## RUBRIC EVALUATE LESSON 31



## Part 2 Task Rubric

INFO-H5: Communicate scientific and/or technical information or ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).

LS1.A-H1: Systems of specialized cells within organisms help them perform the essential functions of life.

LS1.A-H4: Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and function even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (through negative feedback) what is going on inside the living system.

SC-H1: Much of science deals with constructing explanations of how things change and how they remain stable.

SC-H3: Feedback (negative or positive) can stabilize or destabilize a system.

|                               | Emerging  | Developing  | Proficient   |
|-------------------------------|---|---|--|
| Sample<br>Student<br>Response | So, why do athletes<br>have sore muscles<br>after they work out,<br>and how do the<br>muscles repair<br>themselves? Muscles<br>are composed of cell<br>structures called<br>myofibers.<br>When a muscle<br>contracts, its<br>myofibers slide past | So, why do athletes have sore muscles after<br>they work out, and how do the muscles<br>repair themselves? First, you probably need<br>to understand that the muscles are<br>composed of cell structures called<br>myofibers. Take a look at the myofibers on<br>the diagram below. | So, why do athletes have sore muscles after they<br>work out, and how do the muscles repair<br>themselves? First, you probably need to understand<br>that the muscles are composed of cell structures<br>called myofibers. Take a look at the myofibers on<br>the diagram below. |



each other in a coordinated manner; conversely, when the muscle relaxes, these myofibers slide past each other in the opposite direction.

So you're probably thinking, how exactly do tears get repaired? After exercise, the body responds to exercise-induced damage to muscle fibers by increasing a process called protein synthesis in the muscle cells.

This process of protein synthesis is also how milk helps you recover from soreness. The microtears damage the muscle fibers, and the muscle fibers undergo protein synthesis to be repaired. Proteins in milk are broken down into amino acids, and they enter the



The structure of the myofibers and the filaments within the myofiber help the muscle fiber function. For example, when a muscle contracts, its myofibers slide past each other in a coordinated manner; conversely, when the muscle relaxes, these myofibers slide past each other in the opposite direction.

So you're probably thinking, how exactly do these tears get repaired? After exercise, the body responds to exercise-induced damage to muscle fibers by increasing a process called protein synthesis in the muscle cells. You can see this graph from Lesson 27 shows protein synthesis happening. The studies showed that drinking protein drinks (at least for healthy people) increases the rate of protein synthesis above rest.



The molecular structure of the myofibers and the filaments within the myofiber help the muscle fiber function. For example, when a muscle contracts, its myofibers slide past each other in a coordinated manner; conversely, when the muscle relaxes, these myofibers slide past each other in the opposite direction. When muscles contract and relax during exercise, they undergo tiny microtears in their structure. These microtears are responsible for the feeling of muscle soreness. Take a look at this data from Lesson 26, that shows microtears in the bloodstream where they are transported to the myocytes.

Now this is the important part for you to know, when muscles recover from exercise, they also become larger and stronger in the process.

So basically, to wrap it up and make it all connect, as athletes move, their muscles contract and get little tears.. These microtears cause muscles to feel sore. The other important part is the proteins! The proteins in milk break down into amino acids, which are crucial for repairing skeletal muscle microtears to aid in exercise recovery.

![](_page_2_Figure_4.jpeg)

This process of protein synthesis is also how milk helps you recover from soreness. The microtears damage the muscle fibers, and the muscle fibers undergo protein synthesis to be repaired. Proteins in milk are broken down into amino acids, and they enter the bloodstream where they are transported to the myocytes. The myocytes use these amino acids in protein synthesis to make new muscle fibers and recover from the damage they had.

The body also increases the amount of a type of cell called a satellite cell at the site of the muscle fiber injury. This is part of stabilizing the muscle structure.

Now this is the important part for you to know, when muscles recover from exercise, they also become larger and stronger in the process. This happens through the release of several molecules called growth factors that send growth signals to the muscle cells. The process of the body increasing its strength in response to exercise is known as adaptation because the body adapts to the stress placed on it.

![](_page_2_Figure_8.jpeg)

So you're probably thinking, how exactly do these tears get repaired? After exercise, the body responds to exercise-induced damage to muscle fibers by increasing a process called protein synthesis in the muscle cells. You can see this graph from Lesson 27 shows protein synthesis happening. The studies showed that drinking protein drinks (at least for healthy people) increases the rate of protein synthesis above rest. They both showed that protein synthesis remains increased for at least 210 minutes after in one and 28 hours in the other.

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So basically, to wrap it up and make it all connect, as athletes move, their muscles contract and experience microtears. These microtears cause muscles to feel sore and we know that specialized cells, called satellite cells, go in and repair microtears. The other important part is the proteins! The proteins in milk break down into amino acids, which are crucial for repairing skeletal muscle microtears to aid in exercise recovery.

![](_page_3_Figure_2.jpeg)

This process of protein synthesis is also how milk helps you recover from soreness. The microtears damage the muscle fibers, and the muscle fibers undergo protein synthesis to be repaired. Proteins in milk are broken down into amino acids during digestion, and they enter the bloodstream where they are transported to the myocytes. The myocytes use these amino acids in protein synthesis to make new muscle fibers and recover from the damage they had.

The body also increases the amount of a type of cell called a satellite cell at the site of the muscle fiber injury. This is part of stabilizing the muscle structure which will help the body recover from the damage done to the muscle cells.

So the body has a number of negative feedback responses to help it recover from the microtears in muscle fibers that happen during exercise. Basically Immune cells move to the site of the muscle microtears and Immune cells help clear away damaged cells and reconstruct new muscle fiber cells. Satellite cells in the muscle fibers are also activated; these cells undergo cell division to differentiate into new muscle fiber cells. Finally, the

|                                 |   |  | muscle cells themselves increase their rate of<br>protein synthesis, which helps rebuild proteins in the<br>muscle fiber cells. All of these responses help the<br>myocytes regain a state of stability after they are<br>damaged.<br>Now this is the important part for you to know,<br>when muscles recover from exercise, they also<br>become larger and stronger in the process. This<br>happens through the release of several molecules<br>called growth factors that send growth signals to<br>the muscle cells. The process of the body increasing<br>its strength in response to exercise is known as<br>adaptation because the body adapts to the stress<br>placed on it. The body also has several additional<br>adaptations to exercise, such as increased lung<br>capacity, cardiac output, and capillary density.<br>So basically, to wrap it up and make it all connect, as<br>athletes move, their muscles contract and<br>experience microtears. These microtears cause<br>muscles to feel sore and we know that specialized<br>cells, called satellite cells, go in and repair microtears.<br>The other important part is the proteins! The<br>proteins in milk break down into amino acids, which<br>are crucial for repairing skeletal muscle microtears<br>to aid in exercise recovery. |
|---------------------------------|---|--|--|
| How to<br>Achieve This<br>Level | Student completes 0-2 out<br>of 5 Look-Fors | Student completes 3-4 out of 5 Look-Fors | Student completes 5 out of 5 Look-Fors   |

| Part 2 Look Fors   | Prompts to Support Students in Improving on Look Fors  |
|--|--|
| <ul> <li>Include multiple methods of communication, including models and evidence from the module (video plus graphics/diagrams, written report plus graphics/diagrams, or video with narration of a slideshow) (INFO-H5).</li> <li>You can use the class consensus model, data sets, and/or models from any other resources from the module.</li> </ul> | What specific evidence from the module did you choose to include in your presentation?   |
| Clearly communicate scientific information in a way that is appropriate for your chosen audience (INFO-H5).  | In your response, highlight direct scientific information you used from the module<br>that includes informal language. Use a different color to highlight formal language.                                       |
| Describe how exercise can destabilize muscle structure and function in the body and<br>how negative feedback mechanisms in the body and the consumption of milk can help<br>the body return muscle structure and function to its stable state (LS1.A-H4, SC-H3).   | How did you describe the feedback mechanisms associated with muscle structure<br>and function?<br>How did you describe how the presence or lack of milk nutrients can help the body<br>during exercise recovery? |
| Describe how the functions of multiple kinds of specialized cells contribute to muscle structure and function and to exercise recovery (LS1.A-H1).   | Identify at least three different kinds of specialized cells from the module resources and incorporate those into your presentation.   |
| Describe how much of the study of the human body involves tracking how various molecular factors in the body change or remain stable (SC-H1).  | In what ways did you include a reflection on stability and change in your response?  |

## To Support Students in Revising Their Tasks Based on Peer or Teacher Feedback

- Prior to submitting their work, hold a peer-feedback session using a protocol such as <u>Tell-Ask-Give</u> or with norms such as <u>SPARK</u>. Alternatively, students can utilize the Peer Feedback Form. Students can use this feedback to revise their presentations in this lesson and/or in the final unit performance task.
- After submitting their work and receiving feedback and a grade, hold a session for students to norm on the features of high-quality work. Choose three samples of student work (one Emerging, one Developing, and one Proficient), anonymize them, and distribute them to students. Ask students to analyze the three samples of work and annotate what features of the work are high-quality examples of the Look Fors and what features are not. Share the features of high-quality work students identified and ask them to point to specific examples in the work samples. Build a class list of features of high-quality work. Then, allow students time to revise their work based on the list they generated and resubmit it for a revised grade.