Student's Name _____ FOOD SCIENCE **AG 550**

Directions: Evaluate the trainee using the rating scale below and check the appropriate number to indicate the degree of competency achieve. The numerical rating of 3,2,1 and 0 are not intended to represent the traditional school grading system of A, B, C, D and F. The descriptions associated with each of the numbers focus on level of student performance for each of the tasks listed below.

Rating Scale: 0 – No exposure – no information nor practice provided during training program, complete training required.

1 – Exposure only – general information provided with no practice time, close supervision needed and additional training required.

2 – Moderately Skilled – has performed independently during training program, limited additional training may be required

3 – Skilled – can perform independently with no additional training

1. Number of Competencies Evaluated _____
2. Number of Competencies Rated 2 or 3 _____
3. Percent of Competencies Attained (2/1) _____

_____
Grade

_____ _____
Instructor Signature Date

01.0 Introduction

The student will be able to:

0 1 2 3		
☐☐☐☐	01.01	Define the scope of food science and food technology
☐☐☐☐	01.02	Distinguish between food science and nutrition
☐☐☐☐	01.03	List the dimensions of food science
☐☐☐☐	01.04	Describe the historical development of the food industry
☐☐☐☐	01.05	List the seven major classes of food components
☐☐☐☐	01.06	Discuss the ways in which experiments in food science are carried out
☐☐☐☐	01.07	Describe the importance of teamwork in the food processing industry
☐☐☐☐	01.08	Describe the major research focus areas in food science and technology today

02.0 Food Categories and Composition

The student will be able to:

0 1 2 3		
☐☐☐☐	02.01	Name the food categories used in the food industry and those in the Food Guide Pyramid
☐☐☐☐	02.02	Explain the information in food composition tables
☐☐☐☐	02.03	Define the concept of bioavailability
☐☐☐☐	02.04	Define technical terms related to food composition and processing, including degrees Brix, leavening, sucrose inversion, comminuted mean emulsion, trimethylamine, isoelectric pH, and sugar crystallization
☐☐☐☐	02.05	Explain the concept of nutrient density
☐☐☐☐	02.06	Describe the structure of muscle tissue
☐☐☐☐	02.07	Relate collagen content of meat to meat tenderness
☐☐☐☐	02.08	Explain how Standards of Identity for milk products relate to compositional differences
☐☐☐☐	02.09	Explain the difference in composition of crystalline and no crystalline confectionery
☐☐☐☐	02.10	Distinguish between the terms botanical, functional food, nutraceutical and phytochemical

03.0 Human Nutrition and Food

The student will be able to:

0 1 2 3

- ☐☐☐☐ 03.01 Define proper nutrition and describe ways to achieve it
- ☐☐☐☐ 03.02 Describe the Dietary Guidelines for Americans and the Food Guide Pyramid
- ☐☐☐☐ 03.03 Identify the nutrients considered essential for the human body
- ☐☐☐☐ 03.04 Explain how the digestion, absorption, and transport of the various nutrients are accomplished
- ☐☐☐☐ 03.05 Explain how to read a food label
- ☐☐☐☐ 03.06 Discuss the functions of the important nutrients in human nutrition
- ☐☐☐☐ 03.07 Calculate the energy value of any food
- ☐☐☐☐ 03.08 State the nutritional value of alternative sweeteners and fat replacers
- ☐☐☐☐ 03.09 Identify ergogenic substances and their functions
- ☐☐☐☐ 03.10 Discuss how to critically evaluate a weight-loss diet

04.0 Food Chemistry 1: Functional Groups and Properties, Water and Acids

The student will be able to:

0 1 2 3

- ☐☐☐☐ 04.01 Describe the use of chemical symbols, formulas and equations
- ☐☐☐☐ 04.02 Explain the types of importance of chemical bonds that occur in foods
- ☐☐☐☐ 04.03 List the fundamental classes of chemical reactions in food
- ☐☐☐☐ 04.04 Explain the significance of food enzymatic reactions
- ☐☐☐☐ 04.05 Define oxidation, reduction, oxidizing agent, and reducing agent
- ☐☐☐☐ 04.06 List the major functional groups occurring in food molecules
- ☐☐☐☐ 04.07 Describe the chemical and functional properties of water
- ☐☐☐☐ 04.08 Describe the chemical and functional properties of food acids
- ☐☐☐☐ 04.09 Explain food acidity in terms of pH and titratable acidity
- ☐☐☐☐ 04.10 Distinguish features of food systems such as emulsions, foams, gels and solutions

05.0 Food Chemistry 2: Carbohydrates, Lipids, Proteins

The student will be able to:

0 1 2 3

- 05.01 Identify important food sugars, the chemical reactions they participate in, and their functional properties
- 05.02 Describe the structure and functional properties of food polysaccharides including pectin, starch and vegetable gums
- 05.03 Distinguish between the classes of lipid molecules and the chemical differences of fatty acids
- 05.04 State the important functional properties of food lipids, including aeration, crystallization, heat transfer and mouth feel
- 05.05 Describe the structure of food proteins and list their functional properties
- 05.06 Explain the relationship between isoelectric point and protein and functionality
- 05.07 Describe composition of the casein micelle and the functional role of the alpha-, beta-, and kappa-casein polypeptides in the micelle

06.0 Food Chemistry 2: Color, Flavor and Texture

The student will be able to:

0 1 2 3

- 06.01 Identify important food sugars, the chemical reactions they participate in, and their functional properties
- 06.02 Describe the structure and functional properties of food polysaccharides including pectin, starch and vegetable gums
- 06.03 Distinguish between the classes of lipid molecules and the chemical differences of fatty acids
- 06.04 State the important functional properties of food lipids, including aeration, crystallization, heat transfer and mouth feel
- 06.05 Describe the structure of food proteins and list their functional properties
- 06.06 Explain the relationship between isoelectric point and protein and functionality
- 06.07 Describe composition of the casein micelle and the functional role of the alpha-, beta-, and kappa-casein polypeptides in the micelle

07.0 Food Additives, Food Laws and Dietary Supplements

The student will be able to:

0 1 2 3

- 07.01 State the legal definition of a food additive
- 07.02 Explain the purpose for the various types of food additives
- 07.03 Summarize the history of food law in the United States
- 07.04 Discuss milestones in food law during the last five decades of the twentieth century
- 07.05 Define the distinction between the FDA and the USDA
- 07.06 Describe the approval process for food additives
- 07.07 Explain the importance of the NLEA
- 07.08 Describe the impact of the DSHEA regulation
- 07.09 Explain how regulatory efforts have addressed functional foods, GM foods, and organic foods

09.0 Understanding Fat, Sugar, Beverage, and Plant Product Processing

The student will be able to:

0 1 2 3

- 09.01 Provide several examples of tests that assess fat and oil quality
- 09.02 Explain the difference between interesterification and fractionation
- 09.03 List the sequence of steps required to produce refined sugar from sugarcane
- 09.04 Differentiate wet from dry milling
- 09.05 Discuss the key processing aspects of bread, pasta and snack food
- 09.06 Explain what is meant by minimally processed fruits and vegetables
- 09.07 Discuss the effects of pickling, caning, dehydration, and freezing on fruits and vegetables
- 09.08 Outline the basic approaches to produce soy isolated and concentrates
- 09.09 Describe the method in which cocoa butter is converted into chocolate
- 09.10 Assess the potential for protein hydrolysates to act as functional ingredients

08.0 Understanding Food Processing and Preservations: Aminal Products

The student will be able to:

0 1 2 3

- 08.01 Explain reasons why foods are processed, including maintain their freshness, nutritional value, and to extend shelf life
- 08.02 List the unit operations and discuss how they serve as underlying principles to guide the processing of the wide variety of foods
- 08.03 Describe the importance of heat transfer and how it occurs through conductive, convective and radiant energy transfer mechanisms
- 08.04 Provide examples of chemical antimicrobial agents, such as acidulates, short chain fatty acids, and sulfur dioxide
- 08.05 Distinguish pasteurization and blanching as examples of mild heat processes from sterilization, a more severe heat treatment
- 08.06 Define D value, the 12D concept, and TDT, and explain how each provides different information relative to thermal processing and food safety
- 08.07 Provide a general flowchart to indicate the steps required to process milk, yogurt, ice cream and cheese
- 08.08 Describe how egg processing involves separation, mixing, pasteurization, and drying operations
- 08.09 Explain the steps in meat, poultry, and fish processing that are directly related to preservation and those that are not
- 08.10 Explain irradiation processing and its potential to improve food safety by destroying pathogenic microorganisms

10.0 Food Microbiology and Fermentation

The student will be able to:

0 1 2 3

- 10.01 List the four types of foodborne microorganisms
- 10.02 Explain the six factors that affect microbial growth, including temperature, pH, and water activity
- 10.03 Discuss the sources that contribute to the microbial flora of foods
- 10.04 Describe the microorganisms associated with meats, seafood, fruits and vegetables, and dairy products
- 10.05 Explain how food spoilage occurs
- 10.06 Describe the microbial fermentation of milk products, meat products, fruit and vegetables, and cereal grains
- 10.07 Discuss how microbial sampling can be used to verify food quality

11.0 Food Safety

The student will be able to:

0 1 2 3

- 11.01 Describe what is meant by foodborne illness and the associated hazards
- 11.02 Explain how biological hazards cause disease
- 11.03 Identify the most common biological hazards responsible for foodborne disease
- 11.04 Describe the pathway of infection of several microorganisms and parasites
- 11.05 Identify commonly used sanitizers in the food industry
- 11.06 Identify the major contributing factors to foodborne illness
- 11.07 Explain what is meant by mad cow disease
- 11.08 Describe how a HACCP plan is structured
- 11.09 Critique risk assessment calculations associated with food biological hazards

13.0 Food Engineering

The student will be able to:

0 1 2 3

- 13.01 Define the broad scope of food engineering
- 13.02 List the thermal properties of foods
- 13.03 Explain the processes of heat transfer and mass transfer
- 13.04 Describe how materials science principles can be applied to foods
- 13.05 Explain the significance of the glass transition
- 13.06 Discuss the link between food microstructure and food quality
- 13.07 List the psychometric properties of air
- 13.08 State the importance of eh key rheological parameters
- 13.09 Explain the purpose of extrusion technology
- 13.10 List examples of food package types and the plastics used in their fabrication

12.0 Food Toxicology

The student will be able to:

0 1 2 3

- 12.01 List the three types of food toxicants, citing specific examples
- 12.02 Evaluate a dose-response curve
- 12.03 Explain the possibility of cyanide toxicity from eating certain vegetables
- 12.04 Describe the toxicity of domoic acid arising from shellfish consumption
- 12.05 Discuss the safety of herbal products
- 12.06 Explain the structure and mechanism of cholera toxin
- 12.07 Describe the problem of antibiotic resistance and how it relates to human health
- 12.08 Decide if growth promotants BST and DES are harmful and why
- 12.09 Explain how pesticides might be present in a fast food meal
- 12.10 Discuss the distinction between food allergy and food intolerance

14.0 Food Biotechnology

The student will be able to:

0 1 2 3

- 14.01 Define biotechnology, and food biotechnology
- 14.02 List the benefits provided by biotechnology in food production
- 14.03 Explain the basics of genetic engineering techniques
- 14.04 List the issues related to the regulatory aspects of biotechnology-derived foods
- 14.05 List and explain the three categories of equivalence used in determining the safety of biotechnology-derived foods
- 14.06 Give examples of biotechnology-derived plant and animal products
- 14.07 Give examples of biotechnology-derived food processing aids
- 14.08 Describe the use of biotechnology in food safety applications
- 14.09 Discuss the concerns associated with biotechnology-derived foods

15.0 Sensory Evaluation and Food Product Development

The student will be able to:

0 1 2 3

- 15.01 Discuss the meaning and value of sensory evaluation
- 15.02 Summarize the key sensory parameters of importance in sensory work
- 15.03 Classify sensory methods as discrimination, descriptive and affective testing
- 15.04 Evaluate the need to obtain objective and subjective measurements in determining food quality
- 15.05 Explain the stages of product development
- 15.06 Assess the role of marketing in product development
- 15.07 Calculate the probability of success for a new food product
- 15.08 Define what is meant by a product's life cycle

16.0 Milk

The student will be able to:

0 1 2 3

- 16.01 Define the term "milk"
- 16.02 Describe quality control during the production of milk and milk products
- 16.03 Explain pasteurization and homogenization
- 16.04 Identify three methods of pasteurization
- 16.05 Describe the "solids" composition of milk
- 16.06 Discuss separation of butterfat and its uses
- 16.07 List four beverage milk products
- 16.08 Describe butter
- 16.09 Name five concentrated or dried dairy products
- 16.10 List the steps in cheese making
- 16.11 Identify three bacteria used to produce dairy products
- 16.12 Name five fermented dairy products
- 16.13 List the steps in making ice cream
- 16.14 Describe three USDA quality grade shields

17.0 Meat, Poultry, and Eggs

The student will be able to:

0 1 2 3

- 17.01 Describe the production of meat from cattle, pigs and poultry
- 17.02 Identify meat products from cattle, pigs and poultry
- 17.03 Discuss the general composition of meat and meat products
- 17.04 List five factors affecting meat tenderness
- 17.05 Describe the cooking of meat
- 17.06 Discuss the production of meat substitutes
- 17.07 Identify quality grading of meat
- 17.08 Describe egg production
- 17.09 Identify factors affecting egg quality
- 17.10 Discuss egg grading

18.0 Fish and Shellfish

The student will be able to:

0 1 2 3

- 18.01 Identify three fish and three shellfish used for food
- 18.02 Describe aquaculture and processing
- 18.03 Discuss the composition of fish and shellfish
- 18.04 Identify three spoilage issues associated with fish
- 18.05 Describe two processes that ensure quality
- 18.06 List four factors that affect the grading of fish
- 18.07 List four fish products and by-products
- 18.08 Describe two methods for preserving fish
- 18.09 Explain the methods of inspection during processing

19.0 Cereal Grains, Legumes and Oilseeds

The student will be able to:

0 1 2 3

- 19.01 Diagram the general structures of a grain
- 19.02 Name three cereal grains
- 19.03 Describe the general composition of grains, legumes and oilseeds
- 19.04 Identify three properties of starch
- 19.05 List four factors that must be controlled when cooking starch
- 19.06 Discuss the milling of grains to flour
- 19.07 Identify five types of wheat flour
- 19.08 Explain the classes of wheat and grades of flour
- 19.09 Identify the type of flours other than wheat flour
- 19.10 List the steps in corn refining
- 19.11 Name four products derived from corn
- 19.12 Explain the processes that take place during baking
- 19.13 List four oilseeds and indicate the use of their products
- 19.14 Discuss the general use of legumes
- 19.15 Name four general categories of products from soybean extraction
- 19.16 Identify five food products of soybean extraction

21.0 Fats and Oils

The student will be able to:

0 1 2 3

- 21.01 Explain saturated and unsaturated, cis and trans in terms of fatty acids
- 21.02 Describe fatty acids
- 21.03 Discuss melting point and the structure of fatty acids
- 21.04 Identify six sources of fats and oils
- 21.05 List eight functions fats and oils serve in foods
- 21.06 Compare the extraction of fats or oils from animals to that of plants
- 21.07 Describe the process used on oils after extraction
- 21.08 List five processes in the refining and modifying of oils or fats after extraction
- 21.09 Discuss monoglycerides and diglycerides and their uses
- 21.10 Identify substances that may substitute for fat
- 21.11 Describe two tests conducted on fats and oils

20.0 Fruits and Vegetables

The student will be able to:

0 1 2 3

- 20.01 Identify the parts of a plant considered a vegetable or a fruit
- 20.02 Describe the nutrient composition of a fresh fruit or vegetable
- 20.03 Discuss the structure of a plant cell
- 20.04 Describe the plant tissues and their functions
- 20.05 Explain climacteric and nonclimacteric with examples
- 20.06 Name one pigment in fruits or vegetables and describe how it responds to heat of pH
- 20.07 List four factors affecting the texture that give fruits and vegetables their flavor
- 20.08 Name four general compounds that give fruits and vegetables their flavor
- 20.09 Identify the quality grades for fruits and vegetables
- 20.10 Describe how quality grade determines the use of a fruit or vegetable
- 20.11 List five factors considered during storage
- 20.12 Describe the processing of fruits
- 20.13 Discuss the processing of vegetables

22.0 Candy and Confectionery

The student will be able to:

0 1 2 3

☐☐☐☐ 22.01 Identify three crystalline and three noncrystalline candies

☐☐☐☐ 22.02 Describe the relationship between sugar concentration and the boiling point

☐☐☐☐ 22.03 Discuss common components of candies and confectionaries

- 22.04 Identify two ways to produce invert sugar
- 22.05 Explain caramelization in candymaking
- 22.06 Name four sugar-based sweeteners developed from cornstarch
- 22.07 Describe uses of high-fructose corn syrup
- 22.08 Describe cocoa
- 22.09 Explain conching
- 22.10 Describe modern candy and confectionery manufacturing
- 22.11 List four sugar alcohols and four high-intensity sweeteners
- 22.12 Discuss labeling information and requirements for candy

23.0 Beverages

The student will be able to:

0 1 2 3

- 23.01 Describe how carbonated nonalcoholic beverages are manufactured
- 23.02 List the steps in the production of beer
- 23.03 Compare the production of wine to vinegar
- 23.04 Indicate how fermentation plays a role in the production of coffee
- 23.05 Name six ways enzymes are used in the production of beverages
- 23.06 Discuss how two beverages meet the demand for a healthful drink
- 23.07 Identify the fastest growing segment of the beverage industry
- 23.08 Name five herbs used in beverages
- 23.09 Identify the plants that produce coffee and tea
- 23.10 Describe how to produce a coffee substitute
- 23.11 Compare tea to herbal teas

24.0 Environmental Concerns and Processing

The student will be able to:

0 1 2 3

- 24.01 Describe the properties and the requirements used in food processing
- 24.02 Describe the nutrient composition of a fresh fruit or vegetable
- 24.03 Discuss the structure of a plant cell
- 24.04 Describe the plant tissues and their functions
- 24.05 Explain climacteric and nonclimacteric with examples
- 24.06 Name one pigment in fruits or vegetables and describe how it responds to heat of pH
- 24.07 List four factors affecting the texture that give fruits and vegetables their flavor
- 24.08 Name four general compounds that give fruits and vegetables their flavor
- 24.09 Identify the quality grades for fruits and vegetables

25.0 Food Safety

The student will be able to:

0 1 2 3

- 25.01 List three categories of food safety
- 25.02 name four factors contributing to the development of a foodborne disease
- 25.03 List four types of microorganisms that can cause foodborne illness
- 25.04 List five factors affecting microbial growth
- 25.05 Identify the microorganisms that provide an index of food sanitation
- 25.06 Discuss the role of sanitation and cleaning during processing in food safety
- 25.07 Identify the correct order of sanitizing or cleaning a food contact surface
- 25.08 Name three types of sanitization
- 25.09 Identify agencies involved in food safety regulation
- 25.10 Describe the role of HACCP in food safety

26.0 Regulation and Labeling

The student will be able to:

0 1 2 3

- 26.01 Identify the agencies and laws that regulate foods and labeling
- 26.02 Describe the functions of a quality assurance department
- 26.03 Discuss the history of food labels
- 26.04 Name two general categories of food exempt from food labels
- 26.05 List six components found on the nutritional panel
- 26.06 Describe the format of the nutritional panel
- 26.07 Discuss the use of DRVs
- 26.08 Identify when these words can be used: free, low, high, less, light, and more
- 26.09 List two health claim relationships that can be listed on a food package

27.0 World Food Needs

The student will be able to:

0 1 2 3

- 27.01 Discuss the effects of hunger and malnutrition
- 27.02 Describe the impact of hunger worldwide
- 27.03 Discuss possible causes of world hunger
- 27.04 List seven steps identified by the United Nations for elimination hunger
- 27.05 Explain the role of technology in eliminating hunger
- 27.06 Discuss the Plan of Action developed at the World Food Summit
- 27.07 Recognize agencies and organizations concerned with eliminating hunger

28.0 Careers in Food Science

The student will be able to:

0 1 2 3

- 28.01 List the basic skills and knowledge needed for successful employment and job advancement
- 28.02 Describe the thinking skills needed for the workplace of today
- 28.03 Identify the traits of an entrepreneur
- 28.04 List six occupational areas of the food industry
- 28.05 Identify the careers that require a science background
- 28.06 Describe the general duties of the occupations in six areas of the food industry
- 28.07 List six general competencies needed in the workplace
- 28.08 List eight guidelines for choosing a job
- 28.09 List ten guidelines for filling out an application form
- 28.10 Describe a letter of inquiry or application
- 28.11 List the elements of a resume or data sheet
- 28.12 Describe ten reasons an interview may fail