SENCERized Chemistry Course: *Live, Learn and Eat: The Food of Chemistry*

Live, Learn and Eat: The Food of Chemistry was designed to engage and educate students in the classroom by teaching science through the civically-engaging topic of food. *The Food of Chemistry* is a fully-integrated lecture and laboratory course that incorporates chemistry content and experimentation with food and food-related issues by tying the relevance of fundamental chemical principles to the topics of food and cooking. A week-by-week description of the course structure and content is given in the table below.

Week	Lecture Topics	Lecture Demonstrations	Laboratory Experiment
1	**Chemical and Physical Changes**	Prepare vanilla ice cream (physical changes) and caramel sauce (chemical changes)	**Chemical and Physical Changes:** Measure melting point of various fats and reactivity of baking powder and baking soda
2	**Intramolecular Interactions:** Chemical Bonding and Electronic Structure * atoms and electrons * ionic, polar and covalent bonding * metals, nonmetals and electronegativity * Lewis structures and octet rule * molecular shape, polarity, dipole moments Structures of Important Food Molecules * water, alcohols, carbohydrates, * cis vs. trans fatty acids, triglycerides * proteins		**The Scientific Method:** **The Cookie Lab** Students bake various batches of chocolate chip cookies by systematically varying the type of fat and leavening agent and comparing to hypotheses developed from the melting point of fats and acid reactivity of leavening agents in the previous lab.
3		Visual and taste observations of various types of carbohydrates: * glucose, fructose, sucrose, and starches	**Intermolecular Interactions via Chromatography: Sodium Analysis of Campus Foods by Ion Chromatography**

4	**Intermolecular Interactions:** Water and Hydrogen Bonding * hydrogen bonding * solids vs. liquids vs. gases * electromagnetic radiation * microwave spectroscopy, water, molecular rotation * traveling vs. standing waves * How the microwave oven works	Microwave oven * heating liquid vs. solid water * measuring the wavelength of microwave radiation Preparing microwave popcorn	Week 1: Students learn sample collection, sample prep and how to make solutions using volumetric glassware Weeks 2 & 3: Students use the ion chromatograph to analyze the sodium and potassium content of table salt and various salt substitutes, and the sodium content of solutions prepared from foods available in campus vending and dining hall.
5	**Intermolecular Interactions:** Polar vs. Nonpolar * intermolecular forces * melting points vs. structures of common * cooking fats * dissolution, like dissolves like * emulsions and lipid bilayers	Preparing butter from cream (breaking an emulsion by physical stress) and by preparing mayonnaise from oil, vinegar and eggs (creating an emulsion via phospholipids)	
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6	**Intermolecular Interactions:** Proteins and temperature * primary, secondary and tertiary structure * denaturization by manual stress * denaturization by temperature * coagulation/aggregate-ion * hydrogen bonding vs. covalent bonding	Baking angel food cake (an interplay of intermolecular interactions at work) Experiment with denaturization of egg whites with and without tartaric acid	**Intermolecular Interactions via Chromatography:** **Thin Layer Chromatography of Spinach and Carrots** Students use TLC to separate pigments in spinach and carrots and use knowledge of molecular structure and intermolecular interactions to predict relative retardation factors of the various pigment molecules.

7	**Intermolecular Interactions:** Solutions and Crystals * dissolution and crystallization * solubility * saturation and supersaturation	Sodium acetate supersaturation Candymaker's tests of solid sugar properties based on degree of supersaturation Preparing amorphous sugar crystals (lollypops)	**Intermolecular Interactions via Candymaking:** Weeks 1 & 2: Crystallization and supersaturation by preparing saltwater taffy and rock candy Week 3: Crystals in a solid emulsion by working with chocolate
8	**Class Reading Discussion of *The Omnivore's Dilemma* by Michael Pollan**		
9	**Energy:** Heat and Cooking * temperature vs. heat * exothermic vs. endothermic * calorimetry equations, specific heat capacity	Baking pizza on a ceramic pizza stone (high heat capacity) versus a metal pan (low heat capacity)	
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10	**Energy:** Molecular Transformations * combustion reactions * stoichiometry, limiting reactant and yields		**Food Energy by Bomb Calorimetry:** Students measure the energy content in Halloween candy using bomb calorimetry and make comparisons to the food label.

11	**Sodium Analysis presentations to Nutrition Policy students in development of UNCA dietary guidelines (Cluster Project)**		**Molecular Transformations by Organic Synthesis:** Synthesis of an artificial flavor (methyl salicylate) from a pharmaceutical (acetylsalicylic acid)
12-14	**Case Studies of Food and Cooking** review all principles covered in class by cooking various types of food in class	Cooking demos of various types of food	Student release time to work on media project Students work in teams to prepare a video explaining the chemical processes involved in a cooking aspect of their choosing