

MBIO 3032 - Microbiology III (physiology and metabolism)

The course will include an introduction to microbial growth and genomics approaches used for the analysis of microbial physiology and metabolism. Using these tools, the physiology of microbial cell walls, transport, and motility, as well as microbial metabolism as related to ATP production, respiration, fermentation and carbon fixation will be discussed. Not to be held with MBIO 3031 Prerequisites: MBIO 2020 (MBIO 2021) (C); and one of MBIO 2710, MBIO 2711, CHEM 2710, CHEM 2711 (C).



Course Instructor: Richard Sparling

Office: 414C Buller Bldg.

Office phone: 204-474-8320 (leave a message on my voice mail if I am not around)

Email address: Richard.Sparling@umanitoba.ca (**most** reliable way to reach me)

****you MUST use your U of M e-mail to correspond with professors****

For questions from individuals, either after class, or best, to e-mail me including the nature of the question(s). I usually answer the same day (within 24 hours except on weekends).

Students enrolled in this course must ensure they satisfy the following minimum technological requirements:

1. A computing device where one can create and edit documents,
2. An internet connection capable of streaming videos.
3. Some assignments and quizzes will be done on UM Learn

Class location: 201 Armes MWF 12:30-13:20 (7th of Sept to 12th of Dec. 2022)

Lecture material will be available as powerpoint slides on the UM Learn MBIO 3032 website prior to each lecture.

Lectures explaining the material of the powerpoints will be live, in person: Monday, Wednesday and Friday. Students are responsible for material in the powerpoints and lectures (**i.e. what is written and what I say**).

Occasional Fridays will be used for brief tests and midterms (see further instructions below).

Textbooks and other required materials for the lectures:

-Students are responsible for taking their own notes on the material presented orally in the lectures.

-They will have access to the PowerPoint slides that complement the lectures and the prerecorded lectures (available on the UM Learn page for this course).

-Brock Biology of Microorganisms 16th ed. is requested as a general resource for background information for most of the topics discussed (on-line version is fine, mastering microbiology will NOT be used). A significant proportion of the figures used in the course will be taken from that book. The text around these images serves as complementary background to the material presented in class.

-Occasional topical documents and web-based information will be added to complement the information presented in class.

Lecture Topics:

1. General Introduction to the course will be uploaded in anticipation of the first 'lecture' on the 8th of September.

2. Microbial Functional Genomics and 'omics Tools

- a. Genome Sequencing and Annotation
- b. Transcriptomics
- c. Proteomics
- d. Metabolomics
- e. Introduction to Systems Biology tools (KEGG, BioCyc, etc.)

3. Diversity of Microbial Metabolism

- f. Central Metabolism
- g. Fermentation
- h. Respiration, Electron Carriers and Proton Motor Force
- i. Carbon Fixation
- j. Nitrogen metabolism (catabolic and anabolic)

3. Microbial Growth and Physiology

- k. Peptidoglycan, Lipopolysaccharide
- l. Membranes and protein secretion
- m. Bacterial Cell Division
- n. Responding to the environment: Two Component Signal Transduction

4. Putting it all together

- a. Microbial communities as holobionts
- b. introduction to synthetic biology
(elements presented through some of the previous topics as well)
 - i. Directed evolution
 - ii. Minimal genomes and chassis organisms
 - iii. Designer pathways for novel products.

The order of topics will mainly be followed, but there will be some occasional deviation.

The primary learning out-comes expected are

- To develop a vocabulary to discuss how various genomic and functional genomic tools can be used to understand the metabolic and ecological diversity of prokaryotic microorganism.
- To learn various examples of the diversity of metabolic potentials available to microorganisms.
- To learn how microorganisms build-up their structure, and understand how elements of the structure affect antibiotic sensibility and resistance, as well as interaction to the outside world.
- To appreciate how the information above can be applied to understanding microbial communities.
- Using examples learned, to understand how information on genomics, metabolism and physiology can be used for industrial applications.

Evaluations:

- *-3 Short quizzes will be carried out through UM Learn out of class time*
- *-All evaluations must be completed in the allotted time (see below).*
- *-For quizzes, to permit flexibility students can choose to write at any time between 8:00 and 22:00 on the days (Fridays) indicated below.*
- *-To mitigate the temptation of academic dishonesty while providing you with start time flexibility:*
- *-Students quiz questions will be generated randomly from a bank of questions prepared for each specific test and exam (i.e. not everyone will get the exact same questions, nor will they necessarily be in the same order).*
- *-Once an answer or cluster of answers is submitted, you will not be permitted to go back and modify your answer as you proceed to the next question.*
- **Quizzes:** A brief (3-4 questions each) mix of true or false, multiple choice and short answer questions on the material since the previous test/midterm
- Duration 15 min each. Each worth 5 pts:
- Quiz 1, 23th of September
- Quiz 2, 21nd of October
- Quiz 3, 25th of November
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UM Learn quizzes are 'open book'.

HOWEVER, tests, including the time allotment per question, were designed to make searching through materials and notes an unnecessary time sink to answer.

-Definition of 'open book' for this course: you may access **your** notes to answer questions. You **may not** access content from external sources (books, internet, friends, chat groups)

Copying and pasting answers directly taken from external sources (including text books, the class ppt slides and the internet) during quizzes and assignments is considered plagiarism, which is a form of cheating.

-2 Midterms (closed book) will be written during class time with hand-written answers on paper

-Each worth 15% of the final grade.

-A mix of true or false, multiple choice and short answer questions. Some questions will measure recall of materials, some will require critical thinking about the material presented and integration of various elements from different lectures.

Duration 50 min.

Midterm 1, Friday the 7th of October

Midterm 2, Friday the 4th of November

There are NO deferred quizzes midterms. If you are not available to write within the time, the value of the final exam, which is cumulative, will be increased accordingly. NO explanatory note is expected

1 Assignment

Worth 5%. Due on the 9th of December (last day of Class). Instructions will be provided by the 29th of November.

Final Examination is cumulative closed book and hand-written

at the time scheduled by the Registrar's office during the December exam period

Final cumulative exam (3 hours) 50%

It will be in-person

The examination will consist of a mix of questions similar to those of the mid-terms, plus several longer answer questions. Some questions will measure recall of material, some will require critical thinking about the material presented, and some questions will test integration of various elements from different lectures.

Letter grades will only be assigned at the end of the term. Letter grades are assigned taking into consideration the grade distribution in the class and the University of Manitoba's descriptors A⁺ (Outstanding), A (Excellent), B⁺ (Very Good), B (Good), C⁺ (Satisfactory), C (Adequate), D (Marginal), F (Failure)

see <http://umanitoba.ca/student/records/grades/686.html>

Typical low-numerical-boundaries for the letter grades:

A+	90%-100
A	80%-89.9
B+	75%-79.9
B	70%-74.9
C+	65%-69.9
C	57%-64.9
D	50%-56.9
F	< 50%

Richard Sparling holds copyright over the course materials, presentations and lectures which form part of this course. Course materials (both paper and digital) are for the participant's private study and research, and may not be posted anywhere, including, but not limited to social media platforms, free and business websites, test banks etc.

Academic Dishonesty:

The Faculty of Science regards acts of academic dishonesty in quizzes, tests, examinations, laboratory reports or assignments as serious offences and may assess a variety of penalties depending on the nature of the offence. Acts of academic dishonesty include but are not limited to bringing unauthorized materials into an exam, copying from another individual, sharing screenshots during exams, using answers provided by tutors, forging documents, plagiarism, and examination personation. Guidelines are stated in your calendar regarding University policy with respect to academic dishonesty (particularly plagiarism and cheating) and behaviour and absence from final exams.

Please view information with regards to academic integrity.

Be aware; be proactive; be smart and be honest.

The Student Discipline By-Law may be accessed at:

<https://umanitoba.ca/student-supports/academic-supports/academic-integrity>

The list of suggested minimum penalties assessed by the Faculty of Science for acts of academic dishonesty is available on the Faculty of Science webpage:

[Microsoft Word - Acad Dishon TABLE RevCSS AdminC Jul2012 WEB.doc \(umanitoba.ca\)](#)

Student Accessibility Services:

The University of Manitoba is committed to providing an accessible academic community. [Accessibility | University of Manitoba \(umanitoba.ca\)](#) offers academic accommodation supports and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation.

Student Accessibility Services

520 University Centre

Phone: (204) 474-7423

Email: Student_accessibility@umanitoba.ca

STUDENT RIGHTS AND RESPONSABILITIES:

Writing and Learning Support

The Academic Learning Centre (ALC) offers writing and learning supports to help you throughout your academic program. Make an appointment with an ALC writing tutor who can give you feedback at any stage of the writing process, whether you are just beginning to work on a written assignment or already have a draft.

The ALC also has an English as an Additional Language (EAL) specialist available to work with students on improving their English-language academic writing skills. Consult an ALC learning specialist or attend an academic skills workshop to improve your time management, learning strategies and test-taking strategies.

Get support in select courses by making an appointment with an ALC content tutor. The ALC also offers peer-facilitated study groups called Supplemental Instruction (SI) for certain courses that students have typically found difficult. In SI study groups, students ask questions, compare notes, discuss content, solve practice problems, and develop new study strategies in a group-learning format. In addition to one-to-one and group sessions, you can also find writing and study tip sheets and videos on the ALC website.

Academic Learning Centre services are free for U of M students. For more information, please visit the Academic Learning Centre website at:

<http://umanitoba.ca/student/academiclearning/>

University of Manitoba Libraries (UML)

Research begins at UM Libraries. Learn at the Libraries is a great place to start, with information for students on academic writing, how to search the library, evaluating resources, and writing citations. As the primary contact for all research needs, your liaison librarian can play a vital role when completing academic papers and assignments. Liaisons can answer questions about locating appropriate resources or managing citations, and will address any other concerns you may have regarding the research process. Liaisons can be contacted by email or phone, and are also available to meet with you online. When working remotely, students can also receive help online through Ask Us! chat. For further detail about the libraries' services and collections, visit the Libraries' web site.

For 24/7 mental health support, contact the Mobile Crisis Service at 204-940-1781.

Student Counselling Centre

Contact SCC if you are concerned about any aspect of your mental health, including anxiety, stress, or depression, or for help with relationships or other life concerns. SCC offers crisis services as well as individual, couple, and group counselling. Student Counselling Centre:

<http://umanitoba.ca/student/counselling/index.html>

474 UMSU University Centre or S211 Medical Services Building
(204) 474-8592

Student Support Case Management

Contact the Student Support Case Management team if you are concerned about yourself or another student and don't know where to turn. SSCM helps connect students with on and off campus resources, provides safety planning, and offers other supports, including consultation, educational workshops, and referral to the

STATIS threat assessment team.

<http://umanitoba.ca/student/case-manager/index.htm>

1520 UMSU University Centre

(204) 474-7423 (Student Support Intake Assistant)

University Health Service

Contact UHS for any medical concerns, including mental health problems. UHS offers a full range of medical services to students, including psychiatric consultation. Note that due to fire displacement, UHS is unable to provide in-person medical care on the Fort Garry Campus until October, 2020.

University Health Service <http://umanitoba.ca/student/health/>

(204) 474-8411 (Business hours or after hours/urgent calls)

Health and Wellness

Contact our Health and Wellness Educator if you are seeking information on health topics, including physical and mental health concerns, alcohol and substance use harms, or sexual violence. You can also access peer support from a Healthy U peer health educator.

Health and Wellness Educator

<https://umanitoba.ca/student/health-wellness/welcome-about.html>

britt.harvey@umanitoba.ca

469 UMSU University Centre

(204) 295-9032

Sexual Violence Resource Centre

Contact SVRC if you have experienced sexual violence or are seeking information about how to help somebody else. SVRC provides inclusive, survivor-centred, trauma-informed services, such as consultation, referrals, safety planning, and a range of on-site supports, including counselling by Klinik.

Sexual Violence Resource Centre

<https://umanitoba.ca/student-supports/sexual-violence-support-and-education>

svrc@umanitoba.ca

537 UMSU University Centre

(204) 474-6562 (Sexual Violence Intake and Triage Specialist)

A notice with respect to copyright:

All students are required to respect copyright as per Canada's Copyright Act. Staff and students play a key role in the University's copyright compliance as we balance user rights for educational purposes with the rights of content creators from around the world. The Copyright Office provides copyright resources and support for all members of the University of Manitoba community.

Visit <http://umanitoba.ca/copyright> for more information.

Your rights and responsibilities

As a student of the University of Manitoba you have rights and responsibilities. It is important for you to know what you can expect from the University as a student and to understand what the University expects from you. Become familiar with the policies and procedures of the University and the regulations that are specific to your faculty, college or school.

The Academic Calendar

<http://umanitoba.ca/student/records/academiccalendar.html>

is one important source of information. View the sections University Policies and Procedures and General Academic Regulations.

While all of the information contained in these two sections is important, the following information is highlighted.

- If you have questions about your grades, talk to your instructor. There is a process for term work and final grade appeals. Note that you have the right to access your final examination scripts. See the Registrar's Office website for more information including appeal deadline dates and the appeal form

<http://umanitoba.ca/registrar/>

- You are expected to view the General Academic Regulation section within the Academic Calendar and specifically read the Academic Integrity regulation. Consult the course syllabus or ask your instructor for additional information about demonstrating academic integrity in your academic work. Visit the Academic Integrity Site for tools and support

<http://umanitoba.ca/academicintegrity/>

View the Student Academic Misconduct procedure for more information.

- The University is committed to a respectful work and learning environment. You have the right to be treated with respect and you are expected conduct yourself in an appropriate respectful manner. Policies governing behavior include the:

Respectful Work and Learning Environment

http://umanitoba.ca/admin/governance/governing_documents/community/230.html

Student Discipline

http://umanitoba.ca/admin/governance/governing_documents/students/student_discipline.htm

and,

Violent or Threatening Behaviour

http://umanitoba.ca/admin/governance/governing_documents/community/669.html

- If you experience Sexual Assault or know a member of the University community who has, it is important to know there is a policy that provides information about the supports available to those who disclose and outlines a process for reporting. The Sexual Assault policy may be found at:

http://umanitoba.ca/admin/governance/governing_documents/community/230.html

More information and resources can be found by reviewing the Sexual Assault site <http://umanitoba.ca/student/sexual-assault/>

For information about rights and responsibilities regarding Intellectual Property
view the policy:

https://umanitoba.ca/admin/governance/governing_documents/community/235.html

For information on regulations that are specific to your academic program, read the section in the Academic Calendar and on the respective faculty/college/school web site <http://umanitoba.ca/faculties/>

Contact an Academic Advisor within our faculty/college or school for questions about your academic program and regulations
<http://umanitoba.ca/academic-advisors/>

Student Advocacy

Contact Student Advocacy if you want to know more about your rights and responsibilities as a student, have questions about policies and procedures, and/or want support in dealing with academic or discipline concerns.

<http://umanitoba.ca/student/advocacy/>

520 University Centre

204 474 7423

student_advocacy@umanitoba.ca