Fall 9-1-2021

# BIOM 361.00: General Microbiology Lab

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**General Microbiology Lab (BIOM 361)**
**Autumn Semester, 2021**

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**Meeting times:** *Section 1*- TR 11:00-12:50 and *Section 2*- TR 1:00-2:50
**Meeting place:** HS 404 and 405
**Instructor:** Dr. Mike Minnick
**TA:** Luke White & Evan Stark-Dykema
**Office hours:** *Open-door policy;* drop in whenever you like
**Office location:** HS 509
**Phone number:** 406-243-5972
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**Text**: *Microbiology- a Laboratory Manual* 12th ed., Cappuccino and Welsh (2020). ***This is a required, hard-copy text book needed by each student; the electronic version will not suffice. Please note-*** Some lab exercises will be done using handouts that will be provided and/or made available on Moodle.

**Performance-** There will be 2 practical exams and occasional, pre-announced quizzes over the semester. Each lab will require written observations and a results sheet from the text book. Each exam is worth 100 points; quizzes are 10 points and lab results are 5 points per writeup. Exams will be given at the scheduled times shown below. *Since lab exams are practical in nature, it is not possible to give make-up exams on other days.* In all assignments, students are required to do their own original work for this class. Exams are closed book, closed notes, etc. *Performance will be evaluated by a classical grading system of: A (90-100%); B (80-89%); C (70-79%); D (60-69%); F (<60%)**, using a curve for the class. IF YOU MISS MORE THAN 2 LABS (unexcused), YOU MUST DROP THE COURSE.*

**Preparation**- *You will need a lab coat for this course.* Recommendations for success include reading assigned material in advance and attending lab. **BIOM 360 is a prerequisites or co-requisite for this course.** If you lack the pre-requisite or co-requisite you must get the instructor's approval to enroll in this course.

**Accommodations-** UM assures equal access to instruction through collaboration between students with disabilities, instructors, and the Office for Disability Equity (ODE). If you anticipate or experience barriers based on disability, please contact ODE at: 243-2243, ode@umontana.edu, or visit www.umt.edu/disability for more information. Retroactive accommodation requests will not be honored, so please, do not delay. As your instructor, I will work with you and the ODE to implement an effective accommodation, and you are welcome to contact me privately if you wish.

**Academic misconduct** will be reported and handled as described in The University of Montana Student Conduct Code. *All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Code is available for review online at: http://www.umt.edu/student-affairs/community-standards/default.php*

**Dropping course or changing grading status** will strictly follow University policies and procedures, which are described in the catalog. Students should note that they cannot change to an audit after the 15th day of instruction. In addition, dropping the course or changing the grading status (to CR/NCR) are not automatically approved after the 30th day of the semester; these may be requested by petition, but the petition must be accompanied by documentation of extenuating circumstances. Requests to drop the course or change the grading status to benefit a student's grade point average will not be approved.

**Cell phones** must be turned off and stored during lab. Disruption of class by a ringing cell phone could result in the loss of points.

***Incompletes*: will only be given for the reasons stated in the student handbook. *Drops:* The instructor will ONLY approve drops***** after the published drop date for very specific reasons.

*** (University policies on drops, adds, changes of grade option, or change to audit status will be strictly enforced as described in the current catalog. Students should note that after the 30th day of the semester, such changes are NOT automatically approved. They may be requested by petition, but the petition MUST be accompanied by documentation of extenuating circumstances. Requests to drop a course or change the grade basis to benefit a student's grade point average will not be approved.)**

**Lab Exercises**- (may change at discretion of instructor)

| Date | Content | Textbook Pages |
|---|---|---|
| T 8/31 | Rules, safety and great expectations | Inside cover; Preface: ix - xii |
| R 9/02 | Culture and aseptic techniques | 13-18 |
| T 9/07 | Pure culture techniques | 19-23 |
| R 9/09 | Microscopy: bacterial morphology | 37-44 |
| T 9/14 | Microscopy: wet mounts and microbial diversity | 45-50 |
| R 9/16 | Staining: simple and Gram stains | 51-66; 71-78 |
| T 9/21 | Staining: acid fast, spore and capsule (negative) stains | 67-70; 79-92; Handout / Moodle |
| R 9/23 | Defined, differential and selective media, | 93-94; 103-112 |
| T 9/28 | Physical parameters of growth- temperature and pH | 113-122 |
| R 9/30 | Physical parameters of growth- $O_2$ | 129-134 |
| T 10/05 | Serial dilution and enumeration | 135-142 (*see Appendix 2:* 515-516) |
| R 10/07 | Growth curve; inoculate molds; count CFUs from 10/05 | 143-150; 239-252 |
| T 10/12 | Compile growth curve data; score and stain molds | 143-150; 239-252 |
| R 10/14 | **Mid-term- Practical exam** | |
| T 10/19 | Unknown characterization | 217-221 (see pages 151-216 for physiological tests) |
| R 10/21 | “ “ | “ “ |
| T 10/26 | “ “ | “ “ |
| R 10/28 | Microbial genetics: conjugation | 381-386 |
| T 11/02 | Microbial genetics: transformation | Handout / Moodle (see pages 397-408). |
| R 11/04 | Food microbiology: food purity | 319-324 |
| T 11/09 | **HOLIDAY** | |
| R 11/11 | Food microbiology: yogurt production | Handout / Moodle |
| T 11/16 | Medical Microbiology: *Staphylococcus* | 433-440 |
| R 11/18 | Medical Microbiology: *Streptococcus* | 441-448 |
| T 11/23 | Begin antibiotic-producing microorganisms | 361-366 - **Part A, Lab 1** |
| R 11/25 | **HOLIDAY** | |
| T 11/30 | -Continue antibiotic-producing microorganisms<br>-Begin bacteriophage lab | 361-366 - **Part A, Lab 2**<br>Phage Handout- **Lab 1** (see pages 275-80) |
| R 12/02 | -Continue antibiotic-producing microorganisms<br>-Complete bacteriophage lab | 361-366 - **Part B, Lab 1**<br>Phage Handout- **Lab 2** (see pages 275-80) |
| T 12/07 | -Complete antibiotic-producing microorganisms<br>-Water quality analysis | 361-366 - **Part B, Lab 2**<br>337-344- **Labs 1 and 2 (presumptive tests)** |
| R 12/09 | **Final- Practical exam** | |

## Learning outcomes for General Microbiology Lab (BIOM 361)

| TOPICS | LEARNING OUTCOMES |
|---|---|
| Orientation and introduction<br>(1 lab) | -Familiarize students with course expectations and grading<br>-TA introduction and contact information<br>-Refresh basic lab safety<br>-Learn safety measure to use in the context of a microbiology laboratory |
| Pure culture and aseptic techniques<br>(2 labs) | -Learn aseptic technique and handling of potential pathogens<br>-Learn transfer techniques [from broth to slant, slant to slant, slant to broth, and broth to nutrient agar deeps].<br>-Learn streak plate isolation for obtaining bacterial clones, including environmental samples<br>-Learn proper incubation protocols and handling of cultures<br>-Learn how to handle contaminated waste |
| Microscopy<br>(2 labs) | -Learn proper oil-immersion light microscopy using prepared samples<br>-Learn hanging-drop and wet-mount microscopy on environmental samples<br>-Learn basic identification of microbes |
| Staining techniques for bacteria<br>(2 labs) | -Prepare smears and do simple stains on bacterial cultures<br>-Prepare Gram stains of bacterial cultures<br>-Learn acid fast, spore and capsule staining techniques using bacterial cultures |
| Media and physical parameters of growth<br>(3 labs) | -Become familiar with and utilize several differential and selective media for culture<br>-Examine the effects of pH, temperature, and oxygen availability on bacterial growth in several bacterial spp. |
| Enumeration of bacterial growth<br>(2 labs) | -Learn serial dilution to enumerate viable bacteria (CFU's)<br>-Learn how to create a bacterial growth curve |
| Mycology- the molds<br>(2 labs) | -Learn basic mold morphology and staining techniques<br>-Learn how to culture molds to preserve their morphology |
| Unknowns<br>(3 labs) | -Apply knowledge from course to identify a unknown bacteria to the genus/species levels<br>-Use dichotomous keys and phenotypes for identification |
| Microbial genetics<br>(2 labs) | -Learn about conjugation and do a mating experiment between 2 strains of bacteria.<br>-Learn about transformation and transform a strain of *E. coli* |
| Applied microbiology- foods | -Enumerate and compare levels of bacterial |

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| (2 labs) | contamination on common foods<br>-Prepare yogurt to demonstrate fermentation of milk by bacteria |
| Antibiotics-<br>(2 labs) | -Isolate antibiotic-producing *Streptomyces* spp. from soil sample<br>-Demonstrate antimicrobial activity and spectrum of the antibiotic |
| Medical Microbiology<br>(2 labs) | -Learn about common staphylococcal pathogens, including their culture, phenotypes and physiology<br>-Learn about common streptococcal pathogens, including their culture, phenotypes and physiology |
| Virology- bacteriophage isolation<br>(2 labs) | -Isolate coliphage viruses from sewage<br>-Learn about virus life cycles |
| Applied microbiology- standard qualitative analysis of water<br>(2 labs) | -Learn classical water quality analysis (MPN test) techniques<br>-Analyze local river water using technique to detect coliforms |