

Midterm Exam Review

Structure of the exam:

The exam will be worth **75 points** total, and the questions will address four main areas of knowledge:

- **Vocabulary:** knowledge of terminology on biological, scientific, and social concepts. These sorts of questions are more about naming (think nouns, not verbs).
 - Total value of **20 points**.
 - Each question of this type will be worth one point.
 - Question types might include multiple choice, matching, fill-in-the blank, etc.
- **Biological Processes:** knowledge related to biological and health processes, independent of any social components (think verbs, not nouns).
 - Total value of **15 points**.
 - Each question of this type will be worth 1-2 points.
 - Question types may include interpreting or completing diagrams, listing steps in a process, or comparing and contrasting using short answers.
- **Race and Science in U.S. society:** knowledge relate to social aspects of science, race, and racism. This may include current or historical events (relates most closely to discussions).
 - Total value of **25 points**.
 - Each question of this type will be worth 2-5 points.
 - Question types may include short answers or brief (<1 page) essays.
- **Scientific Thinking:** knowledge related to experiments, data, and other pieces of the scientific process (relates most closely to labs).
 - Total value of **15 points**.
 - Each question of this type will be worth 1-4 points.
 - Multiple questions may relate to a single graph or experimental design.
 - Question types may include graph interpretation, short answer, finding errors, good lab practices, or summary statistics.

The exam will be administered in two parts:

- The **“at home”** portion will become available online at noon on Thursday, March 1.
 - This portion will be worth 40 points.
 - It will include the Race and Science in U.S. Society and Scientific Thinking questions.
 - This portion of the exam must be *handwritten* to receive full credit.
 - This portion must be turned in at the start of lab on March 3 to receive the second half.
- The **“in class”** portion of the exam will be completed in lab on Saturday, March 3.
 - This portion will be worth 35 points.

- It will include the Vocabulary and Biological Processes questions.
- This portion of the exam will be given to you when you turn in the first half.
- You will have 90 minutes to complete this part of the exam. Most students will be able to complete this portion within an hour.

What sorts of content might show up on the midterm?

- The exam will include content from January 8 (Week 1) through February 25 (Week 7).
 - Week 8 content on Health Disparities will be on the Final Exam.
- All assigned media, lab activities, and discussion topics are potentially fair game for the midterm exam!
 - Questions will most strongly relate to the **assigned media**. The *quiz questions* and *active learning exercises* in the lectures provide examples of the types of information that is important and the sorts of questions that may show up. They are intended to act as examples to help you practice for the style of questions I might have on the exam.
 - **Lab activities** will not be directly repeated, but the broad themes of those activities (e.g., importance of variation) or the things we repeat each week (e.g., creating hypotheses) might show up in a new context, especially in the Scientific Thinking questions.
 - **Discussion** questions will also not be directly repeated, but the response style requested in the Discussion Rubric is similar to how you will be evaluated on Race and Science in U.S. Society questions.
- The weekly Learning Goals guide the development of exam questions.
 - All learning goals relevant to the Midterm are shown on the next two pages.
 - The learning goals are distributed as follows (goal areas are “halved” if combined with another goal for a particular item):
 - Section A Goals: 11 (A-1), 7 (A-2), 7 (A-3)
 - Section B Goals: 2.5 (B-1), 3 (B-2), 2 (B-3)
 - Section C Goals: 0.5 (C-1), 1 (C-2)
 - The online lectures often show different, simpler goals at the beginning, but all of these “mini-goals” ultimately relate back to the main goals for the week.
 - A quick self-check guide to studying using the learning goals:
 - Do you understand what you should be able to do for each goal?
 - Look at the quiz questions or exercises and figure out which one(s) relate to each goal.
 - Now review the answers to see how they connect to the assigned media.
 - Finally, review the assigned media again by focusing on how they relate to the learning goals.
 - A more detailed example from a different class is listed after table of learning goals.

Learning Goals for Weeks 1-7 (each color is for a different unit):

Week	Topic	Learning Goals
1	Scientific Processes	<ul style="list-style-type: none"> • Name and give examples of the main steps in the scientific method (A-2, A-3) • Compare and contrast the scientific method with how scientists actually do science (A-2, A-3) • Identify common lab hazards and suggest ways to limit their impact on health and safety in class (A-2, A-3) • Construct a reasonable two-part hypothesis (A-2)
2	The Culture of Science	<ul style="list-style-type: none"> • Name the social features of science that help to ensure the reliability of scientific knowledge (A-1) • Identify the ways in which scientists' research can be influenced by societal conditions (B-2) • Discuss examples of controversy related to science and the roles of scientists and broader society in how these controversies play out (B-1, C-1) • Carry out calculations and use lab equipment necessary to prepare aqueous solutions (A-3) • Carry out and document an experiment to test a pre-existing hypothesis, evaluating the hypothesis in light of the data collected (A-2, A-3)
3	Biological vs. Racialized Traits	<ul style="list-style-type: none"> • Explain the roles of genes and proteins in producing biological traits (A-1) • Predict the inheritance of simple traits using an example relevant to questions of race (A-1) • Discuss race as it relates to genetic inheritance and racialized traits (B-1) • Formulate and test a hypothesis related to the effect of changing a standard protocol on the outcome of DNA extraction, and communicate the outcomes in writing (A-2)
4	Populations vs. Races	<ul style="list-style-type: none"> • Explain methods used to infer relationships among organisms and populations (A-1) • Distinguish between current biological knowledge of human diversity and disproven hypotheses about race in humans (A-1) • Differentiate between the biological definition of race and race as a social construct (B-1) • Reflect on preconceptions about race and biology using online communications skills (C-2) • Formulate and test a hypothesis about human diversity using publicly-available data (A-2) • Appropriately use means and standard deviations to summarize and interpret scientific data (A-3)

<p>5</p>	<p>Evolution vs. Eugenics</p>	<ul style="list-style-type: none"> • Describe evolution as well as the roles natural selection, heritability, and genetic drift play in its occurrence (A-1) • Recount the history of scientific racism and biological evidence that has disproven racist ideas held by early geneticists and eugenicists (B-2) • Discuss the experiences of racial groups that have experienced discrimination as a result of eugenic thinking and scientific racism (B-3) • Use appropriate methods in the collection and graphical analysis of human population data (A-3) • Test hypotheses related to human population data and communicate the outcomes and scientific interpretation in writing (A-2)
<p>6</p>	<p>Racism and Stress</p>	<ul style="list-style-type: none"> • Identify the parts of the hypothalamic-pituitary-adrenal axis and the role of each part in the response to stress (A-1) • Distinguish among trauma, acute stress, and chronic stress and their impacts (A-1) • Define epigenetics and describe how this new field relates both to discarded and more recent scientific ideas about race (A-1) • Discuss the role of science in revealing the impacts and legacies of racism and unequal power relations on human bodies and health (B-2) • Use appropriate methods for the collection, statistical analysis, and graphical analysis of data collected using a respirometer (A-3)
<p>7</p>	<p>Environmental Racism</p>	<ul style="list-style-type: none"> • Compare and contrast the effects of three different types of environmental pollutants on target tissues (A-1) • Explain the processes of bioaccumulation and biomagnification from an ecological perspective (A-1) • Define and discuss recent examples of environmental racism (B-3) • Correctly use a microscope for the collection of qualitative data on human cells (A-3) • Communicate the outcomes and scientific interpretation of a lab experiment orally (A-2)

Example of Studying a Single Lecture:

Note: This is only one possible example of how you can study the active lecture materials. This approach to studying is very systematic, so it will be thorough in helping to build connections across the material. This is aimed to help you better identify what parts of the material are giving you the most trouble. Once you do that, you can focus on studying the troublesome piece the most. If you have some other way that you prefer to study that works well for you, you should certainly use that!

Lecture Title/Day: What Causes Breast Cancer? (September 10, 2016)

Mini-Goals:

1. Describe what happens during each part of the cell cycle and how cancer may disrupt the cycle.
2. Name the anatomical features of the breast and their biological functions.
3. Distinguish among different types of causal and risk factors for cancer.

Mini-Goal Verbs:

1. DESCRIBE → Sounds like a “biological process” question?
2. NAME → Probably vocabulary?
3. DISTINGUISH → Probably biological process again?

Exercises/Activities:

Level 1 asks about how a gene mutation affect the cell cycle. Mini-Goal 1 is also asking about the cell cycle, so the Level 1 question is probably testing this knowledge.

Self-Check: Yes, this was a biological process question!

Level 2 has a data table to interpret and asks about whether alcohol is a causal factor and whether it is a risk factor, so this relates to Mini-Goal 3.

Self-Check: This question was a little bit of data interpretation and a little bit of biological process mixed together.

Activity Question 1 involves labeling a diagram of the breast using anatomical terms, so this is part of Learning Goal 2.

Self-Check: This is also biological process knowledge, because it's a diagram.

Activity Question 2 involves matching anatomical terms and their biological functions, so this is also Learning Goal 2.

Self-Check: This is more like the vocabulary knowledge I expected at first.

Relationship of Answers to Lecture Material:

Level 1: Tumor suppressor genes are described in Slide 7. All we know in general is that they inhibit cell division when not mutated. Slide 3 tells us what a mutation to the cell cycle can do in big-picture terms. Slides 5-7 all discuss the cell cycle itself and the involvement of checkpoints in regulating the cycle. So probably the tumor suppressor gene is involved in the checkpoints somehow.

Level 2: Causal factors and risk factors are introduced in Slide 11. We get a whole bunch of examples in Slide 12 and some discussion about how causes and risk are related in Slide 13. We haven't really looked at a data table before to interpret yet, but the information about how risk is determined (i.e., more of a factor is associated with higher rates of cancer in a population) and how causes are determined (i.e., the factor always leads to cancer) can help guide us in judging whether alcohol might be a risk factor in or cause of cancer.

Activity Question 1: Other breast diagrams are available in Slides 8-9 for comparison.

Activity Question 2: Slides 8-9 along with classroom discussion and reading of the textbook helped us figure out how the terms match with the descriptions.

Relationship of Learning Goals to Lecture Material:

Learning Goal 1: Slides 3-7.

Learning Goal 2: Slides 8-10, but personal lecture notes, the materials in the textbook, and materials from the activity (now on D2L) will probably also be needed.

Learning Goal 3: Slides 11-13.

Which Materials/Exercises/Activities Were Most Difficult For Me (Including this "connection building" work I just did)?

I realized when I was working on the Level 2 question that I didn't have as good an idea about risk factors and causes as I thought at first. I wasn't sure how to relate the data to the concept. Reading that table wasn't difficult for me, I just didn't know what it had to do with the question until I saw the instructor's answer.

What Can I Do to Improve that Weakness in the Time I Have Available?

On Monday night I am going to take a half hour after dinner to review my notes and the powerpoint descriptions about causal factors and risk factors to see if I can better understand why alcohol is a risk factor but not a causal factor, and why the data helps me get that information. I'm going to look at the table of examples as well. That table tells me an answer without the data, but I want to understand the bigger picture too because this question will not be exactly repeated on the exam.