# Food Science
# Student Learning Objectives

Linked to the
National Standards for Family and Consumer Sciences Education

**Program Type: 0704** **Course Code: 096827** **CIP Code: 19.0501**

AAFCS assessments are driven by industry standards and requirements; based on relevant content standards and consistent with the National Standards for Family and Consumer Sciences Education and the National Career Clusters Initiative; appropriate to validate achievement of culinary arts competencies; useful in a broad range of education and employment settings, such as secondary and post-secondary education and employer-based human resource and staff development programs; and advantaged to utilize a gold-standard, computer-based testing platform format that provides for valid and reliable competency measurement, and a reporting mechanism for data-driven program improvement, accountability, and individual remediation and acceleration. Products can be reviewed at: http://www.aafcs.org/credentialing-center/pre-pac/portfolio

Uses of the Assessment and Certification
The assessment and certification are used to:
•document exit-level achievement in rigorous secondary programs and lower division post-secondary courses;
•satisfy federal accountability reporting mandates required by Perkins IV legislation;
•facilitate seamless articulation, placement, and credit-by exam within post-secondary institutions;
•validate competencies required for employment at the pre-professional and/or paraprofessional level; and
•provide an industry-recognized certification. (Pre-PAC information and links used with permission from AAFCS.)

Careers
The Food Science Fundamentals assessment/certification address competencies and a skill set necessary for success as a pre-professional in a career with a substantial focus on food science. It will facilitate employment in early career ladder positions and promote continuing education at the post-secondary level in career areas involving:

- food science,
- food safety,
- food quality,
- food technology, or
- food preservation and packaging.

Food Science Competencies List
https://higherlogicdownload.s3.amazonaws.com/AAFCS/1c95de14-d78f-40b8-a6ef-a1fb628c68fe/UploadedImages/CredentialingCenter/Exams/Food/Food_Science_Fundamentals.pdf

Alignment to the Career Ready Practices of the Common Career Technical Core
https://higherlogicdownload.s3.amazonaws.com/AAFCS/1c95de14-d78f-40b8-a6ef-a1fb628c68fe/UploadedImages/CredentialingCenter/Exams/Food/CCTC_Food_Science_Fundmentals.pdf

Alignment to the 21st Century Student Outcomes
https://higherlogicdownload.s3.amazonaws.com/AAFCS/1c95de14-d78f-40b8-a6ef-a1fb628c68fe/UploadedImages/CredentialingCenter/Exams/Food/Food_Science_Alignment_21st_Century_Learning_Skills.pdf

Alignment to the Employability Skills Framework
https://higherlogicdownload.s3.amazonaws.com/AAFCS/1c95de14-d78f-40b8-a6ef-a1fb628c68fe/UploadedImages/CredentialingCenter/Exams/Food/Employability_Food_Science.pdf

**Course Rational**

Food Science integrates and applies knowledge within the disciplines of chemistry, bio-chemistry, engineering, biology, and nutrition to preserve, process, package, and distribute foods that are nutritious, wholesome, affordable, desirable, and safe to eat. This course includes AAFCS assessments leading to students acquiring technical skill attainment (TSA or industry recognized credentials (IRC).

**Course Description**

This course prepares individual to use the scientific method to study the biological and chemical basis for food fermentation, preservation, processing, and preparation. Students develop laboratory, writing, and reasoning skills through measuring, recording, and graphic data; writing laboratory and short research projects; and predicting and evaluating laboratory results.

**Objectives/Categories**

- Orientation to Food Science
- Sensory Evaluation of Food
- Food Safety and Sanitation
- Science Foundations
- Biochemistry of Foods and the Major Nutrient Groups
- Chemistry of Food Formulations and Reactions
- Food Manufacturing Processes

| Student Learning Objectives | NASAFACS (National Standards) | AAFCS (National Assessment) |
|---|---|---|
| **A. Orientation to Food Science** | | |
| Compare and contrast food science to foodservice management | 9.1.1 | 1A |
| Utilize basic principles of measurement in scientific experimentation (e.g., metrics, formulas, and equations) | 9.7 | 6A |
| Demonstrate use, care, and safety of scientific lab equipment | 9.5.4 | 6A |
| Explain the steps in the scientific method | 9.7 | 5B |
| Write accurate and complete reports of science experiments | 9.7 | 5A |
| Identify the public and private organizations that influence food service, dietetics and nutrition industries | 9.1.4 | 1C, 2D |
| Identify career paths related to food science, dietetics and nutrition | 9.1.3 | 1B, 6D |

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| **B. Sensory Evaluation of Food** | | |
| Identify qualities that make up the sensory characteristics of food | 9.5.1 | 5D |
| Describe characteristics of sensory evaluation using appropriate terms | 9.5.6 | 5D |
| Determine characteristics that affect food preferences | 9.5.1 | 5C, 5E |

| C. Food Safety and Sanitation | | |
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| Compare the positive and negative effect of yeast, mold, bacteria and enzymes in foods | 9.5.5 | 2A |
| Identify principles of HACCP (assess hazards, identify critical control points, set up control procedures, monitor critical control points, take corrective actions, develop a record keeping system, verify that the system is working) | 9.2.4 | 2B |
| Describe the types of microorganisms that cause foodborne illness (e.g., bacteria, viruses, parasites, yeast, molds) | 9.2.1 | 2A |
| Explain the relationship between microorganisms and foodborne illness | 9.2.1 | 2A |
| Describe the basic environmental conditions that encourage the growth of microorganisms (e.g., time, temperature, moisture, oxygen) | 9.2.1 | 2C |
| Identify the three major types of hazards that cause foodborne illness (biological, chemical and physical) | 9.2 | 2C |
| Describe symptoms and causative agents of major foodborne illnesses (e.g., salmonellosis, botulism, hepatitis A) | 9.2.1 | 2A |
| Discuss how contamination and cross-contamination of foods can occur | 9.2.4 | 2B |
| Identify methods and procedures for controlling foodborne illness | 9.6.9 | 2B, 6B |
| Demonstrate personal hygiene/health practices essential for food safety and sanitation | 9.2.5, 9.2.6, 9.2.9 | 2B |
| Name typical products, tools and methods for effective cleaning and sanitizing | 9.2.7 | 2A |
| Identify location of and information on MSDS (Material Safety Data Sheets) | 9.2.8 | 2C |

| D. Science Foundations | | |
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| Demonstrate the effect of acids and bases in food, metabolism, preparation, processing and preservation | 9.7.3 | 3E, 4B, 4D |
| Describe the classes of matter, including pure substances and mixtures | 9.7.1 | |
| Identify the elements found in biochemical systems (food) and their atomic symbols | 9.7.1 | |
| Explain the properties and principles of matter and energy (e.g., boding, parts of the atom) | 9.7 | |
| Identify components of a chemical equation | 9.7 | |
| Differentiate between chemical reactions and physical changes in food | 9.7.2 | |
| Demonstrate the relationship between energy, physical changes, and chemical reactions | 9.7.2 | 4B |
| Discuss the relationship between molecular motion and temperature | 9.7.2 | 4B |
| Explain how heat is transferred | 9.7.2 | 4B |
| Interrelate the effects of temperature, latent heat and phase changes | 9.7.2 | |

| E. Biochemistry of Food and the Major Nutrient Groups (Carbohydrates, Proteins, Lipids, Vitamins, Minerals and Water) | | |
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| Describe terms related to the major nutrients and nutrient groups | 9.7 | |
| Describe the functions of the major nutrients and nutrient groups | 9.7 | 3 |
| Explain the functions of the major nutrients and nutrient groups in foods and food systems | 9.7 | 3 |
| Explain the process of sugar hydrolysis | 9.7.4 | 3A |
| Identify the product resulting from the hydrolysis of sucrose and lactose | 9.7.4 | 3A |

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| Compare the structures of amylose and amylopectin and their effect on cooking properties | 9.7.4 | 3A |
| Discuss gelatinization, paste, retrogradation, and syneresis as they relate to starch cookery | 9.7.4 | 3A |
| Explain what occurs during denaturization | 9.7.5 | 3C |
| Describe the chemical structure of protein | 9.7.5 | 3C |
| Compare the properties of saturated and unsaturated fatty acids | 9.7.5 | 3B |
| Identify foods that contain saturated and unsaturated fats (triglycerides) | 9.7.5 | 3B |
| Explain the differences between the types of fats and cholesterol | 9.7.5 | 3B |
| List the ways lipid oxidation can be controlled in food | 9.7.5 | 3B |
| Explain the role of water in the formation of solutions, colloidal dispersions and emulsions | 9.7 | 3E |
| Compare and contrast bound and free water in foods | 9.7 | 3E |
| Compare and contrast water soluble and fat soluble vitamins | 9.7 | 3D |
| Distinguish between major and trace minerals | 9.7 | 3D |
| Identify some interrelationships among nutrients (e.g., vitamin D and calcium) | 9.7 | 3D |
| Discuss the effect of food processing on vitamin and mineral levels in food | 9.5.2 | 3D |
| Relate metabolism to the factors that affect it | 9.7 | 3F |

| **F. Chemistry of Food Formulations and Reactions** | | |
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| Explain the relationships between enzymes, coenzymes and substrates | 9.7.6 | |
| Identify factors that affect enzymatic activity | 9.7.6 | |
| Distinguish the function of enzymatic reactions in food spoilage and food preparation | 9.7.6 | 6C |
| Identify the solvents and solutes in solutions | 9.7 | |
| Analyze the effect of concentration of physical properties of a solution | 9.7 | |
| Identify the properties of colloidal dispersions | 9.7 | |
| Explain the relationship of an emulsion's parts | 9.7 | |
| Explain the functions and properties of leavening agents | 9.7 | |
| Identify the classes of food additives | 9.5.2 | 4A |
| Discuss the role of governmental regulations regarding food additives | 9.5.7 | 2D |
| Explain the use of additives in food | 9.5.5 | |
| Discuss the risks and benefits of using additives in food | 9.5.7 | 4C |

| **G. Food Manufacturing Processes (Fermentation, Canning, Freezing, Dehydration and Irradiation)** | | |
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| Define terms related to food manufacturing processes | 9.5 | 6A |
| Identify commonly processed foods | 9.5 | |
| Compare and contrast food manufacturing processes | 9.5 | 4E, 6C |
| Identify equipment used in food manufacturing processes | 9.5 | 4F, 6D |