

TEACHER GUIDE

EXPLAIN LESSON 5



Module Question: *How is milk digested after it is consumed?*

What We Figure Out:

We figure out that the organs of the digestive system work together in a series of steps to break down nutrients in milk into smaller molecules. Various kinds of specialized cells in each of the organs contribute to this process.

3D Learning Objective:

Students **revise a model to describe the relationships between components** of the digestive system, including the **scale relationships** that show how **organs are made of systems of specialized cells that all contribute to the digestion of milk.**

Time estimate:

50 minutes

Materials:

Lesson 5 Student Guide

Targeted Elements

SEP:

MOD-H3:

Develop, **revise**, and/or use **a model based on evidence to illustrate** and/or predict **the relationships** between systems or **between components of a system.**

DCI:

LS1.A-H1:

Systems of specialized cells within organisms help them perform the essential functions of life.

LS1.A-H3:

CCC:

SPQ-H4:

Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale.



Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.

Directions



Part 1: Our Motivation

The goal of this individual review is for students to self-assess and identify gaps that exist in the model based on what they have learned so far in the module. Ask students to individually review their Class Consensus Model from Lesson 2 Student Guide Part 3: Creating Initial Models. This model shows what happens to milk in the digestive system after it is consumed.

Ask students if these models accurately reflect the new evidence they now have about digestion. Listen for:

- No, we have since identified the function of each organ in digestion, including how cells and enzymes contribute to the organ's function.

Build off student responses to share that they will revise their models using evidence gathered from previous lessons. Finally, point to the Driving Question Board. Share a few selected questions that align with what students will investigate in the upcoming lesson.

Example student questions or ideas that align with the lesson could include:

- We have made models of the digestive system, but what parts are we missing?
- What happens in the (organ) to help in digestion?
- How do cells contribute to digestion?

Students can record these questions on their Lesson 5 Student Guide Part 1: Our Motivation. This will help students understand how this lesson connects to what they were trying to figure out about the Module Phenomenon.



Part 2: Revising a Model of How Milk is Digested

Direct students to return to the Class Consensus Model of how milk is digested from Lesson 2. Have students form small groups. Share with students that in their small groups, they will revise their models to show what they have now figured out regarding the digestion of milk.

Remind students that the class used a specific set of conventions for the models in Lesson 2. Students showed boxes to represent parts of the digestive system, arrows to show how molecules in milk move from one part of the system to another, and zoom-ins that show what is happening on smaller scales.

Share with students that they can use their resources from throughout the module to help them revise these models. In small groups, have students brainstorm what new ideas they have, what they have learned, and how that may create change in their model before they build their new model. Allow students time to revise the models on their Lesson 5 Student Guide Part 2: Revising a Model of How Milk is Digested. As students work, circulate the groups to ask students pressing questions such as:

- What new ideas did you add to your model? What are you trying to show?
- What is the function of this organ? How are specialized cells contributing to the function of this organ?
- What are the sizes of the items you are representing in the model?
- What happens to (molecule) when it is in (organ)? How?
- What evidence from the previous lessons did you use to add this to your model?

FORMATIVE ASSESSMENT OPPORTUNITY

Students **revise a model to describe the relationships between components** of the digestive system, including the **scale relationships** that show how **organs are made of systems of specialized cells that all contribute to the digestion of milk**.

Assessment Artifacts:

- Students' models of how milk is digested (Lesson 5 Student Guide Part 2: Revising a Model of How Milk is Digested).

Look Fors:

- Student models show the interactions between components of the digestive system, including which molecules move from one component to the next (MOD-H1).
- Student models describe how specialized cells contribute to the function of an organ (LS1.A-H1).
- Student models show multiple levels of organization of the digestive system, including the system, organ, and cell levels (LS1.A-H3).
- Student models indicate the relative sizes of organs and cells (SPQ-H4).

Assessment Rubric:

	Emerging	Developing	Proficient
Sample Student Response	Student model shows: <ul style="list-style-type: none"> Some organs of the digestive system. 	Student model shows: <ul style="list-style-type: none"> Organs of the digestive system, including the mouth, stomach, small intestine, and large intestine. How milk moves from one organ of the digestive system to the next, and at each stage, it undergoes a change in its composition. 	Student model shows: <ul style="list-style-type: none"> Organs of the digestive system, including the mouth, stomach, small intestine, and large intestine. Zoom-ins show that each organ is made of cells that contribute to the function of the organ. Each component of the model has an indication of its size. How milk moves from one organ of the digestive system to the next, and at each stage, it undergoes a change in its composition.
How to Achieve This Level	Student completes 0-1 out of 4 Look Fors	Student completes 2-3 out of 4 Look Fors	Student completes 4 out of 4 Look Fors

To Provide Additional Support for Students:

- Direct students' attention to the resources from previous lessons that contain information they might be missing from their models.
- Ask students to focus on one type of molecule at a time and track its journey through the digestive system instead of tracking multiple molecules simultaneously.
- Engage students in a peer feedback session. Provide students with the Look Fors, and use a protocol such as [Tell-Ask-Give](#) or norms such as [SPARK](#). Students can use the Look Fors to provide feedback to each other on how they can improve selected Look Fors in their work.

CCC SUPPORT

SPQ-H4: Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale.

Students' models can include an indication of the size of each component of the model, as shown by scale bars. Students are using their understanding of orders of magnitude to apply the relative sizes of different length units (e.g., m, cm, um, nm) developed in Lessons 3-4 to the different structures in the digestive system.

After students have created their models, with details from their newly revised models, hold a whole-class discussion in which the class builds a Class Consensus Model. You can use the following steps:

1. Each group should select one or more reporters to share their model. Have the first group share their model and add one part to the consensus model. This can be one component, arrow, relationship, or any other feature the group wants to select.
2. The next reporters can agree with, disagree with, or revise parts of the model that have already been added or can add new parts. Continue this process until the full Class Consensus Model is built.
3. As students share, some strategies you can use to help the class build the consensus model are:
 - a. Helpful sentence starters such as:
 - i. We agree with _____'s group, and we also want to add _____.
 - ii. We disagree with _____'s group because _____.
 - iii. We would like to change _____ because (evidence).
 - b. Use discussion prompts such as asking the class:
 - i. Is there anything else that needs to be added to this component before we move on?
 - ii. How does this idea fit with what is currently on the model?
 - iii. What evidence do you have for _____?

As you build the class model, if you find disagreements, follow these steps to help resolve the disagreement:

1. Summarize the two sides.
2. Ask the students to pause and reflect on their reasonings to be on that side.
3. Prompt students to again re-discuss the area of disagreement.
4. If students still disagree, suggest that we can represent areas of disagreement on the class model with question marks or other annotations of uncertainty.

TEACHER SUPPORT

The Class Consensus Model will be revised one more time in the next lesson to add an additional body system, the circulatory system. Later in the unit, students will add additional body systems and their specialized cells to track the movement of many different types of molecules throughout body systems as the body responds to exercise and as the molecules in milk travel through various organs as a part of metabolism. Accordingly, in Module 2, this model will become one of two “metabolism models.” The models will become quite large, taking the form of a mural. As a result, you may want to draw this model on a much larger, permanent surface, such as a large piece of butcher paper, a series of chart papers attached together, or a bulletin board.

CCSS SUPPORT

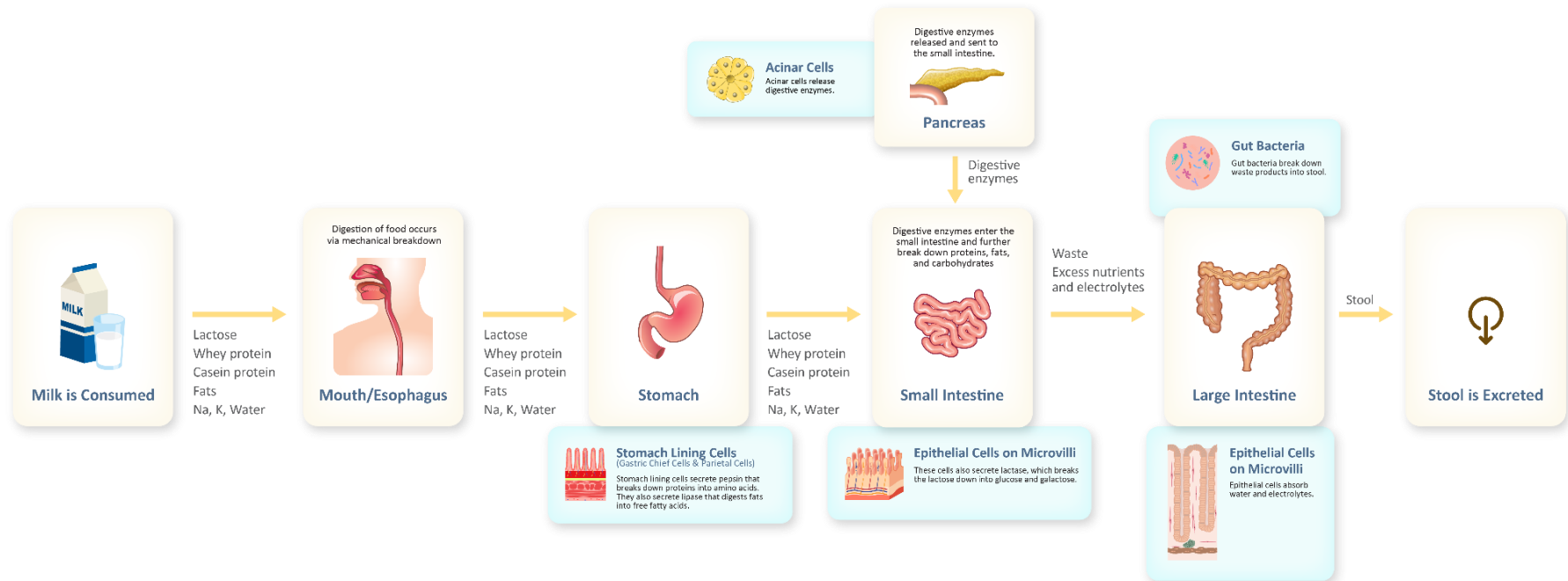
SL 9-10.1(d) Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

In the Class Consensus Model, students will utilize the skills associated with this standard to come to an agreement on what the model should look like. Utilize the sentence starters provided to support students in skill development.

Here is one example of what a Class Consensus Model may look like, though you will want to follow the ideas of your class rather than drive them to this exact model. Students will copy the final Class Consensus Model on their Lesson 5 Student Guide Part 2: Revising a Model of How Milk is Digested.

After the class discussion, point out the different scales of organization in the class model, including the digestive system, each of its organs, and the different types of cells. Name this relationship between the digestive system, organs, and cells as a **hierarchy of organization**.

Example Class Consensus Model



After building the Class Consensus Model, allow students time to reflect on what strengths the model shows and what still seems to be missing to help them answer the Module Question, *How is milk digested after it is consumed?* Facilitate the conversation such that students agree that:

- The model does show how the molecules in milk are digested in different parts of the digestive system.
- The model does not show what happens to some of the molecules after they are digested. For example, the lactose, amino acids, and fatty acids that go into the small intestine seem to not go anywhere else.



Part 3: Asking New Questions

As a final step in this lesson, students will create a new list of questions to help them determine additional information they need to know to help them figure out how milk is digested. They can write these questions on their Lesson 5 Student Guide Part 3: Asking New Questions. Add these questions to the appropriate categories of the Driving Question Board so they can continue to be referenced in the coming lessons.

To facilitate students asking questions, use the Question Formulation Technique.

1. With their group, students take 5 minutes to brainstorm questions about what they need to know about how milk is digested.
2. Students then look at all their questions and choose the 3-5 questions they think are most important to be answered to help them figure out the Module Question.
3. A representative from each group will then share their prioritized questions with the whole class. As students share their prioritized questions, they will add them to the Driving Question Board.

LOOK FOR

In student responses, listen for the following ideas:

- What happens to fatty acids, amino acids, and sugars in the small intestine?
- How do fatty acids, amino acids, and sugars help in recovery?
- Do fatty acids, amino acids, and sugars help in recovery in different ways?
- What happens to the body when exercising?