student will demonstrate an understanding of major social, political, and economic developments that took place in the United States during the second half of the nineteenth century. (USHC-5)

**Indicator(s):**

- Summarize developments in business and industry, including the ascent of new industries, the rise of corporations through monopolies and corporate mergers, the role of industrial leaders such as John D. Rockefeller and Andrew Carnegie, the influence of business ideologies, and the increasing availability of consumer goods and the rising standard of living.
- Summarize the factors that influenced the economic growth of the United States and its emergence as an industrial power, including the abundance of natural resources; government support and protection in the form of tariffs, labor policies, and subsidies; and the expansion of international markets associated with industrialization.

**A32.** The student will demonstrate an understanding of the economic boom-and-bust in America in the 1920s and 1930s, its resultant political instability, and the subsequent worldwide response. (USHC-7)

**Indicator(s):**

- Explain the social, cultural, and economic effects of scientific innovation and consumer financing options in the 1920s on the United States and the world, including the advent of aviation, the expansion of mass production techniques, the invention of new home appliances, and the role of transportation in changing urban life.
- Explain cultural responses to the period of economic boom-and-bust, including the Harlem Renaissance; new trends in literature, music, and art; and the effects of radio and movies.
- Compare the first and second New Deals as responses to the economic bust of the Great Depression, including the rights of women and minorities in the workplace and the successes, controversies, and failures of recovery and reform measures such as the labor movement.

**A33.** The student will demonstrate an understanding of the impact of World War II on United States' foreign and domestic policies. (USHC-8)

**Indicator(s):**

- Explain the lasting impact of the scientific and technological developments in America after World War II, including new systems for scientific research, medical advances, improvements in agricultural technology, and resultant changes in the standard of living and demographic patterns.

**Economics**

**A34.** The student will demonstrate an understanding of how scarcity and choice impact the economic activity of individuals, families, communities, and nations. (ECON-1)

**Indicator(s):**

- Illustrate the relationship between scarcity—limited resources and unlimited human wants—and the economic choices made by individuals, families, communities, and nations, including how families must budget their income and expenses, how people use psychological and intellectual resources to deal with scarcity, and how local political entities as well as nation-states use scarce resources to satisfy human wants.
- Explain the concept of opportunity costs and how individuals, families, communities, and nations make economic decisions on that basis, including analyzing marginal costs and marginal benefits and assessing how their choices may result in trade-offs.
- Compare the four key factors of production—land, labor, capital, and entrepreneurship—and explain how they are used, including the specialization and division of labor that permits efficient use of scarce resources.

**35.** The student will demonstrate an understanding of markets and the role of supply and demand in determining price and resource allocation. (ECON-2)

**Indicator(s):**

- Explain the law of supply and demand, including the relationships of critical determinants (e.g., consumer income, tastes, and preferences; technology; the price of inputs) and the effects of change on equilibrium, price, and quantity.
- Explain the nature and role of competition in a market economy, including the determination of market price through competition among buyers and sellers and the conditions that make industries more or less competitive, such as the effect of domestic and international competition and the quality, quantity, and price of products.
- Explain economic incentives that lead to the efficient use of resources, including monetary and nonmonetary incentives, the ways in which people change their behavior in response to incentives, the relationship of incentives to the laws of supply and demand, and the role of private property as an incentive in conserving and improving scarce resources.
- Explain the effect of shortages and surpluses in a market economy, including the effect of price controls (ceilings and floors) in causing shortages or surpluses, changes in the price of products as a result of surplus or shortage, and market mechanisms for eliminating shortages and surpluses and achieving market equilibrium.

**A36.** The student will demonstrate an understanding of the sources of income and growth in a free-enterprise economy. (ECON-3)

**Indicator(s):**

- Compare personal income distribution and functional income distribution, including how distribution of income affects public policy.
- Explain the role of entrepreneurs in a market economy, including the costs and benefits of being an entrepreneur, the expectation of profit as the incentive for entrepreneurs to accept business risks, and the effect of changes in taxation and government regulation on entrepreneurial decisions.
- Explain the causes and effects of economic growth, including the relationship between investment in human resources and in real capital, the alleviation of poverty, the increase in standards of living, and the creation of new employment opportunities.

**A37.** The student will demonstrate an understanding of personal economic decision making to maximize the net benefits of personal income. (ECON-4)

**Indicator(s):**

- Summarize types of personal economic decisions and choices that individuals make, including determining how to budget money; establishing short- and long-term financial goals and plans related to income, saving, and spending; utilizing loans and credit cards; and considering investment options.
- Explain influences on personal economic decision making and choices, including the effect of education, career choices, and family obligations on future income; the influence of advertising on consumer choices; the risks and benefits involved in short- and long-term saving and investment strategies; and the effect of taxation and interest rates on household consumption and savings.

**A38.** The student will demonstrate an understanding of the roles that federal, state, and local governments play in the operation of markets in the United States. (ECON-6)

**Indicator(s):**

- Compare the various functions and roles of the government in the United States economy, including providing public goods, defining and enforcing property rights, correcting externalities and regulating markets, maintaining and promoting competition in the market, protecting consumers' rights, and redistributing income.
- Summarize major sources of government revenue, including taxation at the federal, state, and local levels and tax revenues from personal income and payroll taxes, sales taxes, and property taxes.

**A39.** The student will demonstrate an understanding of the national economy and economic policies in the United States. (ECON-7)

**Indicator(s):**

- Explain the types of goods and services that are funded with government revenues, including national defense, road construction and repair, public safety, health care, payments on the national debt, and education.

**A40.** The student will demonstrate an understanding of the principles of trade and economic development. (ECON-8)

**Indicator(s):**

- Explain the basic principles of international trade, including the worldwide distribution of resources, the concept of absolute and comparative advantages that leads to specialization and trade, and the concepts of balance of trade and balance of payments that are used to measure international trade.

**United States Government**

**A41.** The student will demonstrate an understanding of the continuing role of the United States Constitution in the defining and shaping of American government and society. (USG-3)

**Indicator(s):**

- Explain the organization and responsibilities of local and state governments, including the purposes and functions of state constitutions; reserved and concurrent powers in the states; the relationships among national, state, and local levels of government; and the structure and operation of South Carolina's government.
- Summarize the function of law in the American constitutional system, including the significance of the concept of the due process of law and the ways in which laws are intended to achieve fairness, the protection of individual rights, and the promotion of the common good.

**A42.** The student will demonstrate an understanding of the concept of personal and civic rights and responsibilities and the role of the citizen in American democracy. (USG-5)

**Indicator(s):**

- Classify the rights of United States citizens as personal, political, or economic and identify the significance and source of such rights and the conflicts that can arise when these rights are limited.

**Physical Science**

**A43.** The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions. (PS-1)

**Indicator(s):**

- Generate hypotheses on the basis of credible, accurate, and relevant sources of scientific information.
- Use appropriate laboratory apparatuses, technology, and techniques safely and accurately when conducting a scientific investigation.
- Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.
- Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.
- Organize and interpret the data from a controlled scientific investigation by using mathematics (including formulas and dimensional analysis), graphs, models, and/or technology.

**A44.** The student will demonstrate an understanding of various properties and classifications of matter. (PS-3)

**Indicator(s):**

- Infer the practical applications of organic and inorganic substances on the basis of their chemical and physical properties.
- Classify matter as a pure substance (either an element or a compound) or as a mixture (either homogeneous or heterogeneous) on the basis of its structure and/or composition.
- Classify various solutions as acids or bases according to their physical properties, chemical properties (including neutralization and reaction with metals), generalized formulas, and pH (using pH meters, pH paper, and litmus paper).
- Distinguish chemical properties of matter (including reactivity) from physical properties of matter (including boiling point, freezing/melting point, density [with density calculations], solubility, viscosity, and conductivity).
- Explain the effects of temperature, particle size, and agitation on the rate at which a solid dissolves in a liquid.
- Compare the properties of the four states of matter—solid, liquid, gas, and plasma—in terms of the arrangement and movement of particles.

**A45.** The student will demonstrate an understanding of chemical reactions and the classifications, structures, and properties of chemical compounds. (PS-4)

**Indicator(s):**

- Explain the role of bonding in achieving chemical stability.
- Summarize evidence (including the evolution of gas; the formation of a precipitate; and/or changes in temperature, color, and/or odor) that a chemical reaction has occurred.

**Biology**

**A46.** The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions. (B-1)

**Indicator(s):**

- Generate hypotheses based on credible, accurate, and relevant sources of scientific information.
- Use appropriate laboratory apparatuses, technology, and techniques safely and accurately when conducting a scientific investigation.
- Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.
- Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.
- Organize and interpret the data from a controlled scientific investigation by using mathematics, graphs, models, and/or technology.
- Evaluate the results of a controlled scientific investigation in terms of whether they refute or verify the hypothesis.
- Evaluate a technological design or product on the basis of designated criteria (including cost, time, and materials).
- Compare the processes of scientific investigation and technological design.
- Use appropriate safety procedures when conducting investigations.

**A47** The student will demonstrate an understanding of the structure and function of cells and their organelles. (B-2)

**Indicator(s):**

- Explain the factors that affect the rates of biochemical reactions (including pH, temperature, and the role of enzymes as catalysts).

**A48.** The student will demonstrate an understanding of the flow of energy within and between living systems. (B-3)

**Indicator(s):**

- Summarize the overall process by which photosynthesis converts solar energy into chemical energy and interpret the chemical equation for the process.
- Summarize the basic aerobic and anaerobic processes of cellular respiration and interpret the chemical equation for cellular respiration.
- Recognize the overall structure of adenosine triphosphate (ATP)—namely, adenine, the sugar ribose, and three phosphate groups—and summarize its function (including the ATP-ADP [adenosine diphosphate] cycle).
- Summarize how the structures of organic molecules (including proteins, carbohydrates, and fats) are related to their relative caloric values.
- Summarize the functions of proteins, carbohydrates, and fats in the human body.
- Illustrate the flow of energy through ecosystems (including food chains, food webs, energy pyramids, number pyramids, and biomass pyramids).

**A49.** The student will demonstrate an understanding of the interrelationships among organisms and the biotic and abiotic components of their environments.

(B-6)

**Indicator(s):**

- Explain how human activities (including population growth, technology, and consumption of resources) affect the physical and chemical cycles and processes of Earth.

**Chemistry**

**A50.** The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions. (C-1)

**Indicator(s):**

- Apply established rules for significant digits, both in reading a scientific instrument and in calculating a derived quantity from measurement.
- Use appropriate laboratory apparatuses, technology, and techniques safely and accurately when conducting a scientific investigation.
- Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.
- Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.
- Organize and interpret the data from a controlled scientific investigation by using mathematics (including formulas, scientific notation, and dimensional analysis), graphs, models, and/or technology.
- Evaluate the results of a scientific investigation in terms of whether they verify or refute the hypothesis and what the possible sources of error are.
- Evaluate a technological design or product on the basis of designated criteria.
- Use appropriate safety procedures when conducting investigations.

**A51.** The student will demonstrate an understanding of the structures and classifications of chemical compounds. (C-3)

**Indicator(s):**

- Identify the basic structure of common polymers (including proteins, nucleic acids, plastics, and starches).
- Classify organic compounds in terms of their functional group.

**A52.** The student will demonstrate an understanding of the types, the causes, and the effects of chemical reactions. (C-4)

**Indicator(s):**

- Analyze the energy changes (endothermic or exothermic) associated with chemical reactions.
- Explain the role of activation energy and the effects of temperature, particle size, stirring, concentration, and catalysts in reaction rates.

**A53.** The student will demonstrate an understanding of the structure and behavior of the different phases of matter. (C-5)

**Indicator(s):**

- Explain the effects of the intermolecular forces on the different phases of matter.
- Illustrate and interpret heating and cooling curves (including how boiling and melting points can be identified and how boiling points vary with changes in pressure).
- Analyze the energy changes involved in calorimetry by using the law of conservation of energy as it applies to temperature, heat, and phase changes (including the use of the formulas  $q = mc\Delta T$  [temperature change] and  $q = mL_v$  and  $q = mL_f$  [phase change] to solve calorimetry problems).

**A54.** The student will demonstrate an understanding of the nature and properties of various types of chemical solutions. (C-6)

**Indicator(s):**

- Summarize the properties of salts, acids, and bases.
- Distinguish between strong and weak common acids and bases.
- Represent common acids and bases by their names and formulas.
- Interpret solubility curves to determine saturation at different temperatures.
- Use a variety of procedures for separating mixtures (including distillation, crystallization filtration, paper chromatography, and centrifuge).

**Physics**

**A55.** The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions. (P-1)

**Indicator(s):**

- Apply established rules for significant digits, both in reading scientific instruments and in calculating derived quantities from measurement.
- Use appropriate laboratory apparatuses, technology, and techniques safely and accurately when conducting a scientific investigation.
- Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.
- Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.
- Organize and interpret the data from a controlled scientific investigation by using (including calculations in scientific notation, formulas, and dimensional analysis), graphs, tables, models, diagrams, and/or technology.  
Evaluate the results of a controlled scientific investigation in terms of whether they refute or verify the hypothesis.

**A55.** The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions. (P-1)

**Indicator(s):**

- Evaluate conclusions based on qualitative and quantitative data (including the impact of parallax, instrument malfunction, or human error) on experimental results.
- Evaluate a technological design or product on the basis of designated criteria (including cost, time, and materials).
- Communicate and defend a scientific argument or conclusion.
- Use appropriate safety procedures when conducting investigations.

**Earth Science**

**A56.** The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions. (ES-1)

**Indicator(s):**

- Apply established rules for significant digits, both in reading scientific instruments and in calculating derived quantities from measurement.
- Use appropriate laboratory apparatuses, technology, and techniques safely and accurately when conducting a scientific investigation.
- Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.
- Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.
- Organize and interpret the data from a controlled scientific investigation by using mathematics (including calculations in scientific notation, formulas, and dimensional analysis), graphs, tables, models, diagrams, and/or technology.
- Evaluate the results of a controlled scientific investigation in terms of whether they refute or verify the hypothesis.
- Evaluate conclusions based on qualitative and quantitative data (including the impact of parallax, instrument malfunction, or human error) on experimental results.
- Evaluate a technological design or product on the basis of designated criteria (including cost, time, and materials).
- Communicate and defend a scientific argument or conclusion.
- Use appropriate safety procedures when conducting investigations.

## B. SAFETY AND SANITATION

<b>SC Standard:</b> B1. Evaluate safety and sanitation procedures.	
<b>FACS Nat'l Standard:</b> 9.2 Apply risk management procedures to food safety, food testing, and sanitation.	
<b>National Certification:</b> Food Science Fundamentals	
<b>Academic Alignment:</b> <b>Academic Alignment:</b> ELA: A1, A2, A3, A4, A5, A6; ISTE: A7, A8, A9, A10, A11, A12, A13; HSE: A13, A14, A17, A19, A20; USHC: A30, A31, A32, A33; ECON: A35, A38, A40; USG: A41, A42; PS: A43, A44, A45; B: A46, A47; C: A50; P: A55; ES: A56	
<b>Essential Question(s):</b> 1. Why is it important to obtain food safety and sanitation certification?	
<b>Indicators:</b>	
<b>What Students Should Know:</b> 1. Certification requirements 2. Safe use of lab equipment 3. Lab techniques and procedures 4. Sanitation practices	<b>What Students Should Be Able to Do:</b> 1. Qualify for food safety and sanitation certification. 2. Demonstrate safe use of lab equipment. 3. Integrate safe lab techniques and procedures. 4. Implement sanitation practices in the lab, home, organizational systems, and the larger environment.
<b>Learning Strategies:</b> <ul style="list-style-type: none"><li>• Research food safety and sanitation certification requirements.</li><li>• Develop a goal and plan to obtain food safety and sanitation certification.</li><li>• Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives (i.e. certification for safety and sanitation).</li><li>• Develop a check sheet that promotes safe use of lab equipment.</li><li>• Create a rubric for evaluating safe lab techniques and procedures.</li><li>• Develop a lab cleaning schedule consisting of rotating responsibilities.</li><li>• Discuss health, safety, and environmental management systems and the importance of organizational performance and regulatory compliance.</li></ul>	
<b>Assessments:</b> learning logs, student self evaluation, performance to demonstrate learning, open-response questions, projects with several interval products	
<b>FACS Student Organization Family, Career, and Community Leaders of America (FCCLA) <a href="http://www.fcclainc.org/">http://www.fcclainc.org/</a></b> <b>APPLICATION/ASSESSMENT THROUGH FCCLA</b> STAR Events: Applied Technology; Food Service; Illustrated Talk Student Body: food safety education projects	

**Resources:**

**[www.foodsafety.gov](http://www.foodsafety.gov)** (**Gateway to Government Food Safety Information**) safety alerts, consumer advice and other resources

**[www.foodsafety.gov/~fsg/f01chart.html](http://www.foodsafety.gov/~fsg/f01chart.html)** (**Foodsafety.gov**) cold food storage chart

**[www.fsis.usda.gov](http://www.fsis.usda.gov)** (**Food Safety and Inspection Service from USDA**) news releases and other resources

**[www.fsis.usda.gov/thermy](http://www.fsis.usda.gov/thermy)** (**Food Safety and Inspection Services: Thermy**) food safety temperature information

**[www.nal.usda.gov/fnic/foodborne](http://www.nal.usda.gov/fnic/foodborne)** (**National Agricultural Library: Foodsafe**) on-line electronic discussion group

**[www.cfsan.fda.gov/~dms/supplmnt.html](http://www.cfsan.fda.gov/~dms/supplmnt.html)** (**Center for Food Safety and Applied Nutrition from FDA**) Dietary Supplement information

**<http://vm.cfsan.fda.gov/list.html>** (**Center for Food Safety and Applied Nutrition**) food safety, documents and other resources

**[www.cfsan.fda.gov/label.html](http://www.cfsan.fda.gov/label.html)** (**Center for Food Safety and Applied Nutrition from FDA**) Food Labeling and Nutrition resources

**[www.cfsan.fda.gov/~dms/flquiz1.html](http://www.cfsan.fda.gov/~dms/flquiz1.html)** (**Center for Food Safety and Applied Nutrition from FDA**): Five interactive food labeling question-quiz, can also be downloaded in non-interactive form in PDF

**[www.extension.iastate.edu/foodsafety](http://www.extension.iastate.edu/foodsafety)** (**The Iowa State Extension Service**) Food Safety Resources

**[www.fightbac.org](http://www.fightbac.org)** (**Fight Bac!**) The Food Safety Partnership resources for teaching food safety

<b>B. SAFETY AND SANITATION</b>	
<b>SC Standard: B2. Determine the economic and ethical advantages and disadvantages of using biotechnology.</b>	
<b>FACS Nat'l Standard: 9.5</b> Demonstrate use of current technology in food product development and marketing.	
<b>National Certification:</b> Food Science Fundamentals	
<b>Academic Alignment: ELA: A1, A2, A3, A4, A5, A6; ISTE: A7, A8, A9, A10, A11, A12, A13; DA: A25, A26, A27, A28, A29; PS: A43, A44, A45; B: A46, A47; B: A46, A47; C: A50, A51, A53; P: A55; ES: A56</b>	
<b>Essential Question(s):</b> 1. How does biotechnology affect your life?	
<b>Indicators:</b>	
<b>What Students Should Know:</b> 1. Biotechnology 2. Epidemiological studies	<b>What Students Should Be Able to Do:</b> 1. Discuss the benefits and/or threats of biotechnology to the world's food supply. 2. Identify the epidemiological studies associated with life experiences.
<b>Learning Strategies:</b>	
<ul style="list-style-type: none"> <li>• Create a time-line of products developed using biotechnology.</li> <li>• Discuss how science technology has affected the field of biotechnology.</li> <li>• Research biotechnology innovations, benefits, risks, and threats to the food supply.</li> <li>• Make a chart illustrating the benefits and threats of biotechnology.</li> <li>• Invite a food scientist or biotechnologist to discuss current research.</li> <li>• Search the media for current reports of benefits or risks with biotechnology.</li> <li>• Compare studies in epidemiology dealing with food for various countries.</li> </ul>	
<b>Assessments:</b> learning logs, student self evaluation, performance to demonstrate learning, open-response questions, projects with several interval products	
<b>FACS Student Organization-Family, Community and Career Leaders of America (FCCLA)</b> <a href="http://www.fcclainc.org/">http://www.fcclainc.org/</a> <p style="text-align: center;"><b>APPLICATION/ASSESSMENT THROUGH FCCLA</b></p>	

**Resources:**

[www.ces.ncsu.edu/depts/foodsci/ext/pubs/bioapp.html](http://www.ces.ncsu.edu/depts/foodsci/ext/pubs/bioapp.html)

**BIOTECHNOLOGY AND ITS APPLICATIONS**

One **example** of modern **biotechnology** is genetic engineering. Genetic engineering is the process of transferring individual genes between organisms or ...

[www.fao.org/biotech/stat.asp](http://www.fao.org/biotech/stat.asp)

**Biotechnology in Food and Agriculture**

There are already **examples** where genetic engineering is helping to reduce the ... for **example**, the network on plant **biotechnology** for Latin America and the ...

[www.dpi.vic.gov.au/.../6E77CE28B94FB8834A2569AE0009D40210F45ECB8C23](http://www.dpi.vic.gov.au/.../6E77CE28B94FB8834A2569AE0009D40210F45ECB8C23)

**What is Modern Biotechnology?**

Oct 26, 2008 ... **Examples of biotechnology** applications of particular interest to the Department include cell culture, genomics, molecular marker-assisted ...

[www.brainmass.com](http://www.brainmass.com)

**Three everyday examples of biotechnology**

How is **biotechnology** used today? **Biotechnology** allows us to use living organisms or their processes for human needs or purposes this topic includes such ...

[www.brainmass.com](http://www.brainmass.com)

[www.transtutors.com/homework-help/Biology/Biotechnology](http://www.transtutors.com/homework-help/Biology/Biotechnology)

**Biotechnology, Genetic Engineering, Examples & Types, Biology ...**

**Biotechnology** is not a pure science like Botany, Zoology, Chemistry or Physics but it is a science derived by the consolidation of the different fields of ...

[www.ca.uky.edu/agc/pubs/brei/brei3/brei3.htm](http://www.ca.uky.edu/agc/pubs/brei/brei3/brei3.htm)

**BREI-3: Food Biotechnology**

This publication provides information about **biotechnology** with **examples** of how these new tools of biology and agriculture are used in food production. ...

**What are examples of agricultural biotechnology products currently ...**

What are **examples** of agricultural **biotechnology** products currently available?

[www.experts123.com/.../what-are-examples-of-agricultural-biotechnology-products-currently-available.html](http://www.experts123.com/.../what-are-examples-of-agricultural-biotechnology-products-currently-available.html)

## C. SCIENTIFIC METHODS

<b>SC Standard: C1. Demonstrate scientific method procedures.</b>	
<b>FACS Nat'l Standard: 9.6</b> Demonstrate food science, dietetics, and nutrition management principles and practices.	
<b>National Certification:</b> Food Science Fundamentals	
<b>Academic Alignment: ELA: A1, A2, A3, A4, A5, A6; ISTE: A7, A8, A9, A10, A11, A12, A13; HSE: A14, A17, A18, A19, A20; EA: A21; IA: A22; G: A23; PC: A24; USHC: A31, A32, A33; PS: A43, A44, A45; B: A46, A47; C: A50, A51, A53; P: A55; ES: A56</b>	
<b>Essential Question(s):</b> What is the purpose of the scientific method? Why do we use the scientific method in Food Science and Dietetics?	
<b>Indicators:</b>	
<b>What Students Should Know:</b> <ol style="list-style-type: none"><li>1. Scientific method</li><li>2. Scientific measurement skills</li><li>3. Hypothesis versus theory</li><li>4. Develop data reports</li></ol>	<b>What Students Should Be Able to Do:</b> <ol style="list-style-type: none"><li>1. Analyze scientific methods used and factors involved in the processing of foods.</li><li>2. Explain why accurate scientific measurements are required for scientific investigations.</li><li>3. Implement the scientific method and science process skills (hypothesis and theory) through research design.</li><li>4. Interpret, analyze, and report data.</li></ol>
<b>Learning Strategies:</b> <ul style="list-style-type: none"><li>• Imagine that you are going on an expedition. You run into an unknown plant. Apply the scientific method to determine if the unknown plant is edible. Describe, draw, and label the unknown plant pretending that it will be published in the “Weird Things to Eat Weekly.” (This is not a real publication.)</li><li>• Conduct food science laboratory experiments that include mathematical and statistical examples for evaluation: design and write a food report.</li><li>• Verify scientific principles used in experiments and write them in a laboratory report.</li><li>• Formulate question for scientific investigation, construct investigations, analyze, data, and develop scientific recommendations based on findings of project.</li><li>• Discuss the role of creativity in constructing scientific questions, methods, and explanations.</li><li>• Write laboratory reports to interpret analyze, and report data.</li></ul>	
<b>Assessments:</b> learning logs, student self evaluation, performance to demonstrate learning, open-response questions, projects with several interval products	

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**APPLICATION/ASSESSMENT THROUGH FCCLA**

Fundraising: food-related business

Leaders at Work: Food Production and Services leadership projects

STAR Events: Applied Technology; Entrepreneurship; Food Service

**Resources:**

[Steps of the Scientific Method](#)

An introduction to the steps of the scientific method.

[www.sciencebuddies.org/science.../project\\_scientific\\_method.shtml](http://www.sciencebuddies.org/science.../project_scientific_method.shtml)

[The Scientific Method](#)

Review of the steps involved in observation, hypothesis testing and prediction, with an interactive assignment in biology.

[biology.clc.uc.edu/courses/bio104/sci\\_meth.htm](http://biology.clc.uc.edu/courses/bio104/sci_meth.htm)

[The Scientific Method - FREE presentations in PowerPoint format ...](#)

The Scientific Method - How to Solve Just About Anything · Basic Steps of the Scientific Method · The Scientific Method Review · The Scientific Method ...

[science.pppst.com/scientificmethod.html](http://science.pppst.com/scientificmethod.html)

[Scientific Method Lesson Plans: Graphing, Metric System](#)

Scientific method lesson plans about scientific principles, metric system, SI conversions, graphing, lab equipment, techniques, and laboratory safety.

[www.lessonplansinc.com/biology\\_lesson\\_plans\\_scientific\\_method.php](http://www.lessonplansinc.com/biology_lesson_plans_scientific_method.php)

[Teacher Resources](#)

Teacher Timeline: Steps to help teachers guide students and plan additional activities. ... Printable Scientific Method Handout This is a larger version of the image in the ... Videos and tutorials; Lessons to share with the family ...

[www.sciencebuddies.org/science-fair.../teacher\\_resources.shtml](http://www.sciencebuddies.org/science-fair.../teacher_resources.shtml)

[Science Lesson Plans & PowerPoints](#)

Interactive science and Math lesson plans for teachers. ... Rusting and the Scientific Method: Lesson using the scientific method to determine what causes ...

[schooltool.us/plans.html](http://schooltool.us/plans.html)

<b>D. BIOORGANIC CHEMISTRY</b>	
<b>SC Standard: D1. Analyze the metabolic impact of nutrients on the body.</b>	
<b>FACS Nat'l Standard: 9.4</b> Apply basic concepts of nutrition and nutritional therapy in a variety of settings.	
<b>National Certification:</b> Food Science Fundamentals	
<b>Academic Alignment:</b> ELA: A1, A2, A3, A4, A5, A6; ISTE: A7, A8, A9, A10, A11, A12, A13; DA: A25, A26, A27, A28, A29; PS: A43, A44, A45; B: A46, A47; B: A46, A47; C: A50, A51, A53; P: A55; ES: A56	
<b>Essential Question(s):</b>	
1. How do dietary needs change across the life span?	
<b>Indicators:</b>	
<b>What Students Should Know:</b>	<b>What Students Should Be Able to Do:</b>
<ol style="list-style-type: none"> <li>1. The functions of the macronutrients and micronutrients</li> <li>2. The enzyme reactions in food</li> <li>3. The function of acids and bases in foods</li> <li>4. The difference between hydrolysis and dehydration synthesis</li> </ol>	<ol style="list-style-type: none"> <li>1. Differentiate the functions of the macro- and micronutrients.</li> <li>2. Analyze enzyme reactions in foods.</li> <li>3. Describe the functions of acids and bases in foods.</li> <li>4. Explain the effect of hydrolysis and dehydration synthesis.</li> </ol>
<b>Learning Strategies:</b>	
<ul style="list-style-type: none"> <li>• Research the nutrient requirements across life the life span and create a Power Point presentation. Share presentations with the class.</li> <li>• Create a scenario of a fictional individual. Design daily meal plan for one week designed for various caloric intakes, ages, or specific needs.</li> <li>• Research ways to prevent enzymatic browning. Test your findings, collect data, and report findings.</li> <li>• Apply peroxide to test for ways to stop enzyme reactions.</li> <li>• Compare shelf life of food based on pH levels.</li> <li>• Create a multimedia presentation on the metabolic impacts of the nutrients on the body.</li> <li>• Conduct acid-base experiment by turning water into wine (This is not a consumable product). (<a href="http://www.antoine.frostburg.edu">www.antoine.frostburg.edu</a>)</li> <li>• Show the difference between hydrolysis and dehydration. Obtain pieces of fruit or vegetables. Place one piece of the food item in a glass or beaker of water and cover. Place the other piece on a moist towel. Let these items remain in the beaker and on the towel for one week. Record and report your findings, daily.</li> </ul>	
<b>Assessments:</b> teacher-student conferences, learning logs, student self evaluation, student records/reflections on their work questionnaire, performance to demonstrate learning, open-response questions, projects with several interval products	

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**Resources:**

**What Are the Different Metabolic Processes?**

Brief and Straightforward Guide: What Are the Different **Metabolic Processes**?

[www.wisegeek.com/what-are-the-different-metabolic-processes.htm](http://www.wisegeek.com/what-are-the-different-metabolic-processes.htm)

Metabolism explained

Jun 22, 2010 ... Dietary deficiencies - for **example**, a diet low in iodine reduces ... Sometimes a faulty gene affects part of the **metabolic process** and stops ...

[www.goforyourlife.vic.gov.au](http://www.goforyourlife.vic.gov.au) >

What is an **example** of the **metabolic process**? - Yahoo! Answers

Sep 19, 2008 ... When you eat food, your body breaks it down into different forms of energy. If you have a high metabolism, your body breaks the food down quickly ...

[answers.yahoo.com/question/index?qid...](http://answers.yahoo.com/question/index?qid...)

Metabolism - New World Encyclopedia

The core **metabolic processes** have been synthesized and standardized into the ... **Examples** of anabolic processes include growth and mineralization of bone ...

[www.newworldencyclopedia.org/entry/Metabolism](http://www.newworldencyclopedia.org/entry/Metabolism)

## E. Food Production

<b>SC Standard: E1.</b> Evaluate various methods of food processing and preservation.	
<b>FACS Nat'l Standard: FACS Nat'l Standard: 9.2</b> Apply risk management procedures to food safety, food testing, and sanitation. <b>9.3</b> Evaluate nutrition principles, food plans, preparation techniques and specialized dietary plans. <b>9.6</b> Demonstrate food science, dietetics, and nutrition management principles and practices.	
<b>National Certification:</b> Food Science Fundamentals	
<b>Academic Alignment:</b> ELA: A1, A2, A3, A4, A5, A6; ISTE: A7, A8, A9, A10, A11, A12, A13; HSE: A13, A14, A15, A16, A17, A18, A19; EA: A21; IA: A22; G: A23; PC: A24; DA: A25, A26, A27, A28, A29; USHC: A31, A32, A33; ECON: A34, A35, A36, A37, A38, A40; PS: A43, A44, A45; B: A46, A47, A48, A49; C: A50, A52, A53; P: A55; ES: A56	
<b>Essential Question(s):</b> 1. Why are different methods of food processing and preservation needed?	
<b>Indicators:</b>	
<b>What</b> 1. Dried food processing 2. Frozen food methods 3. Canned food preservation 4. Irradiation practices	<b>What Students Should Be Able to Do:</b> 1. Compare dehydration methods. 2. Explore methods used to freeze foods. 3. Demonstrate canning techniques. 4. Explain irradiation practices on foods.
<b>Learning Strategies:</b>	
<ul style="list-style-type: none"> <li>• Produce an original product, technique, or process that might be used in the food industry.</li> <li>• Compare food-processing methods. Determine the appropriate processing methods for popular food items.</li> <li>• Create a video demonstration on the procedures for blanching vegetables.</li> <li>• Create a freezer storage chart to show what foods are in the freezer, when it was placed in the freezer, and the date by which it should be removed from the freezer.</li> <li>• Create a bulletin board on the steps to food processing and preservation.</li> <li>• Prepare one cooked jam or jelly recipe and an uncooked jam or jelly recipe.</li> <li>• Prepare various mixtures of fruit leather.</li> <li>• Preserve vegetables by various preservation methods including different spices and herbs. Taste and critique the finished products.</li> <li>• Find the fastest method of pickling. Make a checklist to determine the best quality product produced.</li> <li>• Compare the different types of pickles (kosher, sweet, dill, etc.) for taste, texture, etc. Make a poster advertising your favorite choice.</li> <li>• Compare the taste of orange juice in different types of packaging, example juice box, paper carton, and plastic container. Conduct a survey and develop a bar graph to show the favorite types.</li> </ul>	

- Determine the best method of preservation by taking one food through several preservation methods.
- Identify foods that are irradiated. Discuss the benefits provided by irradiation.
- Develop graphs indicating the cost and shelf life fluctuation over the years of an irradiated product. Discuss if it is worth the cost.
- Create a chart showing the advantages and disadvantages of each food processing and preservation method.

**Assessments:** learning logs, student self evaluation, performance to demonstrate learning, open-response questions, projects with several interval products

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#### **APPLICATION/ASSESSMENT THROUGH FCCLA**

STAR Events: Applied Technology; Food Service; Illustrated Talk

Student Body: food safety education projects

#### **Resources:**

**[www.acid-base.com](http://www.acid-base.com) (Acid Base)** from Tulane University, Department of Anesthesiology, description of acids and bases

**[www.cs.cmu.edu/~mjw/recipes](http://www.cs.cmu.edu/~mjw/recipes) (Carnegie Mellon School of Computer Sciences)** List of recipe archives

**[www.ag.uiuc.edu/~robsond/solutions/nutrition/docs/janan039.html](http://www.ag.uiuc.edu/~robsond/solutions/nutrition/docs/janan039.html) (Food Processing Times for Fruits)** from University of Illinois Extension

**[www.ag.uiuc.edu/~robsond/solutions/nutrition/docs/janan045.html](http://www.ag.uiuc.edu/~robsond/solutions/nutrition/docs/janan045.html) (Food Processing Times for Tomatoes)** from University of Illinois Extension

**[www.bact.wisc.edu/microtextbook/Metabolism/Fermentation.html](http://www.bact.wisc.edu/microtextbook/Metabolism/Fermentation.html) (Fermentation of Food)** metabolism described in a textbook

**[www.icademic.org/97445/Food-Science](http://www.icademic.org/97445/Food-Science) (Icademic.org)** online resources in the food science field, covering lists of food science departments, websites, journals, books and reviews, employment opportunities and events

**[www.fao.org/docrep/x5573e/x5573e0e.htm](http://www.fao.org/docrep/x5573e/x5573e0e.htm)**

Food Processing and Preservation. 330. Food processing and preparation activities cover three main fields: (1) the preservation of foods by (a) modern methods such as refrigeration ...

[www.foodprocessing.com](http://www.foodprocessing.com)

**Food Processing** Source for the latest technical and marketing news in the food industry.

## E. FOOD PRODUCTION

**SC Standard: E2. Analyze the advantages and disadvantages of microbes.**

**FACS Nat'l Standard: 9.6** Demonstrate food science, dietetics, and nutrition management principles and practices.

**National Certification:** Food Science Fundamentals

**Academic Alignment: ELA: A1, A2, A3, A4, A5, A6; ISTE: A7, A8, A9, A10, A11, A12, A13; HSE: A13, A14, A15, A16, A17, A18, A19, A20; EA: A21; IA: A22; G: A23; PC: A24; DA: A25, A26, A27, A28, A29; USHC: A30, A31, A32, A33; PS: A43, A44, A45; B: A46, A47, A48, A49; C: A50, A51, A52, A53, A54; P: A55; ES: A56**

**Essential Question(s):**

1. Why are microbes important to the food industry?

**Indicators:**

**What Students Should Know:**

1. Types of microbes
2. Microbial functions (advantages and disadvantages)
3. Fermentation
4. Pasteurization
5. Food borne illness (Intoxication, Infections, and other causes)
6. Food Safety (Prevention)

**What Students Should Be Able to Do:**

1. Identify the characteristics of microbes.
2. Describe the effects of microbes on food.
3. Explain the effects of microbes in fermentation process. (i.e. soy sauce, yogurt, etc.)
4. Differentiate the types of pasteurization used in food productions.
5. Differentiate the types of food borne illnesses.
6. Describe the ways pathogens enter food supplies.

**Learning Strategies:**

- Research the different types of microorganisms. Create a PowerPoint and present to the class.
- Design a laboratory experiment with half a slice of moistened bread exposed to the environment and the other side covered. Let the bread stand for a week. Record your findings on a daily basis.
- Observe and record the microorganisms found on both sides of the bread.
- Conduct a yeast fermentation experiment consisting of honey and water with different percentages of honey (i.e. 25%, 50%, 75%, 100%). Record and report the amounts of bubbles found in the solutions.
- Conduct a water boiling experiment with one beaker of regular tap water at room temperature and another beaker of boiled tap water. Once water boil; let cool for 5 minutes and cover. Record and report findings over a week or two week period.

**Learning Strategies:**

- Investigate the many types of food borne illnesses on a global scale.
- Create a tri-fold brochure explaining a food borne illness and the way they enter food supplies.
- Create a microbe food product and present to a group of potential buyers/investors and list the reasons why the microbe food product will better than the original product.

**Assessments:** teacher-student conferences, learning logs, student self evaluation, student records/reflections on their work questionnaire, performance to demonstrate learning, open-response questions, projects with several interval products

**FACS Student Organization – Family, Careers, and Community Leaders of America (FCCLA) <http://www.fcclainc.org/>**

**APPLICATION/ASSESSMENT THROUGH FCCLA**

Fundraising: food-related business

Leaders at Work: Food Production and Services leadership projects

STAR Events: Applied Technology; Entrepreneurship; Food Service

**Resources:****What is Food Microbiology?**

May 25, 2005 ... **Food microbiology** is the study of food micro-organisms; how we can identify and culture them, how they live, how some infect and cause ...

[www.bionewsonline.com/1/what\\_is\\_food\\_microbiology.htm](http://www.bionewsonline.com/1/what_is_food_microbiology.htm)

**Microbiology Microbes Bacteria Information and Links**

Microbiology information resources and links on microorganisms, bacteria, microbes, viruses, bacteriology, microbiology and virology by microbes.info

[www.microbes.info](http://www.microbes.info)

**The American Society For Microbiology**

Source For Microbiology: The American Society for Microbiology is dedicated to the utilization of microbiology and microbiological sciences for the promotion of human welfare and ...

[www.asm.org](http://www.asm.org)

**Microbiology Overview - References, Advice, News, Videos, Coping ...**

Learn more about Microbiology. Find the Web's best health guides, medical reports, news, videos and tools for Microbiology. Share Microbiology experiences and get advice from ...

[www.righthealth.com/topic/Microbiology](http://www.righthealth.com/topic/Microbiology)

## F. Careers in Food Science and Dietetics

**SC Standard:** F1. Analyze career paths in food science and dietetics.

**FACS Nat'l Standard:** 9.1 Analyze career paths within food science, food technology, dietetics, and nutrition industries.

**National Certification:** Food Science Fundamentals

**Academic Alignment:** ELA: A1, A2, A3, A4, A5, A6; ISTE: A7, A8, A9, A10, A11, A12, A13; HSE: A13, A14, A16, A19, A20; ECON: A34, A36, A37, A39; PS: A43, A44, A45; B: A46; C: A50; P: A55; ES: A56:

### Essential Question(s):

1. What characteristics do you have that can lead to a successful career in food science and dietetics?
2. What are possible opportunities for leadership development through professional organizations?

### Indicators:

#### What Students Should Know:

1. Career pathways
2. Student organizations
3. Professional organizations
4. Components of an employment portfolio  
(continue from level 1)

#### What Students Should Be Able to Do:

1. Demonstrate knowledge, skills, and practices required for careers in food science and dietetics.
2. Identify co-curricular student organizations related to food science and dietetics.
3. Analyze professional organizations related to food science and dietetics.
4. Maintain an employment portfolio.

### Learning Strategies:

- Research career pathways. Create a career portfolio.
- Generate a presentation describing the team needed to develop a food product using oral and written communication skills.
- Create a portfolio showcasing work samples from food science and dietetics activities.
- Conduct a mock job interview. Incorporate information technology tools to enhance the interview.
- Create a brochure on different career paths.
- Solve problems incurred in managing a student organization (student involvement in creating a food for distribution, fund raising, student volunteer work in a food-related area, etc.) using critical thinking, creativity, and innovation.
- Explain the importance of professional ethics, employability skills, and entrepreneurship skills.
- Invite food science human resources personnel to critique and provide feedback on the components of the employment portfolio.

**Assessments:** Learning logs, student self evaluation, student records/reflections on their work, performances to demonstrate learning, open-response questions, projects with several interval products, peer conferencing

**FACS Student Organization – Family, Careers, and Community Leaders of America (FCCLA)** <http://www.fcclainc.org/>

#### **APPLICATION/ASSESSMENT THROUGH FCCLA**

Career Connection: ACCESS SKILLS for Career Success; SIGN ON to the Career Connection; PROGRAM Career Steps; INTEGRATE Work and Life

Dynamic Leadership: Problem Solving for Leaders; Teamwork for Leaders; Conflict Management for Leaders

Families First: Balancing Family and Career

Leaders at Work: on-the-job entrepreneurship projects

Power of One: A Better You; Speak Out for FCCLA; Working on Working

STAR Events: Career Investigation, Entrepreneurship; Interpersonal Communications; Job Interview

#### **Resource:**

[www.bls.gov/oco](http://www.bls.gov/oco) (Bureau of Labor Statistics) Occupational Outlook Handbook

[www.eatright.org](http://www.eatright.org) (American Dietetics Association) information about dietetics careers

[www.ift.org](http://www.ift.org) (Institute of Food Technologists) information about food technologists

[www.foodtechcareers.org](http://www.foodtechcareers.org) (Institute of Food Science Technology)

[Food\\_Science\\_technology\\_Careers\\_Careers\\_And ...](#)

Would you like to be part of a fast moving industry - the largest and most important economic activity ...

[www.educationforadults.com/career/food-science.html](http://www.educationforadults.com/career/food-science.html) Food\_Science\_Career\_Information Food Science career information for adults looking to return to school and advance or change their career.

[www.cals.uidaho.edu/sfs/careers.htm](http://www.cals.uidaho.edu/sfs/careers.htm) School of Food\_Science\_Careers Careers in Food Science . The multi-billion dollar food industry is the largest

**Resources:**

**[www.bls.gov/oco](http://www.bls.gov/oco) (Bureau of Labor Statistics) Occupational Outlook Handbook**

**[www.eatright.org](http://www.eatright.org) (American Dietetics Association) information about dietetics careers**

**[www.ift.org](http://www.ift.org) (Institute of Food Technologists) information about food technologists**

**[www.foodtechcareers.org](http://www.foodtechcareers.org) (Institute of Food Science Technology)**

**[Food\\_Science\\_technology\\_Careers\\_Careers\\_And\\_...](#)**

Would you like to be part of a fast moving industry - the largest and most important economic activity ...

**[www.educationforadults.com/career/food-science.html](http://www.educationforadults.com/career/food-science.html) Food\_Science\_Career\_Information** Food Science career information for adults looking to return to school and advance or change their career.

**[www.cals.uidaho.edu/sfs/careers.htm](http://www.cals.uidaho.edu/sfs/careers.htm) School of Food\_Science\_ - Careers**

Careers in Food Science . The multi-billion dollar food industry is the largest ...

**[www.ncsu.edu/majors-careers/do\\_with\\_major\\_in/showmajor.php?id=15](http://www.ncsu.edu/majors-careers/do_with_major_in/showmajor.php?id=15)**

**[Food\\_Science : What Can I Do With A Major In...](#)**

Description | Skills | Experience | Sample Careers/Work Settings | Salary Double Majors/Minors | Advanced Degrees | NCSU Orgs | Prof. Orgs | Links | Next Steps

**<http://www.ift.org/careercenter.aspx>** IFT provides insights and information to help advance your career in food science and the food industry. You'll discover food science jobs, learn the latest salary figures and employment outlook data, and discuss workplace issues with your peers.

**[www.iccweb.com](http://www.iccweb.com) (The Internet Career Connection) resources for job searches**

**[www.monster.com](http://www.monster.com) (Monster.com) resources for job searches**

**[www.goodcooking.com/propages/cul\\_add.htm](http://www.goodcooking.com/propages/cul_add.htm) (Professional Food/Beverage/Hospitality Associations) web sites for professional food organizations**