

# 400:202 PRINCIPLES OF FOOD SCIENCE LABORATORY

Fall, 2017

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grades lab reports  
grades pre-labs  
grades pre-labs

**Class time: 8:00 AM – 12:00 PM Thursday (01) or Friday (02) Food Science Lower Pilot Plant Rm 017**

**Course Goals:**

1. Become familiar with physical and chemical characteristics of foods, food behaviors under different conditions, and food processing operations.
2. Observe fundamental science concepts at work in food materials, i.e. learn to apply theory from lecture to real foods.
3. Use scientific method in investigating properties and changes in foods.
4. Develop a basic understanding of food composition and structure/function/behavior relationships, relating molecular properties to food characteristics, quality, and microbial utilization.
5. Develop skills in summarizing and communicating scientific research simply and succinctly.

**Course materials:**

Course syllabus, lab instructions and resource materials are posted on **Sakai 11:400:202 2012**. There will be a course fee of **\$35.00** (preferably cash) to cover costs of lab supplies and lab coats. Pay Dr. Schaich directly.

**Each student must print out lab instructions and bring them to lab in a notebook or binder. Loose lab sheets will not be permitted.**

Some support materials will be posted on the Sakai course site. Additional references books and journals with supporting information are available in Chang Library. Students are encouraged to read broadly about the topics covered in the lab exercises, using whatever sources will help them understand the concepts (including Internet sources).

**Course requirements:**

Read lab exercise and background **before** each class.

**Complete pre-lab question sheets and submit at beginning of lab.**

**YOU WILL NOT BE ADMITTED TO LAB WITHOUT COMPLETED QUESTION SHEETS!**

Attend lab and complete lab experiments each week.

Record all data where indicated in the course notes you bring to class.

Write lab reports according to format (page 3). Reports are due **one week** after completion of lab.

**Points will be deducted for late reports at the rate of 2 points per day unless extensions are granted beforehand by the professor.**

\*\*\*This is a **2 CREDIT** lab course, so be prepared to spend the full time in each lab period to allow for clean-up and discussion of results before leaving. You may bring a bag breakfast or snacks to eat at desks during discussions but not in the food preparation area.

**Lab make-ups: Students are expected to attend all labs.** There are no make-ups for missed classes. If students know they must miss class, or if they get sick, excused absences may be granted if Dr. Schaich is notified BEFORE class. Make-ups for excused absences may be arranged at the discretion of the professor.

**Basis of grades:**

Pre-lab Worksheets	35% (in lab notebook and posted on Sakai)
Lab reports	55%
Participation (including clean up)	10%

**Optional extra credit project:** Write a new laboratory exercise. Include purpose, introduction, directions, questions to be answered in report, expected outcomes. Discuss with Dr. Schaich before submitting.

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**LABORATORY SCHEDULE**

**Food Science Pilot Plant Rm. 017**

<b>SEPT.</b>	<b>7,8</b>	<b>Introduction to lab requirements Meet in 017 at 10:00 AM</b>
<b>Sept</b>	<b>14,15</b>	<b>Effect of pH and soluble solids on Jelly formation</b>
<b>Sept</b>	<b>21,22</b>	<b>Gluten structures in bread Analyze jelly</b>
<b>Sept</b>	<b>28,29</b>	<b>Egg white foaming and gel properties</b>
<b>Oct</b>	<b>5,6</b>	<b>Effect of shear force in making mayonnaise ( a lipid emulsion)</b>
<b>Oct</b>	<b>12,13</b>	<b>Shortening and flaking properties of lipids</b>
<b>Oct</b>	<b>19,20</b>	<b>Crystallization properties of sugars in candies</b>
<b>Oct</b>	<b>26,27</b>	<b>Stabilization of cocoa solids in chocolate milk by carrageenan</b>
<b>Nov</b>	<b>22,23</b>	<b>Enzymatic and non-enzymatic browning</b>
<b>Nov</b>	<b>9,10</b>	<b>Productive fermentation -- Making yogurt</b>
<b>Nov</b>	<b>16,17</b>	<b>Yogurt evaluation</b>
<b>Nov</b>	<b>21,22</b>	<b>Effect of freezing rate on damage to green beans and strawberries</b>
<b>Nov Dec</b>	<b>31 1</b>	<b>Comparison of oven and freeze drying on food properties Analyze freezing</b>
<b>Dec</b>	<b>7,8</b>	<b>Making ice cream (no lab report) Analyze dehydration</b>

## SAFETY

### **All students are expected to wear safety glasses, lab coats, gloves and hair covering during all labs.**

Wear approved safety glasses for all labs (you will not be admitted to class without them -- you each must purchase your own from bookstore, Home Depot, etc., keep track of them, and bring them to each lab).

Lab coats and hair covers will be provided (part of your lab fee). These are required to cover your clothes and prevent contamination of foods from outside microbes. Thus, lab coats can only be worn in class. Remove whenever you leave the laboratory.

Gloves will be provided in class when needed.

## HAND WASHING AND HAIR

Disease is transferred rapidly by hand contact. Because everyone will share in tasting the foods prepared in each lab, students are required to wash their hands with soap and hot water at the dedicated handwashing station in the pilot plant. If you remove your gloves and handle clothes, back packs, etc, or leave the pilot plant during the lab, you must wash your hands again before handling food ingredients.

## CLOTHING

Appropriate attire must be worn at all times. This means slacks (preferably, although knee-length skirts will be allowed) and closed-toe shoes. Sandals, shorts, skimpy tops, or other clothing deemed unsafe and unprofessional are not allowed. Students wearing such attire will be sent home to change, with award of demerit points for participation.

## LAB NOTEBOOKS

Print lab exercises and compile in a 3-ring binder. Bound notebooks with lab directions should be brought to each lab and used for all records; data should NOT be recorded on scraps of paper and then transferred to the notebook. Do not tear out pages. If errors are made, cross them out and note what the error was. **Do not bring single pages of lab instructions to class.**

## LAB REPORT FORMAT

### **General Information:**

- **Reports are due one week after completion of laboratory. Three points are deducted for each day late. If you have a problem completing the lab for any reason, see Dr. Schaich. Reports will not be accepted one week past due date unless a formal extension is granted from Dr. Schaich.**
- Write reports in past tense.
- Write in third person. Do not use personal pronouns I, We, you.
- Type reports in a PC Word file, single spaced, 1 inch margins.
- Submit reports on Sakai under **ASSIGNMENTS**

### **Report Structure: ~5 page summary of laboratory and observations**

Include:

#### **1. Title of laboratory**

#### **2. Student name**

Names of all other students in research group

date lab was conducted

date lab was due and date submitted

#### **3. Introduction:** General description of the purpose of the lab with some background on the scientific principles involved.

4. **Methods:** General description of the methods used and what each is to accomplish. Step by step details of methods are not required. However, note any variations from conditions prescribed in lab write-up.
5. **Results and Discussion: Present key data that illustrates principles studies in the lab.** Manipulate and present data so you can write a logical discussion and present supporting evidence. Transform raw data to a graphical form that shows the relationships you want to discuss. Examples are shown on the next page. You may use Excel, MatLab, or any other program with which you are familiar.

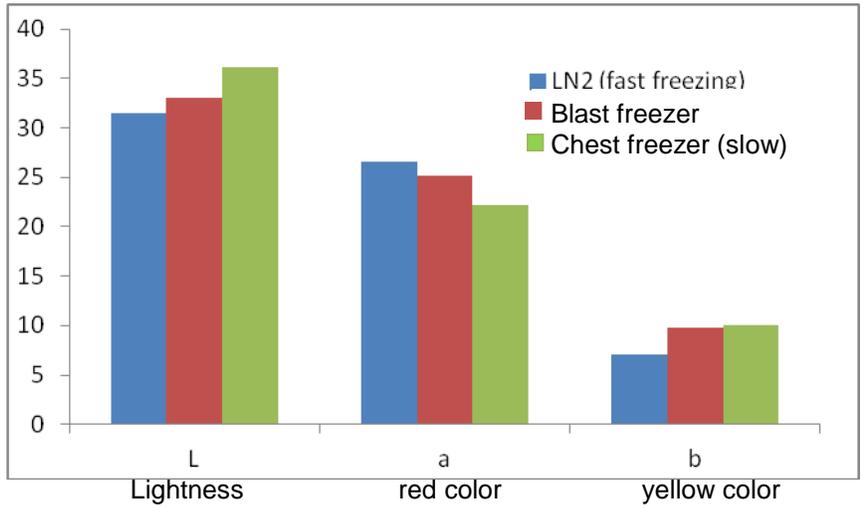
If you need help with software, contact a TA or the Rutgers computer lab. **Make sure you label both axes of graphs.** Describe results verbally and discuss what they mean and what they show in terms of scientific principles, whether they followed expectations, and possible reasons for discrepancies. “Other groups made mistakes” is not an acceptable explanation. Describe the mistake and the consequences. For example: balances were not tared so weights were inaccurate. pH electrodes were not cleaned between jelly samples so calibration drifted. Make a significant effort to sort out the data and find points to demonstrate the principles being studied.

Answers to questions at the end of each lab section should be incorporated into the discussion of results. These questions are specifically focused on important issues and principles you should recognize.

**Examples of how to develop graphs from raw data:**

Freezing method	Drip loss	Texture rating	L	a	b
LN2	0.227	3	31.53	26.55	7.11
Blast	0.279	-6	33.09	25.14	9.82
Chest	0.42	-8	36.12	22.13	10.05

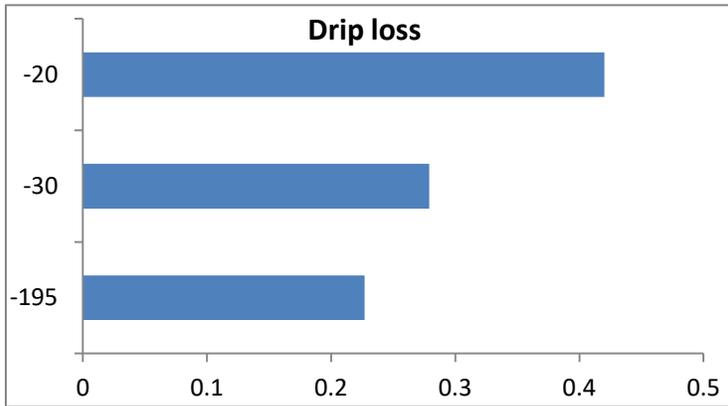
Strawberries



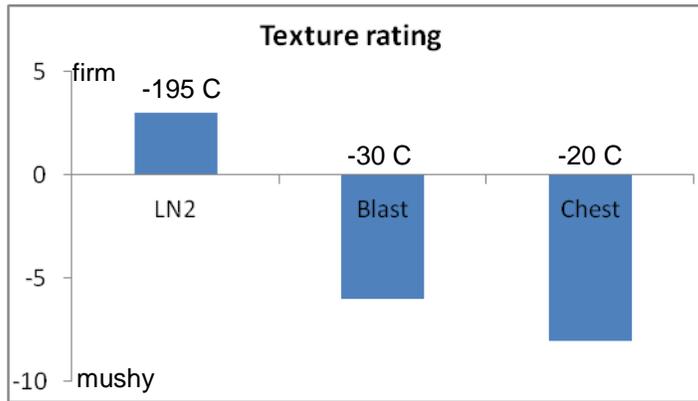
Note: the independent variables here (L, a, b) are separate values not in a series, so their data must be presented in columns or other segregated forms.

Only serial data can be presented in a line graph – e.g. sugar concentration vs browning potential.

**Figure 1. Effect of freezing rate on color of strawberries after thawing.**



Note mistake on these graphs – axis labels are missing.  
**Make sure you label all graphs!**



**Figure 2. Effect of freezing rate on drip loss (left) and texture ratings (right) of frozen strawberries after thawing.**

What can you learn from this data?

Goals of exercise were to study effects of freezing rate on ice crystal size and resulting damage to products. We cannot measure ice crystal size but we can deduce the size from extent of damage from them based on the assumption that larger ice crystals caused more damage to cells, and hence greater release of cell liquids (drip loss). In addition, acids are released and tissues become exposed to air, both of which can later pigments. Cell damage leads to collapse of tissues after the sample is thawed. These effects can be seen in increased drip loss, color changes (red color fades – lightness (L) increases and red color (a) decreases), and texture deterioration (lower scores, increasing mushiness) in samples with slower freezing rates (chest freezer).

- Conclusions:** Briefly summarize what was learned from the experiment. “Data was chaos” is not an acceptable summary. Relate the key points that demonstrate scientific principles and are related to the objectives of the experiment.
- References.** List all references cited in the report. Any format may be used as long as consistency is maintained, e.g. see style guides for authors in J. Food Science, Cereal Science, J. Agric. and Food Chemistry.

Extra credit may be earned for exceptional use of references in developing discussion and interpreting results, or adding additional perspective.

Extra points will be awarded for lab reports that go beyond listed questions and course notes to integrate additional outside material relevant to the laboratory, including explanations or observations from “Good Eats” or “Food Detectives” (with appropriate citations) or from journal articles or books in the library.