Spring 2-1-2019

BIOM 535.01: Advanced Virology

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Syllabus
BIOM 535: Advanced Virology

COURSE INFORMATION:

- CRN: 33083
- Credits: 3
- Term: Spring 2019
- Day/time: MWF; 2:00PM-2:50PM
- Building/room: Health Sciences 411

INSTRUCTOR CONTACT INFORMATION:

Brent Ryckman

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- Office hours: By appointment, or 12PM-1:50PM; WF. (If I am not in my office, check down the hall in my lab, ISB 206.)

COURSE SUMMARY:

A. Course Description:

- This course is offered concurrent with Virology BIOM 435. What follows here is an addendum for students enrolled in BIOM 535 Advanced Virology. As graduate scholar, you are expected to begin making increasing contributions to your field of study. In general, this means mastering the principles of the field (i.e., the currently accepted "facts"), and then *developing your own 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. To facilitate your growth as a scholarly contributor to your field of study, and sharpen your 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).

B. Learning Outcomes

After this course students should be able to (in no order of importance):

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

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

ASSIGNMENTS AND ASSESSMENT, AND GRADING:

A. Specific Aims Assignment: *IN LIEU OF THE TERM PAPER ASSIGNMENT OF BIOM 435*, select a virology topic of your choice and write one specific aim. Most likely you will base your aim on a recent paper that you find interesting. At the end of the semester, you will present your aim to the class followed by an open discussion.

a) Written aim due last week of semester.
b) Submit via. (Word file or PDF)
c) 2000 words max
d) *Recommended* organization:
    A. Rationale (including necessary summary of background and significance)
    B. Experimental design (note: not experimental “details”)
    C. Expected outcomes and interpretations.
    D. Caveats and alternative approaches.

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” section 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:

- the experimental approaches that will be used, and any necessary controls
- the nature of data to be produced
- the range of likely results or data
- how the results/data will be interpreted
- the potential drawbacks or limitations of the approach
- possible alternative approaches.

The goal of the Specific Aims section 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.

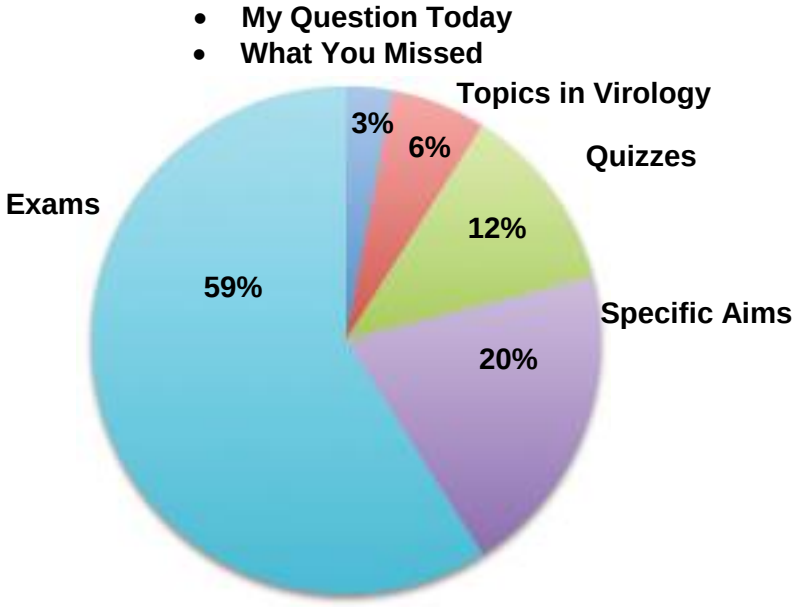
In general, aims can be described as either "hypothesis-driven" or "descriptive." Descriptive aims are those that involve a search for something (aka "fishing expeditions"), or collection of data without any clear sense of meaning or significance. Such aims are usually not very compelling because it 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.".

B. Topics in Virology;BIOB 596: *IN LIEU OF THE PRIMARY LIT REVIEW ASSIGNMENT OF BIOM 435*, you will participate in a weekly virology journal club with graduate students and postdoctoral fellows who are engaged in active virology research on campus (meeting times and locations for virology journal club are decided first week of the semester). Each week one person selects a current virology research article and presents it to the group for critical discussion."

G. Grading (approximate; subject to change):

	Semester total per assessment tool	Percent of final grade
My Question Today	10	2
What You Missed	6	1
Topics in Virology	30	6
Quizzes	60	12
Specific Aims	100	20
Exams	300	59
Semester Total	506	100

Final grade	Final Score	Percentage
A	**469 - 506**	**93-100**
A-	**454 - 468**	**90-92**
B+	**439 - 453**	**87-89**
B	**417 - 438**	**83-86**
B-	**403 - 416**	**80-82**
C+	**388 - 402**	**77-79**
C	**367 - 387**	**73-76**
C-	**352 - 366**	**70-72**
D+	**337 - 351**	**67-69**
D	**317 - 336**	**63-66**
D-	**302 - 316**	**60-62**
F	**< 301**	**< 60**



Disability Services

The University of Montana assures equal access to instruction by supporting collaboration between students with disabilities, instructors, and Disability Services for Students. If you have a disability that requires an accommodation, contact either of us at the beginning of the semester so that proper accommodations can be provided. Please contact Disability Services for Students if you have questions, or call Disability Services for Students (DSS) for voice/text at 406.243.2243. You may also fax the Lommasson Center 154 for more information at 406.243.5330.

Topics covered as time permits

	Flint chapters
1. General perspectives on viruses	V.1, Ch.1-3
2. Methods of studying viruses	V.1, Ch.1-3
3. Virus structure	V.1, Ch. 4
4. Initiation of infection	V.1, Ch. 5
5. Gene expression/genome replication	V.1 Ch. 6-11
6. Assembly, egress and spread	V.1, Ch. 13
7. Pathogenesis	V.2, Ch 1, 2
8. Host defenses/viral immune evasion	V.2, Ch 3,4,5
9. Viruses and cancer	V.2, Ch. 7