

**BIO C17 Summer 2014
MICROBIOLOGY : THE BACTERIAL CELL
LAB INFORMATION AND SCHEDULE**

Please Check course time table for the room number of your Lab Section and blackboard for the name and e-mail address of your TA. Announcements and some labs will be posted on Blackboard. Please check this page at a minimum weekly.

The laboratory component of BI C17 requires 3 hours of laboratory per week. The Laboratory component represents **41% of your final grade.** This laboratory will provide hands on experience in basic microbiology skills. We will supplement the lectures with working examples of concepts discussed in Lectures. On occasion concepts that are most easily presented in the laboratory will be addressed in the laboratory only. **The objective of the laboratory is to provide you with a comprehensive introduction to basic techniques and concepts required for understanding bacterial physiology with an emphasis on bacterial impact on human health.** *On completion of this course the student will understand concepts of microbial growth, control of microbial growth and medical microbiology.* This background will provide the foundation for fourth year courses in microbiology including BIOD17, BIOD26, BIOD29. Skills acquired will be useful in laboratory based jobs in industry, government microbiology laboratories, blood services and medical microbiology laboratories. Skills will also provide the foundation for graduate work in fields utilizing microorganisms.

GRADE DISTRIBUTION FOR THE LABORATORY

Laboratory component of final exam; During exam period TBA (included with lecture exam)	15%
Lab reports (Data Sheets and questions, graphs and calculations)	20%
Lab participation /preparation/performance (TAs will assign flow charts/mind maps prep /summaries/class presentations/ class write ups/reflective practice	6%

Attendance is mandatory: you require UTSC medical certificate for illness or a acceptable reason (cleared prior to the lab by Dr. Brunt) for absence from the instructor, If you miss a lab which are an not excused you may not hand in the assignment. Two unexcused absences result in loss the 6% performance grade and all related grades to missed lab. One unexcused absence 3 % and all related grades. If you miss 3 laboratories you forfeit all grades related to the lab work (26%). **Lab assignments will not be accepted late.**

For the formal report follow this procedure:

The day your report is due, hand in a hard copy to your TA and submitted to turnitin)

Each page of the report must be number and labeled with the student's name. In addition, you **must initial all the pages** of your hard copy. The total number of pages must be indicated on the cover of your report. The hard copy must be received by the TA on her/his hand. Please, don't pile them up on the front bench.

Use of TURNITIN

"Normally, students will be required to submit their course essays to Turnitin.com for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site".

You must inform Dr Brunt in writing if you wish to opt out and you must then provide an electronic copy of your report to Dr. Brunt

READ the academic integrity section below

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

In papers and assignments:

- Using someone else's ideas or words without appropriate acknowledgement.
- Submitting your own work in more than one course without the permission of the instructor.
- Making up sources or facts.
- Obtaining or providing unauthorized assistance on any assignment.

On tests and exams:

- Using or possessing unauthorized aids.
- Looking at someone else's answers during an exam or test.
- Misrepresenting your identity.

In academic work:

- Falsifying institutional documents or grades.
- Falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see <http://www.utoronto.ca/academicintegrity/>).

For each laboratory Data Sheets associated with each particular Exercises are found in the section at the back of the Lab Manual "**Microbiology: Laboratory Theory and Application**" custom edition M. Leboffe and B. Pierce. You are strongly encouraged to fill in a data sheet for each laboratory completed during this course for preparation for the ffixam

Laboratory Assignments Summer 2014

Assignment 1 (7%) due June 3, 2014

Exercise 3-12 Morphological Unknown

Data Sheet 1 %

Slides (3 slides are handed in):

Gram stain 2 %

Acid-fast stain 2 %

Spore stain 2 %

Assignment 2 (4%) Due July 8, 2014

JS1 bacterial growth: introduction, graphs and generation time determination and short discussion

Assignment 3 (9%) formal research paper Use of heat ,UV and chemicals to control bacterial growth . (Paper copy due at the beginning of your lab July 29 , and to **turnitin by 5 pm on the day of your lab)**

Ex 2-14 disinfectants

Ex. 6-6 thermal death time

Ex2-13 UV light: killing effect

TAs will go over specific requirements for assignments. An outline of the requirements for the formal report will be posted

Lab RULES (no cell phone use in the laboratory)

1. Do not bring coats, hats, etc. into the laboratory.
2. Always wear a lab coat (done up) in the laboratory with the sleeves rolled down and closed shoes. See additional laboratory requirements for full details
3. Do not eat or drink in the laboratory.
4. Keep paper, pencils, fingers, etc. out of your mouth. Avoid using paper labels. If used, moisten with water, not your tongue.
5. Wash benches down with 70% alcohol and the beginning and end of lab as described in 12
6. Follow directions for disposal of all material used in the laboratory. All material that has been in contact with microorganisms must be disposed of in disinfectant or autoclave bags.
7. Discard pipettes point-down, in the upright plastic pipette holders. Make sure the pipette tips are covered with disinfectant.
8. Place all *test tubes* containing living cells in the racks in autoclave basins;
9. Place all *flasks* in an upright position in the discard pans.
10. All pipette tips for micropipettors must be disposed in buckets provided
11. **Microscopes** must be cleaned before being put away. **See earlier pages** and TA's instructions for the correct way to put away your microscope.
12. At the beginning and end of each lab session, tidy up your work area as follows: **first shut off bunsen burners**. Squirt /pour an S-shape of 70% isopropanol onto the lab bench. Spread the alcohol with a paper towel to disperse over the bench top, but **do not dry it with the towel**. Instead, **allow the alcohol to evaporate**. Throw the paper towel in the dry waste bag.
13. **Wash hands thoroughly with soap and water** once or twice during the lab, at any time you come in contact with live cells and also just before leaving the laboratory.
14. When leaving the lab, REMOVE YOUR LAB COAT and store it in a locker in the lab if possible. Although not recommended, it is allowable to wear the lab coat in another lab course. However, DO NOT UNDER ANY CIRCUMSTANCES wear your lab coat in the cafeteria or in any other public place (e.g. the Meeting Place, Library, etc.).

HANDLING OF MICROSCOPES

- 1) Each microscope and the storage space for that particular microscope, will have the same identifying number
- 2) Your TA will assign you to a specific microscope . You are responsible for this particular microscope.
- 3) When finished for the day, please do the following:
 - a) Center the mechanical stage
 - b) Lower the light intensity to the minimum and shut off the light
 - c) Using a cotton swap and alcohol wipe of the lens and the stage. Then wipe with lens paper

- d) place the lowest objective (4x) over the stage
- e) Wrap the electric cord around the base
- f) Turn the nosepiece relative to the base (if the nose piece swings), in the direction instructed by the TA
(there is only one way that the microscope will fit into the storage space).
- g) Hold the microscope with two hands-(one hand should be under the base of the microscope) while transporting it to the cabinet (and away from the cabinet)
- H) place in the cubby hole assigned to that particular microscope
- 4) The TAs will check that each microscope has been put away properly.
- 5) Points will be deducted if the microscopes are not put away properly.

Additional laboratory requirements:

- **Lab coats and closed shoes** (no sandals) are mandatory. If you arrive with inappropriate foot attire and/or no lab coat you will not take part in the lab and it will be considered an unexcused absence with a loss of 2.5% of your grade.
- Goggles during staining and when requested by the TA.
- Hair that can fall forward must be tied back
- Please wear sleeves of the lab coat *rolled down* and **remove your lab coat when class is over**. Do not wear your lab coat in public areas e.g. the cafeteria. Please also bring a **dark -coloured, waterproof, superfine (S) marker** e.g. **SHARPIE** for writing on Petri dishes. Regular markers (for paper) and pens, do not write well on plastic Petri dishes and tubes. Please wash your hands using soap, once or twice during lab time and at the end of the lab before leaving the room.
- **This course deals with potentially dangerous, generally unseen living organisms. Therefore, there are strict rules for working in the lab. Compliance with these rules is taken into account when the lab participation grade is determined.**
- **If you are caught eating or drinking you will be asked to leave your lab: associated lost grades**
- If you are immunocompromised you must see me before the lab begins

LAB INFORMATION AND SCHEDULE

The lab Exercises (Ex. #) are as designated in the Lab Manual. There are additional labs which will be provided as files posted a week prior to the laboratory these are designated JS.

You are responsible for **all the introductory material** in each relevant **Section** and **Exercise** in the lab manual, (even if it appears on pages preceding the actual exercise). **You are also responsible for all Sections/Exercises, etc. of Exercises listed as "read", "read only" or "reading assignment".**

- Supporting information from the custom text book also indicated where appropriate to assist with laboratory material
- Lab reviews will be held outside of the laboratory before the final exam and room permitting earlier in term.

FOR THE FIRST LABORATORY

Before coming to the first lab, please read the Introduction pages on Safety and laboratory guidelines, and Section 1 on fundamental skills as well as 2-12 theory from the lab manual. Look carefully at the Figures that describe aseptic technique. You will need to be proficient at these techniques to function in the Microbiology laboratory. **You are responsible for the theory of READ only laboratories**

LAB SCHEDULE

Week of Laboratory Exercise(s) and Assignments

Before each laboratory read and make notes on introductory materials. We do not use all the organisms listed so your TA will go through the organisms each week

Week :	Exercise
1. May 13	Section 3 Microscopy and Staining read Lab manual pages 1-19 Chapter 3 Microscopy, staining and Classification of your text book Ex. 3-1 The light microscope read and understand : <i>Bring to lab a summary of the major components of the microscope and a description of how to calibrate a microscope. Hand in at the beginning of class for participation credit</i> Ex. 3-2 Calibration of the ocular micrometer . You must show your TA the set up for participation credit Ex. 3-5 Smear preparation and simple stains Ex. 3-6 The negative stain Ex. 3-12 Wet mount and hanging drop preparations: motility vs. brownian movement

- Ex. 3-13 Flagella staining - demonstration slides only
2. **May 20** ***Section 3 Microscopy and Staining, continued***
- Ex. 3-7 Gram stain
 Ex. 3-8 Acid fast staining procedures
 Ex. 3- 9 Capsule staining
3. **May 27** ***Section 3 Microscopy and Staining, continued***
- Ex. 3-10 Endospore stain
 Ex. 3-14 Morphological unknown (begin)
 Inoculate Nutrient Broth and motility tube see EX 5-28
4. **Jun 3** ***Section 3 Microscopy and Staining, continued***
- Ex. 3-14 Morphological unknown, completion –
**interpret 5-28 and hand in data sheet and
 summary, Gram stain, acid fast stain and
 endospore stain at the end of lab**
- Section I Fundamental Skills***
 Refer to pages 141-143
 Ex. 1-2 Nutrient agar and nutrient broth preparation
 (read)
 Ex 1-3 aseptic transfer (read only);
 Ex. 1-4 Spread-plate technique, organisms to be
 used will be assigned in lab
 Ex. 1-5 Streak-plate technique, mixed population to
 assigned in class read appendix B and C
5. **Jun 10** record results from week 4 Ex 1-4 and 1-5
- Section 6 Quantitative Techniques***
- Set up:**
- Refer to chapter 5 pages 149-156 of your text book
 Read Appendix C , D, E
- Ex. 6-3 Direct count
 Ex. 6-1 Standard viable (plate) count (read only /data
 provided to do calculations)
 Ex. 6-4 Closed system growth (read only)

Ex. 6-5 plaque assay, refer to page 450-451 in manual

Ex. JS1 Bacterial growth in a closed system, Present flow chart to TA at the beginning of the laboratory part of your assignment participation

comparison of growth at 30C and 37C. Exercise JS 1 will be posted as a file one week prior to the lab. Record O.D. measurements as described. Plates from viable counts will be incubated 24 to 48 hrs., and then stored next week . This is your assignment 2

Reading week Jun 17

6. Jun 24 Record viable counts for JS1 and plaque counts (6- 5)

Section 2 Microbial Growth : Factors Affecting Growth

Refer to pages 131-140 in your text

Set up:

Ex. 2-9 Effect of temperature, Lab 1

Ex. 2-10 Effect of pH, Lab 1

Ex. 2-11 Effect of osmotic pressure, Lab 1

Ex 6-6: Thermal death time versus decimal reduction value (Formal report)

July 1 is a holiday no lab

7. July 8 **Section 2 Microbial Growth : Factors Affecting Growth killing effect and differential tests**

Data analysis : (for these exercises a class participation presentation of bench data)

Ex. 2-9 Effect of temperature, Lab 2

Ex. 2-10 Effect of pH, Lab 2

Ex. 2- 11 Effect of osmotic pressure, Lab 2

Ex. 6-6 Thermal death time versus decimal reduction value: Lab 2 (Formal report)

Set up :

Refer to chapters 6 and 7 in your text

Ex. 2-14 Effect of disinfectants, Lab 1 (formal report)

Ex. 7-3 Antimicrobial susceptibility (affect of antibiotics), Lab 1

Ex. 5-5 Catalase test, Lab 1 (obtain results)

Ex. 5-15 Gelatinase test, Lab 1
Ex 5-24 Bacitracin Novobiocin and Optochin
Susceptibility test , Read only , understand the theory
and hand in the answers to the questions for
participation
Ex. JS2 β -lactamase test (obtain results); lab posted
on blackboard
Ex 4-4 growth on Mannitol salt agar
Ex 7-1 Snyder Test lab 1

8. July 15

***Microbial Growth : Factors Affecting Growth etc
Data analysis:***

Ex. 2-14 Effect of disinfectants, Lab 2 (formal report)
Ex. 7-3 Effect of antibiotics, Lab 2)
Ex. 5-17 Gelatinase test, Lab 2
Ex 4-4 growth on Mannitol salt agar lab 2
Ex 7-1 Snyder Test Lab2

Set up

refer to page 175 of your text book

Ex. 2-13 Ultraviolet radiation: lethal effect , Lab 1
(formal report)
Ex. 10-5 Ultraviolet radiation: damage and repair,
lab1
Ex. 5-16 DNase test, lab 1

Medical microbiology

Ex 7-4 Clinical Biofilms
Ex. JS3 Effectiveness of hand scrubbing, Lab 1, lab
posted
Ex 7-6 Epidemic simulation lab 1

9. July 22

***Section 2 Microbial Growth/ section 7 Medical
microbiology***

Data analysis:

Ex. JS4 Effectiveness of hand scrubbing, Lab 2
Ex. 2-13 Ultraviolet radiation: lethal effect of, Lab 2
(formal report)
Ex. 10-5 Ultraviolet radiation damage/ repair, Lab 2
Ex. 7-4 Biofilms lab 2
Ex 7-6 Epidemic simulation lab2
Ex 5-6 DNase test, lab 2

Set up: Differential tests /Medical Medical Microbiology

Refer to chapter 4 of your text book
Ex JS5 blood agar week 1 (lab will be posted)
Ex 7-2 lysozyme Assay (completed today)
Ex 4-5 MacConkey Agar lab 1

Ex 5-27 Coagulase test Read and understand the data bring answers to questions for participation credit due at the beginning of lab

Section 10 Microbial Genetics

Ex. 10-3 Bacterial transformation : the pGLO system
Lab 1 (refer to chapter 9 of your text book)

Ex. JS6 Bacterial conjugation: the transfer of antibiotic resistant plasmids between cells. Exercise will be posted lab 1

10. July 29

Section 8 Microbial Genetics

refer to chapter 9 of your text book

Data analysis:

Ex. 10-3 Bacterial transformation : the pGLO system,
Lab 2 (**class participation: lab bench analysis**)

Ex JS5 blood agar Lab 2

Ex 4-5 MacConkey Agar Lab 2

Ex . JS6 Bacterial conjugation: the transfer of antibiotic resistant plasmids between cells, Lab 2. –

Work per group and hand in your interpretation prior to class discussion

BACTERIAL NOMENCLATURE

The proper name of an organism is composed of two words. The first word of the name refers to the *genus* to which the organism belongs, and the second word is the “specific epithet”. In most cases the specific epithet used is the *species*. If the specific species has not been designated, then the second term used is the abbreviation “spp.” or “sp”. The name is italicized (or underlined in typewritten manuscripts). The genus name starts with a upper case letter, while the species name starts with a lower case letter (e.g. *Staphylococcus aureus*).

The first time that a microbial name is used in a manuscript (e.g. lab report), both names should be used. Thereafter in the manuscript, when the species is cited, the word that refers to the genus may be abbreviated by using the italicized (or underlined) capital letter, followed by a period (e.g., *S. aureus*). If confusion might result from using only the single letter to represent the genus name, the entire name should be used.

Table 1. Proper and improper usage of bacterial nomenclature in a formal report

Correct*Staphylococcus aureus*Staphylococcus aureus*S. aureus**Staphylococcus spp.* (where species is not known)**Incorrect**

Staphylococcus aureus

Staph. aureus

The genus names of certain bacterial groups are used **(a)** as proper names as above and **(b)** as adjectives to describe the morphology of certain cell types.

When a genus name is used as an adjective it is not capitalized, italicized nor underlined. For example:

<u>proper name</u>	<u>adjective</u>	<u>cell shape</u>	<u>general arrangement</u>
<i>Bacillus</i>	bacillus	rod	single or in short chains
<i>Diplococcus</i>	diplococcus	coccus	in pairs
<i>Streptococcus</i>	streptococcus	coccus	in chains
<i>Staphylococcus</i>	staphylococcus	coccus	in clusters