

THE UNIVERSITY OF BRITISH COLUMBIA

FNH 325 / 326 FOOD SCIENCE LABORATORY I/II

Thursday 1:00 – 5:00, Room 240 McMillan Building

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Sharing Sessions: Room TBA

Course Description and Learning Objectives

Laboratory I and II will provide you with an opportunity to integrate knowledge from the different areas of Food Science and to obtain a better understanding of food as a complete entity. The lab exercises have been designed to reinforce the theoretical concepts covered in the courses on food microbiology, chemistry, analysis, quality control, processing, and to give you the opportunity to develop practical skills that will be useful when you are working in the food industry. These practical skills include working cooperatively in a group and communication, in addition to developing expertise in commonly used laboratory techniques.

Each course is divided into two modules. Module 325-1 will emphasize laboratory skill development, while modules 325-2, 326-1, and 326-2 each deal with a specific food commodity. You will become familiar with the composition and characteristics of these materials, the equipment and procedures for analysis and processing, research and data analysis, and presentation of information in both written and oral formats.

Components of the course are available through the on-line courseware, Vista. If you have not used Vista in a previous class, please see me for a brief introduction or visit <http://www.elearning.ubc.ca/lms/getting-started-with-vista/>.

Course Absences

Participation in all of the laboratories is required. Absence from any of the laboratories must be supported by documentation. For legitimate excuses, you may be required to attend a make-up session, to be arranged with the instructor. There will be no make-up sessions for failure to obtain results due to poor laboratory technique or inadequate preparation for the lab. This will result in the deduction of marks from your lab report and oral presentation.

Course Evaluation

FNH 325

Laboratory reports	50%
laboratory reports	
pre-lab exercises	
lab technique (accuracy of data)	
lab note book (neatness & completeness)	
Pre-lab on-line Quizzes	2.5%
Peer evaluation	1.0%
Oral presentation	2.5%

FNH 326

Laboratory reports	42.5%
laboratory reports	
pre-lab exercises	
lab technique (accuracy of data)	
lab note book (neatness & completeness)	
Pre-lab on-line Quizzes	2.5%
Peer evaluation	2.0%
Oral presentations	5.0%

Final Examination	44.0%	Practical Lab Examination	10.0%
TOTAL	100%	Final Examination	38.0%
		TOTAL	100%

Examinations: The written examinations will be open book. No library books are allowed.

Textbook: There is no required textbook for this course. There are several resource materials listed below that contain information relevant to this course.

Useful References: Books and Websites

The UBC library resource page for FNH 325/326 is available at:

<http://toby.library.ubc.ca/ereserve/er-coursepage.cfm?id=1615>

This site has many useful links to resources useful for finding relevant information and writing reports.

<http://www.nal.usda.gov/fnic/foodcomp/> (Nutrient Data Laboratory Food Composition Data)

Downes, F.P.; Ito, K., ed. *Compendium of Methods for the Microbiological Examination of Foods*. 4th. Washington: American Public Health Association, **2001**.

Nielsen, S.S., ed. *Food Analysis*. 3rd. New York: Kluwer Academic/Plenum Publishers, **2003**. Woodward Library Reserve Collection and Stacks TX545 .F54 2003 It is highly recommended that you purchase an updated edition of this book for this course and FNH 302.

AOAC International Official methods of analysis of AOAC International 17th ed Gaithersburg, Maryland, 2000 S587.A7 CD-ROM

Fennema, O. R. *Food Chemistry*. 3rd Edition. Marcel Dekker, New York, **1996**. [ISBN 0824793463 (cloth : alk. paper); ISBN 0824796918 (paper : alk. paper)]

Poste, L.; Mackie, D.A.; Butler, G.; Larmond, E. *Laboratory Methods for Sensory Analysis of Foods*. Agriculture Canada Publication 1864/E, Ottawa, **1991**

Jay, J.M. *Modern Food Microbiology* 5th edition. Chapman & Hall, New York, **1996**

Singh, R. P.; Heldman, D. R. *Introduction to Food Engineering Second Edition*. Academic Press, New York, **1994** ISBN 0-12-646381-6

Laboratory Reports: Requirements and Format

You will be required to hand in a report based on the work you complete in the laboratory sessions. There are three types of reports, as noted below:

Memo Reports

The purpose of the memo is to communicate the required information quickly, accurately, and completely. Please note that the writing style of the memo is very different from the formal scientific reports. It should be written as if addressing the person in the heading and have a business tone, and should show your professionalism. Your lab data should be attached to the memo reports, just as it is for the formal reports. Sample calculations should be included in an appendix.

Formal Reports

The goal of the formal report is not to prove that you got the right answers; the goal of a formal report is to document your findings and communicate the knowledge you have acquired from a laboratory experiment.

Results Reports

There are some sessions where you are asked to complete and hand in only the results.

Laboratory Notebook

Each student must purchase and use a bound laboratory notebook – **it is advisable to purchase one with tear-out duplicate pages**. The notebook must be brought to the laboratory each day that experimental work is performed. All information in your notebook must be written **in pen**.

Pre-lab Preparation

You are expected to come to the laboratory prepared to carry out the experiments. This will require you to read through your laboratory manual, do the pre-lab quiz on Web CT, prepare a flow chart for each procedure that you will be doing, carry out required calculations, and answer all questions in the pre-lab section of the exercise. **You will not be allowed to participate in the lab without these preparations.** Your pre-lab flow charts should be detailed enough to carry out the procedure **without** reference to your lab book. This pre-lab material should be written in your lab notebook.

Required Materials/Equipment

You require a lab coat, goggles, a lab book, and a marking pen (Sharpie). Please label your supplies with your full name. You will not be allowed to participate in a lab if you do not have your lab coat or safety goggles. You will be required to purchase a disposable lab coat at a cost of \$5.00 if you forget your own.

Oral Presentations

A group oral presentation will be required for modules FNH 325-2, 326-1 and 326-2. Groups may send a copy of their presentation to their instructor by 4:30 on the Monday before the presentation for feedback. The oral presentations will be 15 minutes in length, with approximately 10 minutes for questions..

Outline of Laboratory Exercises

Module 325-1. Introduction/Basic Skills

Session 1: Introduction - course orientation

Exercise 1: Research tools

Session 2: Using Excel or "R" for Statistical Analysis

Exercise 1: Statistics using Excel/R and dilution calculations

Session 3. Basic Skills: Analytical Skills I (Informal Report)

Exercise 1: Pipetting

Exercise 2: 0.1 M NaOH solution from a 10 M stock solution

Exercise 3: Phosphate buffer

Session 4. Basic Skills: Analytical Skills II (Formal Report)

- Exercise 1: Sodium caseinate solution
- Exercise 2: Protein determination using the BCA protein assay
- Exercise 3: Titration and acidity
- Exercise 4: pH of unknown

Session 5. Basic Skills: Microbiological Skills I (Informal Report)

- Exercise 1: Preparation of plate count agar spread plates
- Exercise 2: Preparation of 0.1% peptone
- Exercise 3: Gram staining and microscopy

Session 6. Basic Skills: Microbiological Skills II (Formal Report)

- Exercise 1: Media preparation, aseptic sample preparation, and dilutions
- Exercise 2: Spread plate method of enumeration
- Exercise 3: Petrifilm method of enumeration
- Exercise 4: Pour plate method of enumeration
- Exercise 5: Gram staining and microscopy

Module 325-2. Plant Material: Fruit leather

Session 7. Fruit Leather Formulation and Drying (Memo Report)

- Exercise 1: Vacuum microwave drying:
- Exercise 2. Fruit leather formulation and drying
- Exercise 3. Heat treatment of apple puree with ascorbic acid

Session 8. Sugar Analysis (Results Report)

- Exercise 1: Carbohydrate analysis
- Option 1. Phenol-sulfuric acid method for total carbohydrates
- Option 2. Enzymatic method for carbohydrates (glucose and fructose)

Session 9. Other Chemical and Physical Analyses (Results Report)

- Exercise 1: Moisture determination
- Exercise 2: Dry ashing
- Exercise 3: Water activity determination
- Exercise 4: Colour measurement using the Hunterlab colourimeter
- Exercise 5: Instrumental texture measurement using Texture Analyzer TA-XT2

Session 10. Microbial Analysis and Packaging Film Characteristics (Formal)

- Exercise 1: Media and filtration apparatus preparation
- Exercise 2: Mold and yeast determination in apple puree using the HGMF method
- Exercise 3: Water vapour transmission rates of packaging materials

Session 11. Vitamin C Determination Using Fluorescence Spectroscopy (Formal)

- Exercise 1: Spectrofluorometry for vitamin C

Module 326-1. Dairy Products: Processing of Milk

Session 12. Thermal Processing (Formal Report)

- Exercise 1: Jackson plots
- Exercise 2: Spectrophotometric assay for lysine
- Exercise 3: Hunterlab colour evaluation of milk samples

Session 13. Yogurt Production (Memo Report)

- Exercise 1: Yogurt formulation

Session 14. Yogurt Microflora / Descriptive Analysis (Results Report)

- Exercise 1: Media preparation
- Exercise 2: Direct microscopic counts
- Exercise 3: Plate counts
- Exercise 4: Descriptive sensory evaluation

Session 15. Mineral Determination: Atomic Absorption and Titration (Formal Report)

Exercise 1: Atomic absorption spectroscopy

Exercise 2: Calcium and magnesium in milk by titration

Designing Lab Protocols

Module 326-2. Animal Tissues: Analysis of Fish

Session 16. Lipid Extraction and Oxidation / Carotenoids Quantitation (Formal)

Exercise 1: Lipid extraction

Option 1: Labconco Goldfisch solvent extractor

Option 2: Lipid extraction using the Bligh-Dyer method

Exercise 2: Determination of the thiobarbituric acid (TBA) number

Exercise 3: Spectrophotometric determination of total carotenoids

Exercise 4: Thin layer chromatography of lipids

Session 17. Protein Extraction and Quantification /

Sodium Dodecyl Sulfate - Polyacrylamide Gel Electrophoresis

Exercise 1: Protein extraction and quantification using the BCA assay

Exercise 2: Sodium dodecyl sulfate-polyacrylamide gel preparation

Session 18. Iso-Electric Focusing Polyacrylamide Gel Electrophoresis (IEF-PAGE) and Sodium Dodecyl Sulfate- PAGE (Results Report)

Exercise 1: Sodium dodecyl sulfate-PAGE analysis of sarcoplasmic proteins

Exercise 2: Iso-Electric Focusing-PAGE analysis of sarcoplasmic proteins

Session 19. Histamine Determination and Discriminative Sensory Evaluation (Memo)

Exercise 1: Enzymatic test for histamine determination in tuna.

Exercise 2: Discriminative sensory evaluation