

Welcome to the First Exam!

BNFO 300: Molecular Biology Through Discovery

The primary purpose of this exam is to serve as an educational tool. With this in mind, do not be surprised if some of the problems go beyond your present abilities and try to connect things you may not yet have connected. Still, almost all of the elements have been drawn from the problem sets and study questions. If you ask yourself, “*Have I seen something like this before?*” the answer is generally yes. Answer what you can and go as far as you can (and further) with the rest.

Don't allow yourself to get stuck! There are always ways of getting through or around a problem. It exists. Find it. If you find yourself going in circles, stop and ask for directions.

RULES OF THE GAME

- **Available resources:** This is an open book exam. It is an open notes exam. It is an open web exam. Most important, it is an open brain exam.
- **Unavailable resources:** ...but not an open people exam. If you disagree with my admonition, at least show your conviction by listing those with whom you had contact and why.
- **Major exception - Consultations:** Akhil, Vince, and I *are* open resources for this exam. We would be delighted to consult with you any time you feel the need. For this exam, librarians are also available for consultations. Discover how helpful they can be!
- **Ask questions that help me answer them:** Consultations that begin with “*I don't know what is going on*” are likely to end with “*I'm sorry to hear that.*” More successful consultations will begin with your setting forth the problem you're confronting, the steps you have taken to overcome it, and what you feel you need to make further progress.
- **How to consult:** E-mail, telephone, walk-in... all work. To the contact information on the web (click on *Who we are*), add the home phone 285-2447, open for business until 10:30 PM, every day including weekends. I'm often at VCU on weekends during the day.
- **Where to find the exam and related files referred to in the exam:** In your e-mailbox.
- **When to submit:** Your responses are to be submitted by **9 AM, Monday, January 24, and not a moment later.** Why? I am using this exam in part to assess who is seriously taking the course, because there is a list of people who would like to and have thus far been frozen out. Monday is the last day for add/drops. If I don't get an exam by the appointed time, I will conclude that your slot in the course would be better used by someone else, and you will be removed from the course.
- **What to submit:**
 - In general, electronic submission is preferred. Hard copy is a distinct second choice, but will not be refused.
 - If you send one or more attached files, ***be sure the filename begins with your last name*** (so I don't get a mailbox full of files named “Exam.doc”). **Any file submitted whose file name does not begin with the last name of the submitter will have its spirit extracted and placed inside a doll, which I will then stick pins in.**
 - ***Show your thought processes! No answer without reasons (except Q1-5).***
 - ***Any assertion that is not obvious must be cited, in your own words, no quotes.***

Preliminaries

1. If you have neither received nor given aid regarding this exam (apart from exceptions listed above), then **sign/provide your name**. Otherwise sign/provide someone else's name.
2. Have you read the instructions on page 1 of this exam? If you have, have you understood them? If you have not understood them, have you sent an e-mail to me describing how you are confused and requesting elucidation?
3. I have submitted the [Personal Questionnaire for this course](#).
(Hint: The answer to this question is yes, if true. The question is worth 47,000 points)
4. Go to the [course web page](#) and note the quote at the bottom from Richard Feynman. Which of the following best captures its meaning?
 - A. Don't believe anyone
 - B. Don't believe anyone until you have checked their credentials to determine whether they're likely to know what they're talking about.
 - C. Don't believe.
 - D. Don't.

Part I: Introduction to the Course

Please answer the questions for this part [online](#).¹

Part II: Introduction to the Course

The following resources may be helpful for answering the remaining questions:

- [How to Find Research Articles](#)
- [How to Find a Mentor](#)

Another suggestion: Read through all the remaining questions before starting to answer any of them.

5. Choose some topic that interests you and is at least tangentially related to molecular biology. Estimate how many articles have been written related to that topic, where the topic is the main focus of the article. The topic should be sufficiently broad that the number is greater than 6 but sufficiently narrow that the number does not exceed a couple of 100.

Here's an example of a bad topic: *DNA replication* (> 100,000 articles!)

Here's an example of a good topic: *Control of transcription during the development of facial characteristics in dogs*

Provide the topic, the number of articles, and the means by which you made the estimate.

¹ <http://www.people.vcu.edu/~elhaij/bnfo300/16/Units/Intro-course/exam1-course.html>

6. Find a review article concerning the topic you related in Question 5.

Provide a full reference² to the article and the means by which you found it.

7. You're looking for a research job, after having spent much of the past few years of your life studying mycobacteria. You want to stay with that field, but you fear that your choices are limited, as you feel compelled to live close by your ailing parents in Wilmington, DE (Delaware). You've decided a good strategy is to find some organization in Wilmington that has published recently on work related to mycobacteria (define "recently" as within the last 15 years).

Provide references² to one or more articles that fit your criteria, along with the name of the organization and the means by which you found all this information.

8. Find a faculty member at VCU whose research fits into the area you defined in Question 5. Feel free to work backwards, changing your area of interest to fit the interests of a particular faculty member, but make sure that your answers to Questions 5, 6, and 8 are consistent with each other.

Provide references² to one or more articles with the VCU faculty member as an author that demonstrates the connection with your area of interest. Also provide a brief explanation of why you chose this article and topic. What's so interesting?

Extra – in case you have the time and inclination

Suppose you are an editor at a respected scientific journal, and you are considering the following submission for publication:

*Mary had a little lamb, whose fleece was white as snow,
And everywhere that Mary went, the lamb was sure to go.
It followed her to school one day, which was against the rules.
It made the children laugh and play, to see a lamb in school.*

You're inclined to reject the manuscript out of hand. It is shorter than the usual submission to your journal, but the main objection is the lack of what you perceive to be the rigor required by a scientific article. But your heart softens, and you resolve to fulfill your calling as an editor by editing, rewriting the submission to meet your specifications. What follows is the first paragraph of what came of your effort, the **Results** section of an article in which *every assertion is connected to an observation*, either yours or someone else's, and *every observation is connected to the means by which it was produced*.

² A full reference should contain the names of all the authors (unless there are more than 10, in which case list the first two... and the last), the year, the title, the journal, the volume, and the inclusive page numbers. Provide also a link to the article or at least its abstract. So long as you provide all this information, any format is OK.

Cultural Impact of Human-Ovine Mutualism

Results

An adolescent human female (code-named "Mary") was tagged with a fluorescent protein for subsequent identification and then released. In random observations (n=7) over the course of a day, she was repeatedly observed within 2 meters of an animal with morphological characteristics typical of sheep [1]. The length of the animal's ischium (pelvis bone) to the scapula (shoulder bone) was measured repeatedly to be 18.7 cm, to be expected if the measurements were performed on a single specimen. This value places the animal in the smallest 5% of lambs in the 2010 U.S. lamb census [2].

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References

1. Reese WO (2009). Functional Anatomy and Physiology of Domesticated Animals. Fourth edition. Wiley-Blackwell, Danvers MA.
2. U.S. Bureau of Agronomic Statistics (2010). Morphological Assessment of Livestock. p.47. U.S. Government Printing Office, Washington DC.

Your task now is to complete the **Results** section of the manuscript, following the original as closely as possible but adhering to your high standards regarding evidence. Strangely, those high standards for some reason do not prevent you from making up any facts you may need and any references to justify those facts. So feel free.

Provide the Results and References sections.