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MB 441/541 Lab Schedule – Winter 2017

	Date	Activity	Notes
Week 1	Tues, Jan. 10	Appendix A	Introduction to project, streak plate & microscope
		Exercise 1	Standard Plate Count (SPC)/Spiral Plating
Week 2	Tues, Jan. 17	**Dilution Problems**	**Due at beginning of lab**
		Exercise 1	finish
		Exercise 2	Direct Microscopic Count (DMC)
		Exercise 3	Preservatives
		Food Project	**Part I: Food Selection (due by end of lab)**
Week 3	Tues, Jan. 24	**Exercise 1**	**Report due at beginning of lab**
		Exercise 3	finish
		Exercise 4	Pasteurization (**prepare dilution scheme**)
		Exercise 5	Bacteriophages
Week 4	Tues, Jan. 31	Exercises 4, 5	finish
		Exercise 6	Rapid Methods of Food Analysis: DNA isolation, PCR
Week 5	Tues, Feb. 7	**Exercises 2, 3**	**Reports due at beginning of lab**
		Food Project	**Part II: Research of Food (uploaded into Canvas by each student, by 5 pm)**
		Exercise 6	finish
		Exercise 7	Traditional Methods - *Salmonella*
		Exercise 8	Rapid Methods of Food Analysis: ELISA
Week 6	Tues, Feb. 14	**Exercises 4, 5**	**Reports due at beginning of lab**
		Food Project	**Part III: Dilution Schemes (due at beginning of lab)**
		Exercises 7, 8	finish
		Exercise 9	Computer Modeling
Week 7	Tues, Feb. 21	**Exercise 6**	**Reports due at beginning of lab**
		Food Project	Part I: Spoilage Organisms = Standard Plate Count, Yeast & Molds, *Pseudomonas*, Psychrotrophs, *Bacillus*, Lactic Acid Bacteria (LAB)
		Food Project	Part II: Indicator Organisms = Coliforms.
Week 8	Tues, Feb. 28	**Exercises 7, 8, 9**	**Reports due at beginning of lab**
		Food Project	Plate counts
Week 9	Tues, March 7	**Final Exam**	**2 hours**
	Mon, March 13	**Food Project**	**Part IVa: PowerPoint presentation due by 5 pm**
Week 10	Tues, March 14	**Food Project**	**Part V: Written Report (uploaded into Canvas by each student, by 5 pm)**
			Part IVb: Oral Report presented during lab (Session 1: 8:30-10:25, Session 2: 10:25-12:20)

All items are due by 8:30 am (at the start of lab), unless otherwise indicated.

Learning Outcomes for MB 441/541

1. Demonstrate the ability to perform basic microbiological techniques used in the food industry
2. Accurately report observations made during laboratory exercises.
3. Expected to acquire ability to conduct and analyze experimental measurements relevant to microbiology.
4. Acquire basic skills needed to learn detailed food microbiological procedures as the need arises.
5. Acquire the ability to use the primary literature to search for information on food-borne pathogens and properties of foods.
6. Make predications, assess and articulate for a specific food the microorganisms important in quality, spoilage and disease.
7. Graduate students will have to demonstrate detailed understanding about a particular food and the microorganisms important in spoilage and disease.

Learner Expectations:

1. Attend lab (on time) and stay the entire lab period.
2. Read laboratory exercises in lab manual before they are to be performed.
3. Bring lab manual to class.
4. Come prepared to take final exam (i.e. do not wait until the night before to cram).
5. Participate in learning activities and complete tasks on time.
6. Be a good team player and do not let other members of the team do all the work.

BASIC INFORMATION

Instructor
Dr. Linda Bruslind, Nash 322, 737-1842, bruslindl@oregonstate.edu

Pre-requisites/Co-requisites
Pre-requisites: MB 302, MB 303; Co-requisite: MB 440/540

Office Hours
During lab periods or by appointment (email instructor for available days/times)

Required Learning Resources

- MB 441/541 lab manual
- Compendium of Methods for the Microbiological Examination of Foods (1992 version on reserve in library, two 2001 copies in Dr. Bruslind's office for borrowing in vicinity)
- FDA Bacteriological Analytical Manual or BAM (on the web)
- Modern Food Microbiology, 7th edition by Jay (text for MB 440/540)
- The USDA National Nutrient Database for Standard Reference (on the web)

GRADING (approximate, subject to marginal changes)

Final Exam	40 pts.
Food Project	160 pts.
Dilution Set	25 pts.
Lab Reports (9)	225 pts.
Total	450 pts.

Final grades are assigned on a straight percentage basis: 93-100% = A; 90-92% = A-; 87-89% = B+; 83-86% = B; 80-82% = B-; 77-79% = C+; 73-76% = C; 70-72% = C-; 67-69% = D+, 63-66% = D, 60-62% = D-, below 60% = F. There will be no curve, if the average is above 75%. If you choose S/U grading, you need to get 70% (C-) to get an "S". Election of S/U grading should be known only to the student and their academic advisor.

Course Policies
Missed labs: Attendance is mandatory. Except for extremely exceptional circumstances (as determined by the instructor), **there is no way to make up a missed lab.** If you have more than one absence, you will receive an incomplete if passing the course, an "F" if not passing the course. Arriving at the laboratory more than 10 minutes late two times constitutes an absence.

Missed final exam: No make-up exam will be given. Missing the final exam will constitute a zero.

Lab reports/assignments: Expectations for the lab notebook/lab reports and the class projects are explained in detailed in the following pages. The lab schedule indicates due dates. All assignments are due at the beginning of lab (8:30 am), unless otherwise indicated. Lab reports handed in after 8:30 am but before the end of lab (12:20 pm) will be deducted 10%; reports handed in before 5 pm on the day due will be deducted 20%. Lab reports handed in the following day before 5 pm will be deducted 50%. After that items will not be accepted.

Grading: students have 2 weeks from the time that papers/exams are returned (or available for pick-up) to contest a score. Please look your papers over carefully! Points will be posted on Canvas several times throughout the term. Check to make sure all your grades are recorded correctly.

TurnItIn: assignments required to be uploaded to Canvas will utilize the plagiarism prevention service TurnItIn to check assignment content against Internet sources, academic journal articles, and the papers of other OSU students, for common or borrowed content. TurnItIn generates a report that highlights any potentially unoriginal text in your paper. Papers submitted through Turnitin will be added to the OSU TurnItIn database and may be checked against other OSU paper submissions. Students retain all rights to their written work.

University & Department Policies

The following information is summarized from the OSU Student Conduct Regulations.

Students are expected to be honest and ethical in their academic work. Academic dishonesty is defined as an intentional act of deception in one of the following areas:

*cheating- use/attempted use of unauthorized materials, information or study aids
*fabrication- falsification or invention of any information
*assisting- helping another commit an act of academic dishonesty
*tampering- altering or interfering with evaluation instruments and documents
*plagiarism- representing the words or ideas of another person as one's own

When evidence of academic dishonesty comes to the instructor's attention, the instructor will document the incident, permit the accused student to provide an explanation, advise the student of possible penalties, and take action. The instructor may impose any academic penalty up to and including an "F" grade in the course after consulting with his/her department chair and informing the student of the action taken.

The goal of Oregon State University is to provide students with the knowledge, skill and wisdom they need to contribute to society. Our rules are formulated to guarantee each student's freedom to learn and to protect the fundamental rights of others. People must treat each other with dignity and respect in order for scholarship to thrive. Behaviors that are disruptive to teaching and learning will not be tolerated, and will be referred to the Student Conduct Program for disciplinary action. Behaviors that create a hostile, offensive or intimidating environment based on gender, race, ethnicity, color, religion, age, disability, marital status or sexual orientation will be referred to the Affirmative Action Office.

The Department has additional concerns about referencing material from the Internet. Any information obtained from the Internet should be cited as completely as possible with the author's name, title of the web site, affiliation of the author and date the material was put on the web or last updated. You should also do some critical analysis of the credibility of the information as anyone can put information onto the web.

Students with documented disabilities who may need accommodations, who have any emergency medical information the instructor should know, or who need special arrangements in the event of evacuation, should make an appointment with the instructor no later than the first week of the term. In order to arrange alternative testing the students should make the request at least one week in advance of the test. Students seeking accommodations should be registered with the Office of Services for Students with Disabilities.

LAB NOTEBOOK/LAB REPORTS

Keeping a lab notebook is a required part of the laboratory. You may use a 3-ring binder with loose leaf paper or a notebook of some type. All observations and results should be recorded in your lab notebook. Do not make observations or record results in your lab manual or on random scraps of paper. You will need to attach all your raw data sheets to appropriate lab reports so be sure that you are keeping exercises separate.

All lab reports should be well organized, neat, and **typed**. Each exercise should be clearly labeled and dated. Each exercise will have at least 3 parts: **objectives, results, and discussion**.

Objectives (5 pts):
The objectives section should include 1) information about the concepts or techniques being taught – what is the purpose or relevance to the student? (the "what," +1), 2) the purpose or relevance of the exercise to the food industry (the "why," +2), as well as 3) an explanation of any methodologies that will be used to accomplish the exercise (the "how," +2). The objectives section should be written in full sentences, not bullets.

Results (10 pts):
Any exercise that includes a food sample should include information on the example form shown in the lab manual section about sampling. Information on food samples will be posted on Canvas (for class exercises) or provided to you (for the food project).

All data and observations should be included in the lab book. It may involve a picture of something viewed under the microscope, in which case total magnification and a description should accompany the picture. If plate counts are involved, you should include all dilutions plated and results for all dilutions, even if they are too numerous to count or 0. You should indicate the type of medium plated and temperature of incubation. When calculations are required, you must show your work (even if you use a calculator, you must set up the problem). If graphs or class data are needed, they should be included. Graphs or tables should always have a title and legend if needed. Enough information should be included on the graph or table so that the grader could tell exactly what is being presented. Report microbial counts as 2 significant figures, 1 decimal place, exponential form (i.e. 3.5×10^5 CFU/ml).

Sheets with all related raw data should be attached to the report. If class data was used then a copy of class data should be attached. **Raw data will be checked for presence, but will not be graded. Only components that are part of the final typewritten report will be graded.** All raw data should be neatly re-typed into the report in an organized fashion.

Discussion (10 pts):
This should be well-written, at least one solid paragraph for each exercise, written in full sentences. Each discussion should include, but not be limited to: a conclusion based on the results obtained (referencing specific values or facts), whether or not the objective for the exercise was reached, any difficulties in performing the directions for the experiment, problems encountered, identification/explanation for outliers, or differences in your results compared to what was expected. If class data is given, you should always compare your data to class data. The discussion section is an opportunity to do critical analysis of the data obtained; it's a chance to analyze results and come to rational conclusions based on those results. The discussion section can also be used as an opportunity to offer suggestions for mitigating issues or differences encountered, if the experiment were repeated. **In addition, most exercises give specific items that should be addressed in the discussion (see end of each exercise in lab manual).** You need to reference **any material** obtained from another source (including your textbook/lab manual).

Finally, always check lab reports after they have been graded to make sure that mistakes have not been made and that points were added correctly. You have a **maximum of two weeks** to get a grade changed starting the day the assignment is returned or available for pick-up.

Helpful Hints for Doing Well on the MB 441/541 Lab Reports

Objective

- Write in full sentences, not bullets.
- Think of the importance/relevance of the exercise beyond your individual sample (i.e. the SPC method obviously applies to samples beyond hamburger or alfalfa. Yes, it's nice to determine the microbial load for those foods but the method was taught because it's universally used to determine microbial load for all foods).
- Be sure to address the "how." Assume that the person reading the paper is not familiar with the methodologies being used. Don't give step-by-step instructions but do provide a few sentences explaining the techniques. (i.e. if the exercise was about the use of the Gram stain you wouldn't just say "For this exercise we used the Gram stain." You would want to say something along the lines of "For this exercise we used the Gram stain, a differential stain that uses 4 different reagents to colorize bacterial cells purple or pink, depending upon the characteristics of their cell wall. The stained bacterial smear is then observed under the oil immersion lens of a light microscope.")
- In order to adequately address the "what," the "why," and the "how," I would expect your objective to be at least 5 sentences (not bullets!).

Results

- Be sure to include the detailed sample information posted on Canvas.
- Show all calculations.
- Properly label all your tables/figures/graphs. Assume that someone from outside the class is looking at your report and provide enough information so they could figure out your results.
- Your raw data must be attached to each report but it is not considered part of the official lab report. Re-type values into a neatly labeled typewritten table, don't refer to the handwritten one in your raw data! Class data will be available on Canvas in a typewritten form so you may print that off and attach directly to your report or you may insert a table directly into your results section. If you attach a table then be sure to reference "see attached table."

Discussion

- Every report needs to address whether the experimental objective was reached, an overall critical analysis of the results, and a discussion of difficulties or problems encountered with the experiment. This should be **at least** a well-written solid paragraph analyzing the results obtained. All of them. Think about them. Analyze, hypothesize, extrapolate. You are not off the hook if the experiment didn't "work." In fact, you should have LOTS to say if the experiment wasn't successful in the conventional sense.
- In **addition** to the well-written solid paragraph (minimum!) you need to address any specific questions described in the discussion section of the lab manual for each exercise. **IN ADDITION.** Answering these specific questions, even in detail, does not excuse you from writing a well-written solid paragraph addressing the results as a whole. Even if the results are lousy. Dazzle me with your analytical and deductive powers.
- Be sure to back up what you say. If you're basing a conclusion on results, cite the specific values of importance (i.e. "the concentration calculated for my sample, 2.5×10^6 CFU/g, was less than the concentration calculated for the class as a whole, 3.7×10^8 CFU/g." Don't just say "my value was lower than the class value."). If you're using external information then provide a complete citation, using ASM style.

FOOD PROJECT

Each student will research and test a commercially available food, reporting the final results in both an oral presentation and a written report. Undergraduates will work on some aspects as a group, while other aspects will be performed independently. Graduate students will work independently on the entire project.

Part I: Food Selection. Due by Jan. 17 before leaving lab- 5 pts. (individual grade)

Possible foods for the food project will be posted on Canvas or available from Dr. Bruslind during class. Graduate students will study a food independently, while undergraduates will work in groups of no more than 3. While each member of an undergraduate group will have the same food (i.e. frozen chicken) to research, the actual food samples for testing will differ in terms of manufacturer, source, etc.

Part II: Research of Food. Due Feb. 7 by 5 pm - 45 pts. (group grade for undergraduates) – upload through Canvas. Undergrads can upload their components individually.

Students will research their assigned food to gather information relating to the food and its' microbes. Research should involve the use of numerous resources including, but not limited to, the use of primary literature sources (i.e. peer-reviewed journal articles) and specific required references listed below. Undergraduates will each be assigned 3 aspects of the food to research (a, b, or c, below), submitting a group report that covers all 9 nine aspects of the food research. Graduate students cover all aspects by themselves. Coverage of each aspect should span at least a solid paragraph in full sentences. All facts must be referenced within the text, using the style of the American Society of Microbiology or ASM* (+2 pts). Reports must be submitted through Canvas.

Food aspects to research (+3 pts each, 27 pts total):

a) Nutritional content (use ref #1 below, proximates **only**)
   Description (not list!) of any health inducing properties or benefits derived from food
   Description of organisms most important in the disease-causing potential of food to humans (note: disease ≠ spoilage);
b) Typical preparation method(s) for consumption
   Microbial standards/limits for the food or microbial load expected in food, if there are no standards indicated (use ref #2 below)
   Description of microbes most important in the spoilage of this food (note: spoilage ≠ disease);
c) Typical storage methods
   Details about the common methods used for isolation/identification for the most important human pathogen associated with this food (use ref #3 below)
   Specific examples of incidence of human disease or outbreaks associated with this food

As part of their research each student is expected to utilize primary literature references related to their research, less than 2 years old. Undergraduates are required to have at least 2 primary literature references per group member, graduates must have at least four. **Students must write a 1 paragraph summary for each of their primary literature sources and submit with the Research of Food paper, in addition to including pertinent information in the body of the paper. The full reference for each paper must be provided.** (+12 pts)

Students are **required** to use the following references (+4 pts). It is expected that they will also utilize other, appropriate resources that they find while conducting their research. **Do not use Wikipedia!**

1. USDA National Nutrient Database for Standard Reference*
2. Compendium of Methods for the Microbiological Examination of Foods, published by APHA (2001 on reserve in library, two 1995 copies in Dr. Bruslind's office for use in office vicinity).
3. Bacteriological Analytical Manual (BAM), 8th ed. 1995 by the Food and Drug Administration*
4. MB 440/540 class textbook, *Modern Food Microbiology* 7th edition by Jay, Loessner, and Golden.
5. Primary literature references, less than two years old (at least 2 for **each** undergraduate group member – 6 total for the undergraduate group; 4 for each graduate student). Older papers can be used as well but the use of newer articles is required.

*The website addresses for these and other recommended resources (such as CDC, FSIS, Food Info Net, a MB writing guide, etc.) will be posted on Canvas.

Part III. Dilution Schemes. Due Feb. 14 at beginning of lab - 35 pts. (individual grade)

Each student is required to design 7 **separate** dilution schemes for their food, indicating how they will test their food for specified spoilage and indicator organisms, using information acquired during the research of the food and the directions from Exercise 1 (SPC) and the Food Project information. Each student will be testing their food for: overall number of microbes in the food (standard plate count), yeasts & molds, *Pseudomonas*, psychrotrophs, *Bacillus*, Lactic Acid Bacteria (LAB), and coliforms. Students will need to make a pictorial dilution scheme (see Figure 1a) for **each** group of organisms indicating: dilutions to be prepared (+1), volumes to be used (+1), and plates/tubes prepared with final dilutions indicated (+1). Page 34 lists the materials that will be provided to each student. Students should know standards/ limits for their food and which spoilage organisms are important in their food - this will provide a framework for what dilutions should be plated for the SPC, spoilage organisms, and indicator organism. **When in doubt, lower dilutions should be plated**. Duplicates should only be used for the SPC and dilutions should always be sequential (i.e. plate out 10^{-3}, 10^{-4}, 10^{-5}, not 10^{-2}, 10^{-4}, 10^{-6}). After each dilution scheme students need to provide details about the principle behind the media and/or conditions used for each group of organisms (+2 each, 14 pts total). In other words, explain how the media or conditions are designed to select for this group of organisms, by addressing specific ingredients and the role of each. **Points will not be awarded for information copied directly from the lab manual.** Information must be typewritten, although the pictorial dilution schemes can be handwritten, if neat. Dilution schemes must be prepared independently (i.e. undergraduates should work separately, even if assigned the same food).

Part IVa. PowerPoint presentation for oral report. Due Monday, March 13 by 5 pm. – 10 pts (group grade)

Each undergraduate group/graduate student must submit their completed PowerPoint presentation by Monday, Mar. 13, 5 pm. Email presentation to bruslindl@oregonstate.edu. Guidelines will be posted on Canvas.

Part IVb. Oral Presentation. Due March 14 during class time – 20 pts (group grades). 5 pts (individual grade) for not being late to assigned session.

Undergraduates will give reports as a group and graduate students individually. Students will be assigned Session 1 (8:30-10:25) or Session 2 (10:25-12:20) – **all the members of one undergraduate group will be assigned the same session. Students must attend all the presentations for their session or they will receive a zero for the oral presentation score.** The oral report must be a 8-10 minute PowerPoint presentation that includes:

1. Background information of the food including sample information and other relevant details (i.e. composition, storage conditions, microbial standards, spoilage organisms, pathogens of concern, disease outbreaks, etc.) – presented equally by members of the group, with each member covering information related to their own food as well as information they obtained during the research of the food.
2. Table(s) of data with calculated **averages** for each group of organisms (raw data should not be presented). What were the most important microbes in the food? Did this relate to what the research indicated? – presented by each individual. Each undergrad should have a data table on a separate slide.
3. Conclusion - quality of food, limitations of sampling method, concerns and importance of abuse, etc. – presented by group.

Part V: Written Report. Due March 14 by 5 pm - 40 pts. (individual grade) – upload through Canvas

Each student will prepare a final report that combines information from the research of the food with components of a typical lab report. Each student should cover all 9 aspects of the research of the food (a solid paragraph for each aspect), with undergraduates using facts previously gathered by **all** the group members (+18). **However, each student needs to present the information in their own words!** In addition, the report should also include information associated with each individual student's sample: sample information (+1), tables with the raw data collected (+2), calculations (+1), a single table with the calculated averages for each group of organisms (+7), and a well-written discussion section offering critical analysis about the food used for the project (+4). If no/low counts were obtained then the student should calculate out the limit of detection for that test. All facts must be referenced within the paper (+2). All required references must be cited (+2), using ASM style (+1). All scientific names must be properly written (+2).

All of the information in the written report should have already been compiled – it just needs to be presented in an organized and cohesive fashion. **Raw lab pages are not acceptable – all data should be entered into well organized and well labeled tables.**

Plagiarism

(The following section on plagiarism was modified from a passage obtained from Bill Oye, OSU Student Conduct Program. The original passage was developed in collaboration with faculty in the OSU Department of English.)

If you use words or ideas from another source, you must appropriately credit that source. For example, assume you want to use material from the following paragraph about cell metabolism:

> A knowledge of cell metabolism is essential for understanding the biochemistry of microbial growth. Also, a knowledge of metabolism aids in developing laboratory procedures for preventing the growth of unwanted microorganisms. Because many of the important practical consequences of microbial growth, such as infectious disease or the production of useful products, are linked to microbial metabolism, a knowledge of microbial nutrition and metabolism is also of great use in medical and industrial microbiology.
> (Michael T. Madigan, John M. Martinko, and Jack Parker, *Brock Biology of Microorganisms*, 9th edition, Prentice Hall, 2000, p.104)

Acceptable Borrowing: Direct Quotation (remember that this is rare in scientific writing)

> In *Brock Biology of Microorganisms*, the authors say, "A knowledge of cell metabolism is essential for understanding the biochemistry of microbial growth" (1).

Material borrowed in any form should be identified in the Reference section. The following would be an appropriate listing for a scientific paper (however, you should always consult your instructor or supervisor to see if a particular format should be followed):

1. Madigan, M.T., J. M. Martinko, and J. Parker. 2000. *Brock Biology of Microorganisms*, 9th edition, p. 104. Prentice Hall, N.J.

Acceptable Borrowing: Paraphrase with some Quotation

> In *Brock Biology of Microorganisms*, the authors emphasize the importance of knowing about microbial metabolism and nutrition, saying it is "of great use in medical and industrial microbiology" (1).

The source is cited, and that portion which is borrowed word for word is placed in quotes.

Acceptable Borrowing: Paraphrase

> In *Brock Biology of Microorganisms*, the authors emphasize the importance of knowing about microbial metabolism and nutrition, indicating that such knowledge can be used in three areas: (a) determining ways to prevent microbial contamination, (b) developing appropriate methods of growing microbes in the lab, and (c) for application when working with microbes in the fields of industry and medicine (1).

The paraphrase is acceptable and needs only a citation. The paraphrase has not borrowed the wording, sentence structure, or general organization of the source, but it has borrowed the specific ideas. Contrast it with the unacceptable "paraphrase" which follows.

Unacceptable Paraphrase

> In *Brock Biology of Microorganisms*, the authors stress the importance of knowledge of cell metabolism in order to completely understand the biochemistry of microbial growth. They suggest that such knowledge can aid in the culturing of microbes by developing laboratory procedures and in preventing the growth of unwanted microbes by developing suitable procedures. They even say that consequences of microbial growth, such as infectious disease or useful products produced, can be linked to microbial metabolism (1).

This is an unacceptable paraphrase **despite the citation at the end**. It does not borrow word for word perhaps, but it borrows word after word as it skips through the sentence, substituting here and there. Furthermore, it borrows basic sentence structure and general organization.

Unacceptable Borrowing: Plagiarism

> I believe that a knowledge of cell metabolism is essential, without such knowledge one can not understand the biochemistry of microbial growth. Because the results of microbial growth, such as disease or useful products produced by microbes, are linked to microbial metabolism, a knowledge of the nutrition and metabolism of microbes can be very helpful in the fields of medical and industrial microbiology.

This is an obvious attempt on the borrower's part to claim another's ideas. Besides hiding the source of the ideas, the borrower has used another's sentence structure and general organization. Even if the borrower really holds these ideas, such use of another person's work is plagiarism.

LABORATORY RULES

1) **CLEAN** desktop with **DISINFECTANT** (quaternary ammonium compound, QAC) at the beginning and end of class. Carefully wash hands with soap before leaving the lab.

2) **KEEP YOUR WORK SPACE CLEAR –** keep only the lab manual, your lab notebook, and any necessary lab supplies on your bench top; everything else should be placed under the bench, keeping the aisles clear. Backpacks/coats/cell phones etc should not be left on the lab bench top. **Do not bring valuables to lab!**

3) **DO NOT** eat, drink, chew gum or tobacco in lab. Open beverage/food containers must be left on the hallway shelf outside lab. Keep your hands out of your mouth, nose, and eyes.

4) **WEAR APPROPRIATE CLOTHING** – You are required to provide and wear a lab coat at all times in lab. Open toed shoes are not allowed. Protective eye goggles & gloves are required for all experiments using corrosive/toxic chemicals or potentially pathogenic organisms. These will be provided when needed.

5) **PAY ATTENTION TO ANNOUNCEMENTS -** No MP3 players/iPods in lab; turn off cell phones/pagers while in lab.

6) **NO UNAUTHORIZED VISITORS** in the lab. **NO ANIMALS** in the lab.

7) KNOW THE LOCATION of the fire extinguisher (on the wall in the hallway), the fire blanket (the red box on the wall near the windows), & the eye wash (yellow capped faucet at sink). A full body shower is located outside the lab, to the right and around the corner, at the entrance to the media room in Nash 324.

8) **INJURIES –** report accidental cuts or burns to the instructor or TA immediately. If the injury needs professional assistance, you will be escorted to the Health Center or proper facility.

9) **BROKEN GLASSWARE** - Call the instructor or TA to assist you. **Do not dispose of any glassware in the regular garbage cans.**

   a. **Contaminated glass** is placed in the large metal can on the discard table.
   b. **Non-contaminated glass** is placed in the large cardboard "broken glass" box.

10) **SPILLS** – If you spill anything in lab, inform the instructor or TA so that they can assist you in proper clean-up. If culture is spilled on your clothing or belongings, they may require decontamination to assure your safety.

11) **INCUBATING OF CULTURES –** each workspace has an assigned number that can be used to identify your materials. Carefully label all materials to be incubated with your name/initials, seat #, and organism identification. Place materials to be incubated in the incubation tub at the front of the lab, unless otherwise directed.

   a. Label **culture plates** on **agar side** with your name/initials, seat #, and organism identification. Place plates in incubation tubs **agar side up**. This prevents moisture from forming on the inside of the lid and obliterating colonies.
   b. Label **culture tubes** on the **glass** (**not plastic caps**) with your name/initials, seat #, and organism identification. Place tubes in racks in incubation tub.

12) **BUNSEN BURNERS** in the lab have almost invisible flames – use caution when they are on. Long hair must be tied back during lab to avoid contact with flame. Make sure to completely turn off your Bunsen burner when finished. Alert the instructor or TA to the smell of gas in the lab.

13) **PIPETTING -** Do not pipette by mouth. When using rubber bulbs, insert the pipette gently into the bulb to avoid breaking the pipette and potentially cutting yourself.

14) **DISCARDING CLASSROOM MATERIAL - All materials used in lab that are contaminated with culture (tubes, plates, pipettes, etc.) must be autoclaved before cleaning or disposal.**

a. **Used slides** should be cleaned with slide cleaner or green dishwashing detergent and returned to slide container.
b. **Used cover slips** go in the cardboard box for glass waste.
c. **Used razor blades/pins** go in the metal can for contaminated glass waste.
d. **Plastic Petri plates** go into an autoclave bag at the discard table. Do not discard **glass** items in the autoclave bag!
e. **Plastic transfer pipettes, swabs, etc** go into an autoclave bag at the discard table. Do not discard **glass** items in the autoclave bag!
f. **Culture tubes** go into wire baskets in metal containers ("coffins") at the discard table.
g. **Glass bottles** go into metal containers ("coffins") at the discard table. Loosen screw caps before autoclaving. Side arm flasks should be filled with water first.
h. **Glass Petri plates** go into metal containers ("coffins") at the discard table.
i. **Uncontaminated** paper towels used to clean desk with disinfectant or lens paper can be placed in metal container on the lab bench. The metal container should be emptied in the main garbage can at the end of each lab.
j. **Black wire racks** are to be returned to the lab shelves. Colored plastic racks stay on the lab bench.

15) **MICROSCOPE USE –** our microscopes are valuable and must be cared for properly. When replacing the microscope after use:

a. Clean all oil off the 100X objective, first with flat lens paper and then flat paper saturated with lens cleaner. Wipe dry with another piece of lens paper. Residual oil will destroy the seals on the objective. Crumpled lens paper will scratch the lens. Never use anything other than lens paper to clean your microscope lenses.
b. If you have gotten oil onto the 40X objective lens, inform the instructor or TA so it can be appropriately cleaned.
c. Clean off dirt or oil from the stage, condensers, or oculars.
d. Leave a low power (4X or 10X) objective into place.
e. Wrap the cord neatly around the oculars.
f. Roll out the microscope shelf completely before replacing the microscope. Sign and date the sheet in the cabinet. Have your TA check your microscope.

16) **LEAVING THE LAB** – Clear the lab bench of all cultures, plates, and other supplies. Empty metal can of paper waste into a large garbage can. Clean desktop with disinfectant and wash hands with soap. Make sure you have all of your belongings.