Spring 2-1-2022

BIOM 535.01: Advanced Virology

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Syllabus
BIOM 535 Advanced Virology

[redacted] COURSE INFORMATION:

1. CRN: 31893
2. Credits: 3
3. Term: Sp 2022
4. Day/time: MWF; 2:00PM-2:50PM
5. Building/room: Health Sciences 207
6. Zoom link (UM login required): https://umontana.zoom.us/j/91421403378

[redacted] INSTRUCTOR CONTACT INFORMATION:

1. Brent Ryckman
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6. Office hours: By appointment.

[redacted] COURSE SUMMARY:

A. Course Description:

1. This course is offered concurrent with Virology BIOM 435. This syllabus an addendum for students enrolled in BIOM 535 Advanced Virology.
2. Graduate scholars are expected to begin making increasing contributions to their field of study. In general, this means mastering the principles of the field (i.e., the currently accepted "facts"), and then developing novel ideas to advance the field. This means giving critical thought to the material presented, and thinking about it in new ways, asking deeper questions, reorganizing the facts to find novel meanings etc., etc.
3. To facilitate growth as a scholarly contributor to your field of study, and sharpen skills of critical thought and creativity the activities outlined below are added to the course material of BIOM 435 (also see the BIOM 435 syllabus).

ASSIGNMENTS, ASSESSMENTS AND GRADING:

A. Students are responsible for all assignments noted in Syllabus BIOM 435 Virology

B. Specific Aims assignment (50 points total)

1. Overview

a) Select a virology topic of your choice and write one research grant "Specific Aim." Most likely you will base your aim on a recent paper(s) that you find interesting.

b) At the end of the semester aims will be presented to the class followed by an open discussion

2. Written component (40 pts)

a) The driving force behind biomedical research is the creativity of independent scientists. Most virology research in the United States is funded by agencies such as National Institutes of Health (NIH) or National Science Foundation (NSF). "Peer-review" committees (comprised of scientists from around the country), assess the strengths and weaknesses of grant applications, and this largely determines which projects are funded. Successful grant applications clearly state the research questions, and what will be done to address them. The "Specific Aims: of the research approach is where the scientist describes what they will actually DO with the research funds requested, and what they expected to learn from the data. This includes:

(1) the experimental approaches that will be used, and any necessary controls

(2) the nature of data to be produced

(3) the range of likely results or data

(4) how the results/data will be interpreted

(5) the potential drawbacks or limitations of the approach

(6) possible alternative approaches

b) The goal of the Specific Aims of a grant is to clearly convey what you plan to do, and what will be learned, and convince the review committee that you clearly understand the methodologies, and have the creativity and knowledge to deal with unanticipated complications such that useful information will be obtained in any event.

c) In general, aims can be described as **either "hypothesis-driven"** or "descriptive." Descriptive aims are those that involve a search for something (aka "fishing expeditions"), or collection of data without any clear sense of meaning or significance. Such aims are usually not very compelling because it is difficult to know if any useful information will be gained. In contrast, hypothesis-driven aims generate more enthusiasm because they are based on a set of clear questions. A well-designed, hypothesis-driven aim will yield useful information no matter what the results. Of course, descriptive research can be important to lay the foundations of hypothesis-driven research. In general though, granting agencies expect that the descriptive work has already been done and included in the application as "preliminary data.".

d) FORMATING

(1) Submit to Moodle-link. Word file (preferred) or PDF.

(2) 2000 words max

(3) Recommended organization:

(a) Title of Aim

(b) Rationale (including necessary summary of background and significance)

(c) Experimental design (note: not experimental "details")

(d) Expected outcomes and interpretations.

(e) Caveats and alternative approaches

3. Oral presentation component (10 points)

a) Approximately 10 minutes followed by 5 minutes for questions and discussions.

C. Topics in Virology; BIOB 596

1. A corequisite for BIOM 535.
2. Most students will use this literature-based independent to inform their Specific Aims assignment for BIOM 535.

D. Learning Outcomes

1. Independently formulate "principles" of virology.
2. Formulate discrete and abstract questions based on individually formulated "principles".
3. Perform independent research of information sources such as the internet to explore individually formulated questions.
4. Fill in the blank-labels on a diagram of the Baltimore virus classification scheme.
5. Cite at least two examples of molecular biology "principles" that were discovered by studying viruses.
6. Distinguish the terms "susceptible", "resistant" and "permissive" with respect to potential host cells.
7. Explain the term "cytopathic effects" in the context of viral replication.
8. List at least two distinct ways of quantifying viruses as physical entities, and two distinct ways of measuring viruses as replicating entities.
9. Calculate multiplicity of infection using given information/data.
10. Identify the, eclipse, latent/lag, exponential and plateau phases of a viral replication curve
11. Match the terms icosahedral, helical, naked and enveloped to diagrams of representative viral particles.
12. Distinguish the terms "affinity" and "avidity" with respect to viral receptor interactions.
13. Explain the fundamental differences in entry mechanisms between enveloped and naked viruses.
14. Identify what types of *purified* viral genomic nucleic acids are infectious when delivered into cells by transfection methods.
15. Explain why RNA viruses are generally more prone to mutations than DNA viruses
16. Distinguish reassortment from recombination as mechanisms of RNA virus evolution.
17. Explain at least one mechanism by which RNA viruses switch from mRNA production to genome replication.

18. Compare and contrast the autoregulatory and temporal cascade mechanisms of DNA virus gene expression regulation.
19. Explain the relationship between alternative RNA splicing mechanisms of HIV and nuclear export of viral RNA molecules.
20. Explain at least one mechanism of how viruses inhibit or suppress host gene expression.
21. Explain at least one mechanism by which viruses expand their genetic coding capacity at the level of mRNA translation.
22. Explain the term “concatamer” as it relates to viral DNA replication.
23. Describe three priming mechanisms for viral DNA replication.
24. Explain the concept of “self-assembly” of viral particles.
25. Compare and contrast cell-to-cell viral spread and cell-free viral spread.
26. Match a list of general events in viral pathogenesis with a list of viral, host and environmental factors that influence the event.
27. Distinguish intrinsic host defenses, innate immunity and adaptive immunity.
28. Distinguish acute and persistent infections using given data.
29. Explain at least one mechanism of viral immune evasion.
30. Explain why DNA viruses often affect the regulation of the cell cycle, and how this relates to the development of cancer.
31. Obtain primary research articles from internet sources such as PubMed
32. Critically evaluate the strengths and weaknesses of primary research articles.

Grading (approximate, subject to change)

	Semester total per assessment tool	**Percent of final grade**
Unit Quizzes	**110**	**36.7**
Unit Principles, questions, research articles; written assignments	**110**	**36.7**
Discussion Participation	**30**	**10**
Specific aims	**50**	**16.7**
Semester Total	**300**	**100**

Final grade	Final Score	Percentage
A	**279 – 300**	**93-100**
A-	**270 – 276**	**90-92**
B+	**261 – 267**	**87-89**
B	**249 – 258**	**83-86**
B-	**240 – 246**	**80-82**
C+	**231 – 237**	**77-79**
C	**219 – 228**	**73-76**
C-	**210 – 216**	**70-72**
D+	**201 – 207**	**67-69**
D	**189 – 198**	**63-66**
D-	**180 – 186**	**60-62**
F	**<180**	**< 60**

[redacted]ACCESSIBILITY, DISABILITIES, AND SPECIAL ACCOMMODATIONS:

The University of Montana 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 the ODE at: (406) 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.

[redacted]UM CULTURAL LEAVE POLICY

Cultural or ceremonial leave allows excused absences for cultural, religious, and ceremonial purposes to meet the student's customs and traditions or to participate in related activities. To receive an authorized absence for a cultural, religious or ceremonial event the student or their advisor (proxy) must submit a formal written request to the instructor. This must include a brief description (with inclusive dates) of the cultural event or ceremony and the importance of the student's attendance or participation. Authorization for the absence is subject to approval by the instructor. Appeals may be made to the Chair, Dean or Provost. The excused absence or leave may not exceed five academic calendar days (not including weekends or holidays). Students remain responsible for completion or make-up of assignments as defined in the syllabus, at the discretion of the instructor.