Course Description:

Discover the science behind your favorite foods! How is root beer made? Are all additives bad? Will you get sick if you eat mold? These questions and more will be answered. Learn biology, chemistry, and physics as you 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:	**5757**
Credit:	**1(120), 2(240), 3(360)**
National Certification:	**Food Science Fundamentals** **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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STANDARDS AND INDICATORS

B. INTRODUCTION TO FOOD SCIENCE AND DIETETICS

B1. Identify the components of the scientific method.

1. Identify the steps in the scientific method.
2. Analyze a product employing the appropriate direct instruments.
3. Operate indirect instruments.
4. Demonstrate precision in technology.

B2. Analyze the relationship between food science and dietetics**.**

1. Summarize the history of food science and dietetics.
2. Identify the major components of food science.
3. Explain the importance of dietetics and nutrition.

B3. Investigate career paths within food science and dietetics**.**

1. Identify various career opportunities in food science and dietetics.
2. Explore the advantages of joining a professional organization.
3. Develop an employment portfolio.

C. LABORATORY AND FOOD SAFETY

C1. Evaluate laboratory and food safety practices.

1. Incorporate safe use of lab equipment.
2. Integrate safe lab techniques and procedures.
3. Implement sanitation practices in the lab.
4. Summarize information regarding food borne illnesses as a health issue for individuals, families, and the global community.
5. Analyze how OSHA, DHEC, and other governmental agencies' regulatory codes protect the nation's food supply.
6. Identify food codes relevant to specific laboratory practices.

D. ENERGY & METABOLISM

D1. Explore the types of energy used in the food industry.

1. Distinguish between the types of energy.
2. Differentiate the forms of energy used in the food industry.
3. Observe and critique how energy is transformed to another form of energy.

E. FOOD CHEMISTRY

E1. Analyze the physical properties of matter and chemical reactions.

1. Identify the physical properties of matter.
2. Explain how atoms, molecules, and compounds relate to food items.
3. Explain how phase changes are examples of reversible physical change.
4. Describe how chemical changes are illustrated by chemical equations.

E2. Summarize the basic properties of foods.

1. Summarize the purposes and functions of carbohydrates, lipids, and proteins.
2. Explain the metabolic pathways and their chemical reactions.
3. Analyze relationships between food intake and body weight.
4. Summarize the properties and uses of water.
5. Identify the properties of vitamins and minerals in foods.
6. Summarize the purpose of acids and bases in food.
7. Justify the use of additives in foods.
8. Summarize enzyme reactions in the body and in food.

F. FOOD PRODUCTION

F1. Analyze the correlation between food production, processing, packaging, and marketing in the food industry.

1. Explain the relationship between food production and processing.
2. Identify nonliving conditions that can affect microbial growth on foods.
3. Identify products with probiotics.
4. Identify packaging and marketing strategies (i.e. sugar coated cereals that are placed at a child's eye level in the grocery store).
5. Explore sensory evaluation.
6. Incorporate the metric system of measurement in laboratory procedures.
7. Identify the different types of preservatives and their role in food-processing.
8. Explain how the different types of packing protect food.
9. Compare and contrast hot and cold processing.
10. Research the changes of products and processing over time.

ACADEMIC STANDARDS (for alignments only)

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.

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

Indicator(s):

- 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.

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
A22. 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.

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.
A35. 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 $q = mLv$ and $q = mLf$ [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.
- 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. INTRODUCTION TO FOOD SCIENCE AND DIETETICS

SC Standard: B1. Identify the components of the scientific method.

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; HSE: A13, A14, A17, A19, A20; EA: A21; IA: A22; G: A23; PC: A24; DA: A25, A26, A27, A28, A29; PS: A43, A44, A45; B: A46; C: A50; P: A55; ES: A56

Essential Question(s):

1. Why is it important to study the scientific method?

Indicators:

What Students Should Know:	What Students Should Be Able to Do:
1. Steps in the scientific method 2. Direct instruments (i.e. use of senses) 3. Indirect instruments (i.e. microscope, balance scale, etc.) 4. Technology usage (i.e. unit conversions & measurements, accuracy, research, etc.)	5. Identify the steps in the scientific method. 6. Analyze a product employing the appropriate direct instruments. 7. Operate indirect instruments. 8. Demonstrate precision in technology.

Learning Strategies:

- Explain classroom and laboratory procedures.
- Write reports using scientific terminology
- Use the metric system of measurement
- Write a story about the discovery of a new food using the scientific method. Present to the class for evaluation.
- Create a scientific design employing the scientific methods. (i.e. Lima Bean Experiment: Control – Regular lima bean, Experiment – What are the effects of a lima bean being exposed to water versus a lima bean not being exposed to water. Formulate [record, collect, and evaluate] data over a one week period. Report results along with a theory.)
- Discuss why you like certain foods.
- Describe the characteristics of successful sensory testing
- Discuss factors affecting people's food preferences
- Explain what sensory evaluation panels do
- Explain how sensory evaluation panels are conducted
- Define the term sensory evaluation.
- Conduct investigations to become familiar with measuring equipment and skills.
- Organize data and tables.
- Compare volume measurements using various types of glassware and instruments (i.e. pipette, scale, syringe, etc.).
- Compare masses using electronic and triple-beam balances.

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

Fundraising: food-related business

Leaders at Work: Food Production and Services leadership projects

STAR Events: Applied Technology; Entrepreneurship; Food Service

Resources:

www.acid-base.com (Acid Base) from Tulane University, Department of Anesthesiology, description of acids and bases

www.orst.edu/dept/lpi (Oregon State University) The Linus Pauling Institute describes research to determine the role of micronutrients, vitamins and phytochemicals.

www.sciencebuddies.org/science-fair-projects/project_scientific_method.shtml
Steps of the Scientific Method
An introduction to the steps of the scientific method ... Key Info. The scientific method is a way to ask and answer scientific questions by making observations and doing experiments.

teacher.pas.rochester.edu/phy_labs/AppendixE/AppendixE.html
Introduction to the Scientific Method
Introduction to the Scientific Method. The scientific method is the process by which scientists, collectively and over time, endeavor to construct an accurate (that is, reliable ...

www.biology.clc.uc.edu/courses/bio104/sci_meth.htm
The Scientific Method
Review of the steps involved in observation, hypothesis testing and prediction, with an interactive assignment in biology.

B. INTRODUCTION TO FOOD SCIENCE AND DIETETICS

SC Standard: B2. Analyze the relationship between food science and dietetics.

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, A17, A20; PS: A43, A44, A45; B: A46, C: A50; P: A55; ES: A56

Essential Question(s):

1. Why study the sciences involved with food?
2. How is food science related to dietetics?

Indicators:

What Students Should Know:	What Students Should Be Able to Do:
1. The history of food science and dietetics 2. Food science (the nature of food and principles of production, processing, preservation, and packaging) 3. Dietetics (the implementation of nutrition - components of food and usage in the body)	1. Summarize the history of food science and dietetics. 2. Identify the major components of food science. 3. Explain the importance of dietetics and nutrition.

Learning Strategies:

- Construct a food science timeline.
- Define the term food science and describe the main goal of food scientists.
- Identify qualities that make the sensory characteristics of food9
- Explain the interrelationship of food science and nutrition.
- Identify the elements on the periodic table that are in common foods.
- Create a Venn diagram indicating the various sciences included in food science and dietetics (nutrition).
- Invite a registered dietitian to discuss the importance of food science in dietetics and nutrition.
- Compose a collage of food packaging and the nutrition facts labels.
- Research the benefits of studying food science in a global society.
- Look at old cookbooks and compare it to present day foods.
- Interview an older adult to determine the types of fast foods and convenience food they had when they were young.
- Research various companies that employ food scientists.
- Survey the origins of fruits and vegetables in the local grocery stores.
- Create a collage of newspaper articles relating to national and international food supply. Shape the collage like the country of origin.
- Research the food customs of various religions and share findings
- Research the benefits of studying food science in a global society. (LS)

Assessments: Student self evaluation, rubric, 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** Fundraising: food-related business Leaders at Work: Food Production and Services leadership projects STAR Events: Applied Technology; Entrepreneurship; Food Service
Resources: **www.cals.wisc.edu/students/majors/Dietetics** Dietetics Dietetics. Home » Dietetics. Translating the sciences of nutrition and food. A dietetics education opens doors for any student who is interested in nutrition and food science and wants ... **www.registrar.ufl.edu/catalogarchive/02-03-catalog/colleges/agriculture/agriculture_012_.htm** Food Science and Human Nutrition Food Science and Human Nutrition. Food Science Dietetics Nutritional Sciences Food Science and Human Nutrition Minor. fshn.ifas.ufl.edu. The Department of Food Science and Human Nutrition ...

B. INTRODUCTION TO FOOD SCIENCE AND DIETETICS

SC Standard: B3. Investigate career paths within 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 can you do with a degree in food science or dietetics?
2. What characteristics are needed for a successful career in food science or dietetics?

Indicators:

What Students Should Know:	What Students Should Be Able to Do:
1. Opportunities for employment and entrepreneurship 2. Role of professional organizations 3. Components of an employment portfolio	1. Identify various career opportunities in food science and dietetics. 2. Explore the advantages of joining a professional organization. 3. Develop an employment portfolio.

Learning Strategies:

- Organize a chart depicting career opportunities in food science and nutrition.
- Invite food science or dietetic professionals to participate in a panel discussion of their career.
- Develop a 2 minute television commercial that promotes a career opportunity in food science or dietetics.
- Collect classified ads of current openings that are related to the food science or dietetic profession. Share findings with the class.
- Research colleges and universities that offer programs of study in food science or dietetics. Compare the entrance requirements, course descriptions, and unit requirements that are offered with each program.
- Research the professional organizations and conduct a survey to determine the organization they would like to join.
- Create a rap promoting careers in food science and dietetics.
- List the qualifications needed for a career in sensory evaluation.

Assessments: Student evaluation, student records/reflections on their work, questionnaires, open-response questions, projects with interval products, peer conferencing , parent conferencing

FACS Student Organization-Family, Community and Career 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

Resources:

www.bls.gov/oco (Bureau of Labor Statistics) Occupational Outlook Handbook

www.eatright.org (American Dietetics Association) information about dietetics careers

www.ift.org (Institute of Food Technologists) information about food technologists

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** 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 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
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

Resources:

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 (The Internet Career Connection) resources for job searches

www.monster.com (Monster.com) resources for job searches

www.goodcooking.com/propages/cul_add.htm (Professional Food/Beverage/Hospitality Associations) web sites for professional food organizations

C. LABORATORY AND FOOD SAFETY

SC Standard: C1. Evaluate laboratory and food safety practices.

FACS Nat'l Standard: 9.2 Apply risk management procedures to food safety, food testing, and sanitation.

National Certification: Food Science Fundamentals

Academic Alignment: Academic Alignment: 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

Essential Question(s):

1. What does a safe laboratory look like?
2. How do I increase food safety in the laboratory and home?
3. How does food safety affect nutrition?

Indicators:

What Students Should Know:	What Students Should Be Able to Do:
1. Safe use of lab equipment 2. Safe lab techniques and procedures 3. Lab sanitation practices 4. Food borne illnesses 5. OSHA, DHEC, and other governmental agencies 6. Food Codes	1. Incorporate safe use of lab equipment. 2. Integrate safe lab techniques and procedures. 3. Implement sanitation practices in the lab. 4. Summarize information regarding food borne illnesses as a health issue for individuals, families, and the global community. 5. Analyze how OSHA, DHEC, and other governmental agencies' regulatory codes protect the nation's food supply. 6. Identify food codes relevant to specific laboratory practices.

Learning Strategies:

- Discuss and role play lab safety procedures.
- Prepare first-aid supply kits.
- Create an instructional brochure for personal or emergency protection.
- Identify common laboratory hazards in a collage, drawing, or illustration.
- Locate a Materials Safety Data Sheet (MSDS) and fire extinguishers.
- Develop and sign a Lab Safety Contract; file the contract.
- Demonstrate appropriate use of equipment.
- Demonstrate safe lab techniques and procedures.

Learning Strategies:

- Create vertical acronyms using safety terminology. (i.e.
  Secure
  All
  Fire
  Extinguishers
  This
  Year = A Safe Learning Environment
- Practice laboratory procedures that prevent biological contamination.
- Practice aseptic techniques.
- Explain how "the process affects the outcome."
- View video/DVD universal precautions. Create a lab checklist of the information that was presented in the video/DVD. Perform the duties of a "safety patrol officer" using the checklist.
- View the ServSafe or HAACP video/DVD. Earn a "Food Safety and Sanitation License."
- Sterilize reagents and equipment.
- Write a narrative story or a script for "The Case of the Merciless Microbe" when assigned a microbial agent by drawn-selection from "the microbial pool" (i.e. Fun Guy, Strepto Coccus, Staph Lococcus, etc.).
- Identify microorganisms that are helpful and those that are harmful.
- Make a Venn diagram illustrating the similarities and differences between food intoxication and food infection.
- List organisms that cause food-borne illness. Take swab samples of home and classroom environments for microbial growth experiment (must either have access to an autoclave or disposable Petri-dishes with agar).
- Identify sanitary food-handling practices in the Tale of Tom E. Ache (http://www.uen.org/Lessonplan/preview.cgi?LPid=5342).
- Find the chemical agent in a team scavenger hunt through the MSDS file for the food science/foods lab.
- Create a poster explaining how to control microbial growth on foods.
- Defend an OSHA regulation in the class "courtroom" against the allegation that that code is unimportant in protecting the food supply.
- Research the history of the USDA Food Codes.
- Take a "tour" through the food regulatory codes. Think-pair-share ways to make improvements in different settings.
- Identify United States government agencies that keep the food supply safe.

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

FACS Student Organization Family, Career, and Community Leaders of America (FCCLA)
http://www.fcclainc.org/

APPLICATION/ASSESSMENT THROUGH FCCLA

STAR Events: Applied Technology; Food Service; Illustrated Talk

Student Body: food safety education projects

Resources:

www.foodsafety.gov (Gateway to Government Food Safety Information) safety alerts, consumer advice and other resources

www.foodsafety.gov/~fsg/f01chart.html (Foodsafety.gov) cold food storage chart

www.fsis.usda.gov (Food Safety and Inspection Service from USDA) news releases and other resources

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

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

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 (Center for Food Safety and Applied Nutrition from FDA) Food Labeling and Nutrition resources

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 (The Iowa State Extension Service) Food Safety Resources

www.fightbac.org (Fight Bac!) The Food Safety Partnership resources for teaching food safety

D. ENERGY & METABOLISM

SC Standard: D1. Explore the types of energy used in the food industry.

FACS Nat'l Standard: 9.5 Demonstrate use of current technology in food product development and marketing.

National Certification: Food Science Fundamentals

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

Essential Question(s):

1. How is energy used in the food industry?
2. How do we know energy exists?

Indicators:

What Students Should Know:	**What Students Should Be Able to Do:**
1. Types of Energy (potential and kinetic) 2. Forms of Energy (i.e. chemical, mechanical, physical, etc.) 3. Heat and Temperature	1. Distinguish between the types of energy. 2. Differentiate the forms of energy used in the food industry. 3. Observe and critique how energy is transformed to another form of energy.

Learning Strategies:

- Create a demonstration with a partner of how energy is used in the food industry.
- Research the terms: heat and temperature; report how it relates to the use of energy.
- Demonstrate heat transfer by playing the game 'Hot Potato'.
- Write two true statements and two false or opinion statements about physical and chemical changes. The statements will be read out loud to the class to determine if they are fact or opinion.
- Describe the relationship of energy to physical and chemical reactions.
- Determine energy requirements using multiple variables. (i.e. Boil water and place various items in the boiling water to determine how quickly each item will reach a certain temperature.)
- Conduct experiments comparing microwave to conventional oven preparation.
  Cook various sizes of foods, e.g., potatoes, to determine cooking times.
- Make ice cream using two plastic bags (ice cream in a bag).

Learning Strategies:

- Compare the relationships between food intake, physical activity, and body weight. Keep a food journal to determine the relationship between food intake and the way you feel.
- Keep a physical activity journal to determine the relationship between physical activity and the way you feel.
- Keep weekly log of weight to compare weight and food intake.
- Discuss the processes of heat and temperature.
- Investigate how energy is released and absorbed through physical and chemical changes.
- Explain heat transfer.
- Explain latent heat in phase changes.
- Compare various temperatures on rates of reaction.

Assessments: teacher-student conferences, student self evaluation, performances to demonstrate learning, 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** Fundraising: food-related products/business STAR Events: Applied Technology; Food Service; Food Innovations Student Body: food marketing education projects; food safety projects
Resources: **www.ift.org (Institute of Food Technologists)** information about food technologists http://school.discoveryeducation.com/foodscience/science_resources.html http://school.discoveryeducation.com/foodscience/science_resources.html Browse this site for downloadable videos, profiles of professional food scientists, lesson materials and experiments, information about colleges and scholarships, and more. http://www.factmonster.com/ipka/A0882305.html www.annecollins.com/food-energy-for-the-body.htm How the Body Uses Food Energy How the Body Uses Food Energy ... levels are typically determined by the type of carbs we eat. High GI foods ... Burn Calories and Lose Weight | Calories Used ...
Resources: www.healthyeatingclub.com/info/books-phds/books/foodfacts/html/data/data2a.html · Food Data Chart - Energy ... relatively inefficient in its use of food energy, loss will occur in faeces and by relatively more heat production. The word 'energy' has been used ... www.whfoods.com/genpage.php?tname=faq&dbid=26 WHFoods: What Foods are Good for Energy? How does my body make energy from food? The main types of food used to provide energy - that is, the foods that are stripped of their energy, so it can be used by your body

E. FOOD CHEMISTRY

SC Standard: E1. Analyze the physical properties of matter and chemical reactions.	
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; DA: A25, A26, A27, A28, A29; PS: A43, A44, A45; B: A46, A47; B: A46, A47: C: A50, A51, A53; P: A55; ES: A56	
Essential Question(s): 1. How do atoms and molecules affect food? 2. Which foods are edible when they turn brown?	
Indicators:	
What Students Should Know: 1. Physical properties of matter 2. Physical and chemical reactions 3. Physical change 4. Chemical change	**What Students Should Be Able to Do:** 1. Identify the physical properties of matter. 2. Explain how atoms, molecules, and compounds relate to food items. 3. Explain how phase changes are examples of reversible physical change. 4. Describe how chemical changes are illustrated by chemical equations.
Learning Strategies:	
• Create human chemical bonds (ionic, covalent, molecules, etc.) using placards so students represent electrons, neutrons, protons, etc. Keep placards the same color for various parts for faster identification and assembly. • Play "Which Matter?" with a game-show flair and teams to determine categories of matter when shown a food picture (i.e. compounds, elements, homogeneous mixtures, heterogeneous mixtures, organic compounds, inorganic compounds). • Create human molecules by placing placards on each student signifying atoms (some may need to be larger molecules such as C_3 or C_{10}). Keep placards the same color for various elements for faster assembly of the class. Start off easy (H_2O) and go toward the more complex (Glycerol and fatty acids = Lipid). • Conduct gelatin and water experiments illustrating phase changes. Students should record time and descriptions of changes of state. • Bake cookies with varying amounts of baking powder to illustrate chemical changes.	
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	

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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:

www.math.unl.edu/~jump/Center1/Labs/WhatisFoodChemistry.pdf
What is Food Chemistry
Page 1 of 7 What is Food Chemistry? Submitted by Deb Dommel Modified from IFT Experiments Series "Food Chemistry" What is food chemistry? Food Science deals with the production ...

www.newworldencyclopedia.org/entry/Food_chemistry Food chemistry - New World Encyclopedia
Food chemistry is the study of chemical processes and interactions of the biological and nonbiological components of foods. It overlaps with biochemistry in that it deals with the ...

www.ift.org/divisions/food_chem IFT Food Chemistry Division
The Food Chemistry Division of the Institute of Food Technologists (IFT) was organized in 1995 to provide leadership and technical ...

chemistry.about.com/library/weekly/bl040103a.htm Food Chemistry Quiz
Food Chemistry Quiz: multiple choice questions chemistry quiz chemistry quizzes chemistry articles food chemistry

www.ehow.com/how-does_5207187_food-scientist-use-chemistry_.html
How Does a Food Scientist Use Chemistry? | eHow.com
By Diane Watkins, eHow Contributing Writer ·
How Does a Food Scientist Use Chemistry?. Chefs think of cooking in terms of the art of putting ingredients together to form a new recipe. Food scientists think of cooking in terms ...

E. FOOD CHEMISTRY

SC Standard: E2. Summarize the basic properties of foods.	
FACS Nat'l Standard: 9.3 Evaluate nutrition principles, food plans, preparation techniques and specialized dietary plans.	
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. Which food items assist in maintaining a healthy body?	
Indicators:	
What Students Should Know: 2. Nutrients that produce energy 3. Metabolic pathways (anabolism/ catabolism) 4. Weight management 5. Properties and functions of water 6. Structure and function of vitamins and minerals 7. Structure and functions of acids and bases in food 8. Food additives 9. Enzyme reactions	**What Students Should Be Able to Do:** 1. Summarize the purposes and functions of carbohydrates, lipids, and proteins. 2. Explain the metabolic pathways and their chemical reactions. 3. Analyze relationships between food intake and body weight. 4. Summarize the properties and uses of water. 5. Identify the properties of vitamins and minerals in foods. 6. Summarize the purpose of acids and bases in food. 7. Justify the use of additives in foods. 8. Summarize enzyme reactions in the body and in food.
Learning Strategies: • Taste different types of sugars and sugar alternatives to rank sweetness and solubility (fondants, fudge, etc.). • Conduct experiments with a number of different foods to show starch content. • Collect 10 labels from 10 food items and graph carbohydrate content. • Cook pasta with various amounts of water to determine length of cooking time. • Collect 10 labels from 10 food items and graph fat content • Taste test different levels of fats. • Analyze margarine labels to determine the type of fat used in the products. Compare the taste and texture of these products. • Compare recipes by substituting products for lipids (yogurt, sour cream, applesauce, puree prune, egg whites). • Collect 10 labels from 10 food items and graph protein content. • Conduct a sensory evaluation of products made with animal proteins or alternatives. • Demonstrate the denaturization of protein by using egg whites or cooked eggs.	

Learning Strategies Cont'd:

- Expand the effects of heat and acid on milk or other protein in products.
- Explain how the body uses energy and calories.
- Describe how metabolic pathways (anabolism / catabolism) affect life.
- Calculate personal basal metabolic rate (BMR) using a given formula.
- Estimate body composition Calculate body mass index.
- Explore the perils of eating disorders.
- Analyze different diets for health needs.
- Identify weight-related disorders and diseases.
- Collect 10 labels from 10 food items and graph mineral and vitamin content.
- Test foods for iron using a magnet.
- Compare the solubility of vitamins using water and/or fat products.
- Identify cooking methods that don't destroy nutrients.
- Research enrichments and fortification of foods as related to health.
- Chart the comparison of different purposes of additives in foods (preserve quality, enhance sensory, or control consistency).
- Conduct a ph test on common kitchen ingredients.
- Test the ph level of your saliva.
- Evaluate the effect of chemical leavening agents.
- Taste baby food, clean spoon off with your mouth, and put the spoon back in baby food to see the food breakdown.
- Illustrate how digestive enzymes work throughout the body (mouth, stomach, intestines).

Assessments: teacher-student conferences, learning logs, student self evaluation, student records/reflections on their work, questionnaires, performances to demonstrate learning, open-response questions, projects with several interval products, peer conference

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

APPLICATION/ASSESSMENT THROUGH FCCLA

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STAR Events: Illustrated Talk

Student Body: nutrition-related education projects

Resources:

www.healthknot.com/nutrition.html Basic nutrition: vital nutrients
Essential nutrients. Each of the six basic nutrients - except water - is made of a large number of different molecules that can significantly differ in their properties and ...

library.thinkquest.org/C004535/basic_cell_functions.html ·Basic Cell Functions
Basic Cell Functions - Properties of Life - Molecule Transport - Reproduction ... The cell must be able to obtain nutrients and other molecules to survive

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findarticles.com/p/articles/mi_m0ISW/is_2003_May/ai_100767890
How vital nutrients function together to improve health - Medicinal ...
How vital nutrients function together to improve health - Medicinal Properties in Whole Foods from ... the synergistic effects of nutrients, and ... Basic HTML tags that work in comments ...

www.associatedcontent.com/article/2300665/importance_of_good_nutrients_in_our.html ·
Importance of Good Nutrients in Our Healthy Life - Associated Content ...
Good nutrients are involved in the creation of each ... beans are loaded with disease fighting properties. ... The basic benefit of good nutrients is that they help the body to stay in ...

www-foodsci.ucdavis.edu/research/microencapsulation
Microencapsulation in Food and Related Applications ...... aimed at developing new basic knowledge and applicable information and technology to allow effective delivery of nutrients ... and health promoting properties of different nutrients ...

F. FOOD PRODUCTION

SC Standard: F1. Analyze the correlation between food production, processing, packaging, and marketing in the food industry.	
FACS Nat'l Standard: 9.5 Demonstrate use of current technology in food product development and marketing	
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; 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	
Essential Question(s): 1. How are you attracted to new food products? 2. What new food products have you enjoyed lately? 3. What is your favorite food commercial and why?	
Indicators:	
What Students Should Know: 1. Food production and processing 2. Nonliving and living conditions that affect microbial growth 3. Probiotics 4. Packaging and marketing 5. Sensory evaluation 6. Measurement 7. The role of preservatives. 8. The importance of packaging and processing in protecting the quality and safety of food. 9. Hot and cold processing. 10. How food products and processing have changed over time.	**What Students Should Be Able to Do:** 1. Explain the relationship between food production and processing. 2. Identify nonliving conditions that can affect microbial growth on foods. 3. Identify products with probiotics. 4. Identify packaging and marketing strategies (i.e. sugar coated cereals that are placed at a child's eye level in the grocery store). 5. Explore sensory evaluation. 6. Incorporate the metric system of measurement in laboratory procedures. 7. Identify the different types of preservatives and their role in food-processing. 8. Explain how the different types of packing protect food. 9. Compare and contrast hot and cold processing. 10. Research the changes of products and processing over time.

Learning Strategies:

- Assess foods for signs of invasive growth of microorganisms.
- Explain how nonliving and living conditions can promote the growth of microorganisms.
- Investigate the basic conditions that promote microbial growth.
- Research and present a tri-fold of a bacteria, protista, or fungi disease that affect foods.
- Investigate a virtual lab (Sheri will provide website) for sensitivity of growth
- Generate a list of microorganisms categorized as probiotics.
- Create a pseudo-facebook account and list 'bacterial buddies' that would be suggested as a friend.
- Identify qualities that make the sensory characteristics of food.
- Describe the characteristics of successful sensory testing.
- Discuss factors affecting people's food preferences.
- List the qualifications needed for a career in sensory evaluation.
- Explain what sensory evaluation panels do in the food industry.
- Explain how sensory evaluation panels are conducted.
- Develop, process, package, and market a new food product.
- Compare and contrast microbes.
- Compare the effects of ingredients on the growth of yeast.
- Conduct and experiment on agar using various bacteria in varying conditions.
- Relate the economic impact of food spoilage in underdeveloped countries.
- Conduct an experiment-making yogurt (lactic acid bacteria).
- Find food faux pas (mistakes) current events, the origin of the mistake, the effects on the economy, and how the results affected the community and/or the global society.
- Research examples of food marketing techniques gone bad.
- Construct a model of how the various forms of food preservation interrelated.
- Compare the cost per serving of canned, frozen, and fresh vegetables. Share with the class.
- Compare homemade products with commercial products (i. e. bread)
- Compare pickled products to fresh products.
- Compare different preservation methods.
- Research the impact canned food had on the military.
- Compare different packaging for refrigeration, freezing, and dry storage.
- Compare the nutritive value using a nutrition analysis program of one serving of each of the following: grapes versus raisins, plums versus prunes and mashed potatoes versus instant mashed potatoes. Share results with the class.
- Conduct a sensory evaluation of carbonated cola stored in glass, aluminum, and plastic. Share the results with the class.

Assessments: teacher-student conferences, learning logs, student self evaluation, student records/reflections on their work, questionnaires, performances to demonstrate learning, open-response questions, projects with several interval products, peer conference

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http://www.fcclainc.org/

APPLICATION/ASSESSMENT THROUGH FCCLA

Fundraising: food-related products/business

STAR Events: Applied Technology; Food Service

Student Body: food marketing education projects; food safety projects

Resources:

www.acid-base.com (Acid Base) from Tulane University, Department of Anesthesiology, description of acids and bases

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 (Food Processing Times for Fruits) from University of Illinois Extension

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 (**Fermentation of Food)** metabolism described in a textbook

www.icademic.org/97445/Food-Science (**Icacademic.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
Food Processing and Preservation
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 ...

Food Processing
Source for the latest technical and marketing news in the food industry.
www.foodprocessing.com