

Unit 3

Metabolic Reactions:

How do things inside our bodies
work together to make us feel
the way we do?

Student Work Pages





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How do things inside our bodies work together
to make us feel the way we do?

Student Work Pages

Core Knowledge Science



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Metabolic Reactions

How do things inside our bodies work together to make us feel the way we do?

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Science Classroom Norms

Classroom Norms	
Respectful Our classroom is a safe space to share.	• We provide each other with support and encouragement. • We share our time to talk. We do this by giving others time to think and share. • We critique the <i>ideas</i> we are working with but not the <i>people</i> we are working with.
Equitable Everyone's participation and ideas are valuable.	• We monitor our own time spent talking. • We encourage others' voices who we have not heard from yet. • We recognize and value that people think, share, and represent their ideas in different ways.
Committed to our community We learn together.	• We come prepared to work toward a common goal. • We share our own thinking to help us all learn. • We listen carefully and ask questions to help us understand everyone's ideas. • We speak clearly and loud enough so everyone can hear.
Moving our science thinking forward We work together to figure things out.	• We use and build on others' ideas. • We use evidence to support our ideas, ask for evidence from others, and suggest ways to get additional evidence. • We are open to changing our minds. • We challenge ourselves to think in new ways.

Name: _____

Date: _____

M'Kenna's Doctor's Note

Patient's Name: M'Kenna

Age: 13

Symptoms

Symptoms that started first ✓ Nausea ✓ Vomiting ✓ Abdominal cramps ✓ Diarrhea ☐ Constipation	Notes The patient complains that her stomach hurts after she eats and that she feels nauseated. Her parents say she eats regular meals but has suddenly started losing a lot of weight. The patient says she often has diarrhea and stomach cramping. She has a hard time breathing when she tries to play basketball and gets out of breath quickly. The patient complains of feeling tired and weak all the time.
Symptoms that started later ☐ Fever ✓ Fatigue ✓ Weight loss ☐ Fainting ☐ Weight gain ☐ Back pain ☐ Leg pain ✓ Muscle cramps ✓ Rapid heartbeat with exercise ☐ Swollen joints ☐ Difficulty walking or moving ☐ Confusion ☐ Dizziness ✓ Brain fog or difficulty concentrating ☐ Headaches ☐ Numbness ☐ Slow heartbeat ☐ Cold feet or hands ☐ Chest pain ☐ High blood pressure ✓ Difficulty breathing with exercise ☐ Difficulty breathing all the time ☐ Chest pain ☐ Wheezing ☐ Asthma	

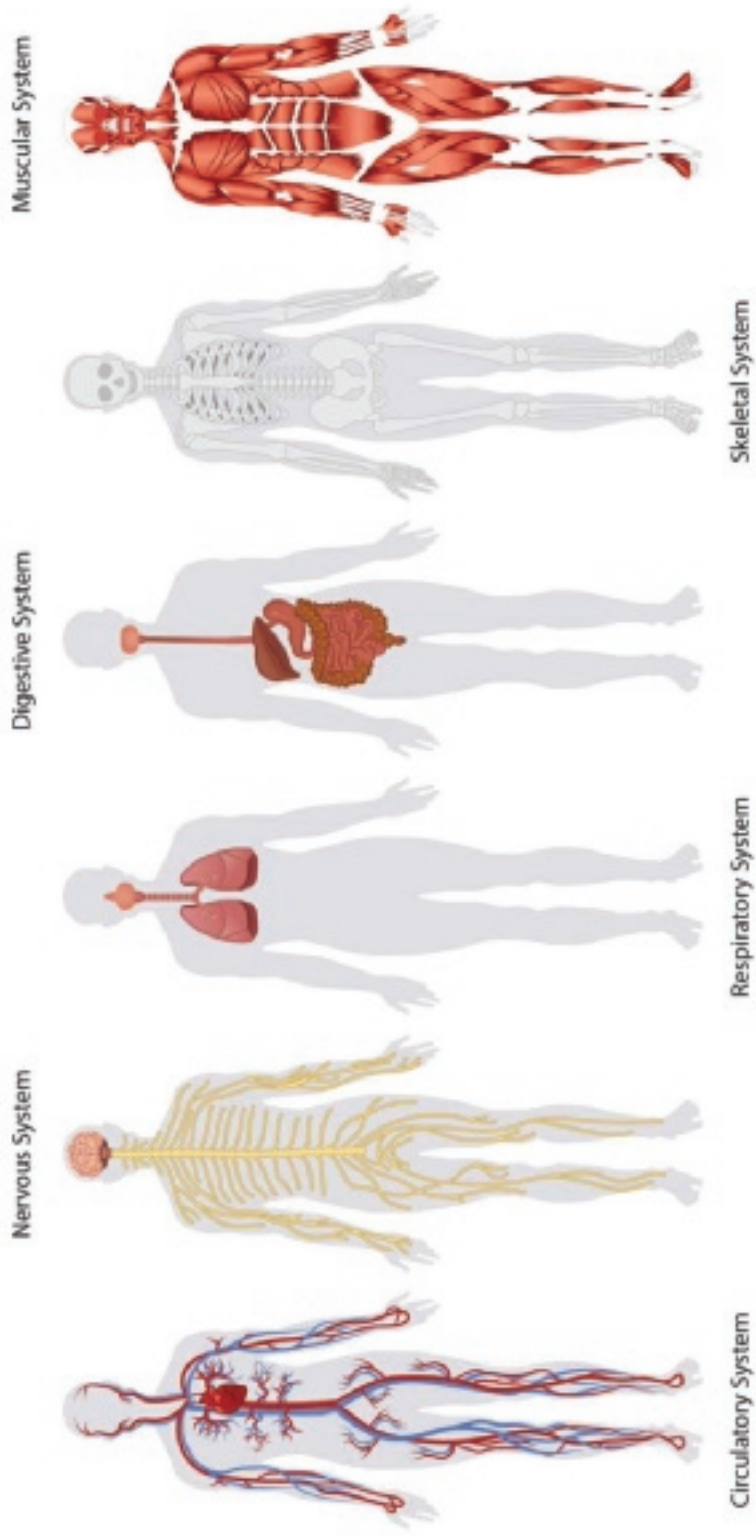
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Date: _____

Map M'Kenna's Symptoms to Her Body Systems

What parts of M'Kenna's body are being affected? Map M'Kenna's symptoms to where you **THINK** they occur. Write each symptom on the body system you think it is affecting.

- Record questions if you become stuck.



Name: _____

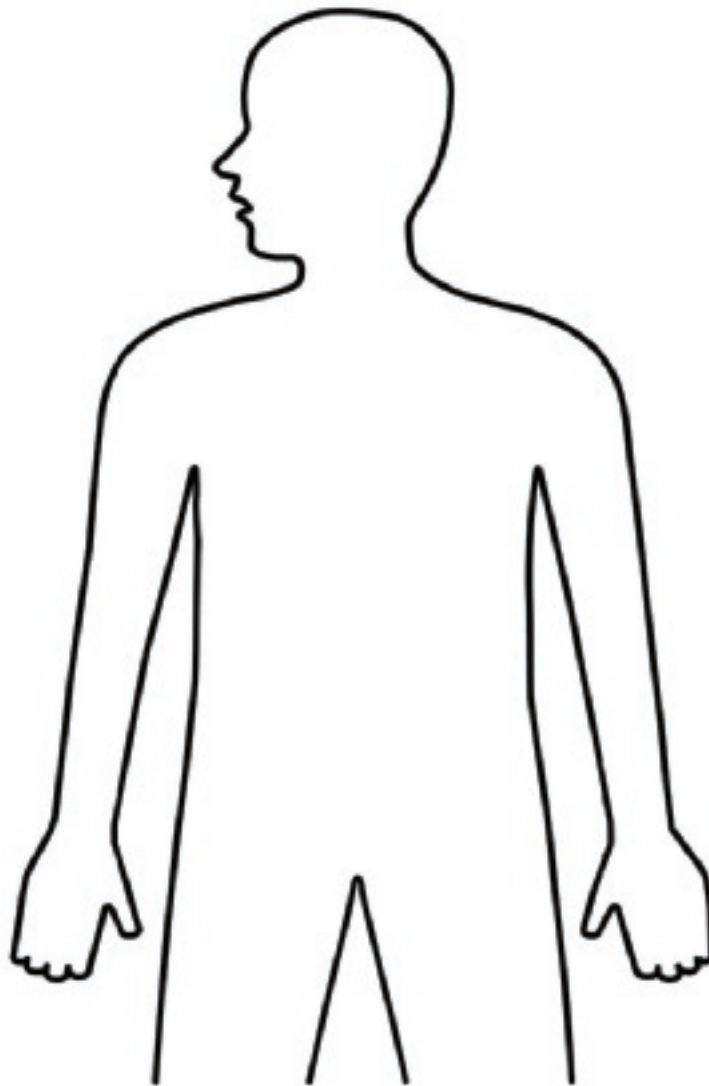
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Initial model

Build an initial model to explain the following question:

What is causing M'Kenna to have symptoms in all of these different parts of her body?

- Use pictures, symbols, and words to try to explain what is going on inside M'Kenna.
- How could all of these symptoms be happening in different body systems?
- Why did some symptoms start happening before others?
- Record questions that you have if you become stuck.



Analyzing Endoscopy Images

Examine the pair of endoscopy images from a healthy person and from M'Kenna at each location along the digestive tract.

1. Record your observations in the data table column "*Observations of M'Kenna's endoscopy images*." Use descriptive words to illustrate what you see.
2. Review the data you collected and decide whether M'Kenna's organs look mostly similar to or very different from the healthy organs. Record your findings in the last column of the data table.

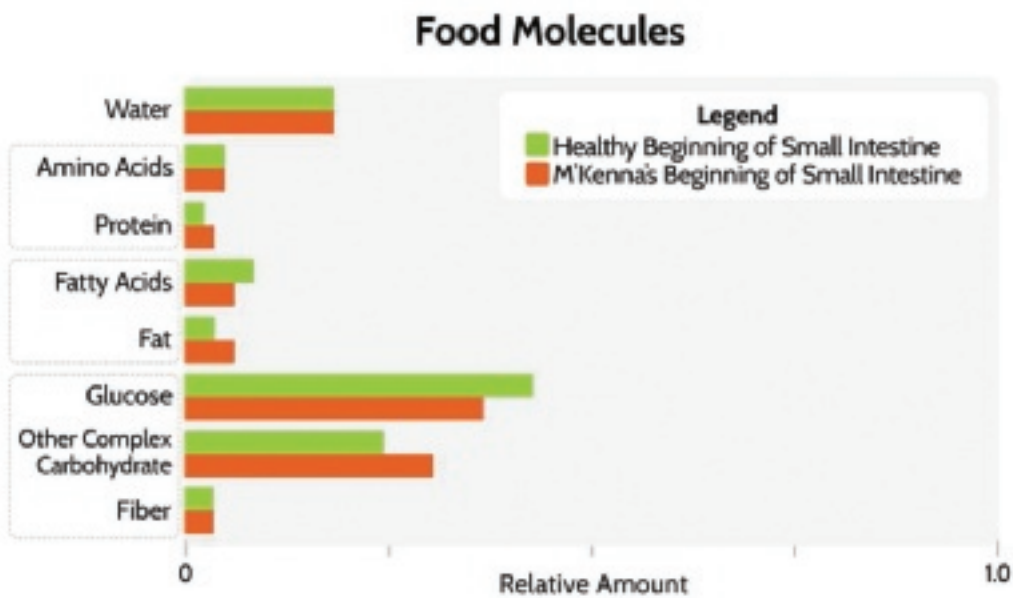
Organ	What I notice from the illustrations	Observations of M’Kenna’s endoscopy images	Is M’Kenna’s image mostly similar or very different from the healthy person’s? If different, what are the differences?
Esophagus			
Stomach			
Beginning of small intestine			
Middle of small intestine			
Large intestine			

Name: _____

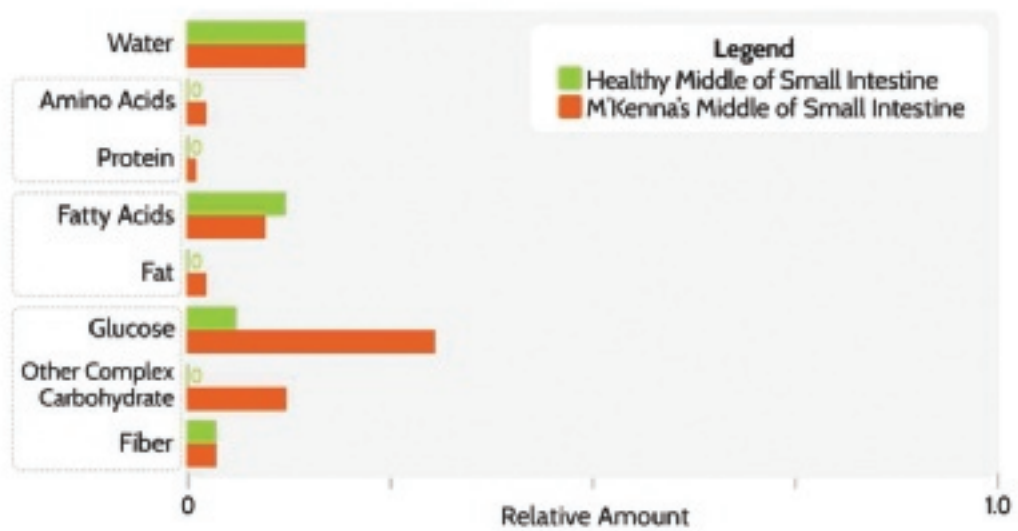
Date: _____

What happens in the small intestine?

Directions: These graphs show what happens to food molecules in a graham cracker as they pass through the small intestine. Draw arrows to parts of the graph and write "What I see" (WIS) and "What it means" (WIM) notes in the space below.



Food Molecules



Dialysis Tube Investigation

Part 1: How do we set up our dialysis tube system?	
Which food molecule(s) are outside of the tube (Start)?	Which food molecule(s) are inside of the tube (Start)?
Part 2: Predictions	
Which food molecule(s) do you think you will find outside of the tube (End)?	Which food molecule(s) do you think you will find inside of the tube (End)?

Explanation of why I made my predictions:

Part 3: What do iodine and Benedict's look like with just water?	
Color of Iodine and Water	Color of Benedict's and Water

Part 4: What food molecules are outside of the tube after the investigation?	
Color of Outside Liquid with Iodine	Color of Outside Liquid with Benedict's
Food molecules detected outside of the tube	

Part 5: What food molecules are inside of the tube after the investigation?	
Color of Inside Liquid with Iodine	Color of Inside Liquid with Benedict's
Food molecules detected inside of the tube	

Part 6: Answer the making-sense questions in your science notebook.

1. Did any of the food molecules that started off inside the dialysis tube end up outside of the tube? Explain what happened.
2. What do the class results tell us about the structure of the surface of the dialysis tubing?
3. What do these results tell you about what might be different about the structure of a complex carbohydrate molecule (like starch) compared to a sugar molecule (like glucose)?

Progress Tracker

Question	Source of evidence
What we figured out in words/pictures	

Progress Tracker

Question	Source of evidence
What we figured out in words/pictures	

Name: _____

Date: _____

Analysis Strategy for Graham Cracker Data

The question we want to answer:

Investigation question:

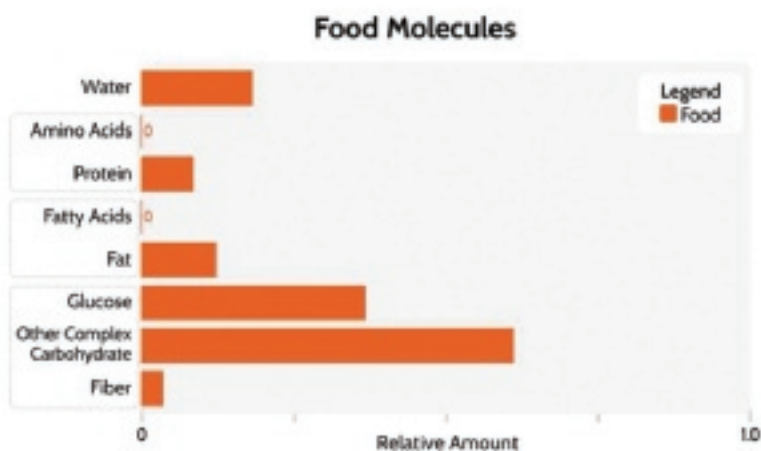
Directions: As you examine the graphs that represent what happens to the graham cracker at different points in the digestive system, use the I² sensemaking strategy to take notes on what you see and what you think it means.

The graphs show how a graham cracker changes as it moves from the mouth to the middle of the small intestine and then to the large intestine. Pay attention to the complex carbohydrates (starch), but you can make other observations as well.

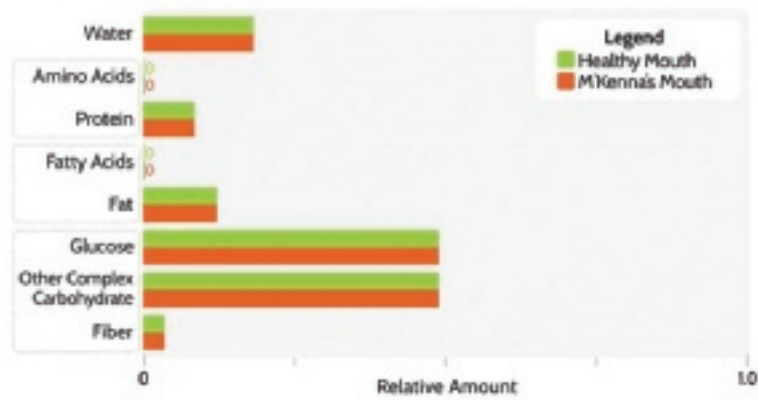
On your own



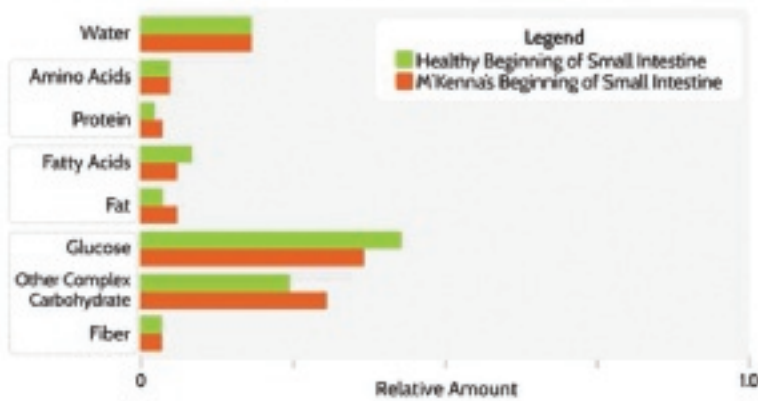
1. Draw an arrow to something that you notice in the graph. Write "WIS" (what I see) and follow that with what you notice about the data. Be prepared to share your observations.
2. Next to that observation, write "WIM" (what it means) and follow that with your interpretation of your observation. Tell what you think is significant about what you see.



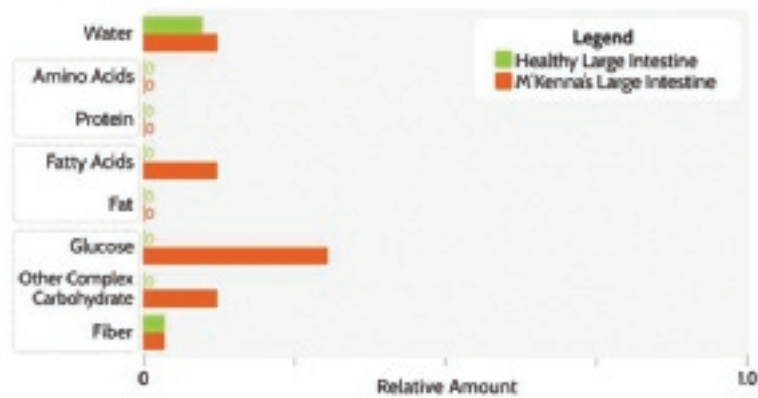
Food Molecules



Food Molecules



Food Molecules



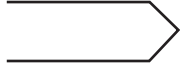
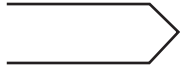
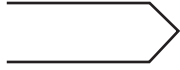
Record your responses to these questions in your student notebook:

1. What is happening to complex carbohydrates in the healthy data (green)?
2. What is happening to complex carbohydrates in M'Kenna's data (orange)?
3. What substance seems to remain constant (unchanged) as it travels through the digestive system?
4. How do these graphs help us determine what we would expect to see in solid waste that leaves the body as poop in a healthy system?

Name: _____

Date: _____

Data Table for Chemical Reactions in the Mouth

	Tube A	Tube B	Tube C	Tube D
Part 1: Diagram of Tube Label each tube with the substances you plan to add.				
Part 2: Procedures Record the order and title of procedures you will follow to set up your tubes in each box (remember to add your indicator last!). Example: 1. RICE 2. WATER 3. IODINE 4. MIX				
Part 3: Prediction What color do you predict the indicators will be after the investigation?				
Part 5: Results What color were the indicators after the investigation?				
Part 6: Interpretation Which food molecules were detected in each tube?				

Name: _____

Date: _____

Table to Organize Food Molecules Data

	Food: Graham cracker					
	(increases [↑], decreases [↓], or stays the same [=], and/or is zero [0])					
	Mouth	Esophagus	Stomach	Beginning: Small intestine	Middle: Small intestine	Large intestine
Water						
Amino acids						
Protein						
Fatty acids						
Fat						
Glucose						
Other Complex Carbohydrate						
Fiber						

Name: _____

Date: _____

Compiled Models from Progress Tracker

Review your Progress Tracker. Compile all of the models that you have developed so far in your Progress Tracker into one model to answer: *What have you figured out so far?*

Use pictures, symbols, and words to try to explain the key ideas in your models.

- Record questions that you have if you become stuck.

Name: _____

Date: _____

Gotta-Have-It Checklist

Instructions: Use your Progress Tracker and your science notebook to make a checklist of the most important ideas you need to make a new model to explain this question:

- **How does a healthy digestive system work?**

What our model needs to have to answer the question, “How does a healthy digestive system work?”	Check off pieces of the model as you use them.	
	Used	Did not use
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Use your checklist to make a new model for answering the question, **“How does a healthy digestive system work?”** As you use ideas from your checklist, put a check in the “Used” column and label the concept on your model with its row number from the checklist. If you do not use an idea, place a check in the “Did not use” column.

Name: _____

Date: _____

Lesson 7 Peer Feedback Guidelines

Giving feedback to your peers is an important skill. Use this document to help you give and receive feedback from others in your class.

Giving Feedback

This tool was inspired by the Sticky Note Feedback resource originally developed by Ambitious Science Teaching at: <https://ambitioussciencelearning.org/sticky-note-student-feedback/>

Feedback needs to be specific and actionable. That means it needs to be related to science ideas and that you should provide your own suggestions for improvement.

Productive examples:

- "Your argument from evidence has a claim that you think your animal burns food molecules the same way as humans, but I think you should add in some evidence and reasoning for why you think that."
- "You make the claim that you don't think birds and humans do similar chemical reactions to break down food, but we disagree because they both have the same inputs of oxygen and food and outputs of carbon dioxide and water. We suggest looking at the inputs and outputs of cells again."

Non-productive examples:

- "I like your drawing."
- "I agree with everything you said."
- "Your poster is really pretty."
- "I disagree."

How to Give Feedback.

Your feedback should give ideas for specific changes or additions the person or group can make. Use the sentence starters below if you need help writing feedback.

- The poster said _____. We disagree because _____. We think you should change _____.
- I like how you _____. It would be more complete if you added _____.
- We agree that _____. We think you should add more evidence from the _____ investigation.
- We agree/disagree with your claim that _____. However, we do not think the _____ (evidence) you used matches your claim.
- Do you think you should add _____?

Receiving Feedback

The purpose of feedback is to get ideas from your peers about things you might improve or change to make your work more clear, more accurate, or better supported by the evidence you have collected.

When you receive feedback, you should:

- Read it carefully and ask someone else to help you understand it, if needed.
- Decide if you agree or disagree with the feedback and say why you agree or disagree.
- Revise your work to address the feedback.

Name: _____

Date: _____

Self-Assessment: Giving and Receiving Feedback

Giving Feedback

How well did you give feedback today?

Today, I...	YES	NO
Gave feedback that was specific and about science ideas .		
Shared a suggestion to help improve my peer's work.		
Used evidence from investigations, observations, activities, or readings to support the feedback or suggestions I gave.		

One thing that I can do better the next time I give feedback is:

Receiving Feedback

How well did you receive feedback today?

Today, I...	YES	NO
Read the feedback I received carefully.		
Asked follow-up questions to better understand the feedback I received.		
Said or wrote why I agreed or disagreed with the feedback.		
Revised my work based on the feedback.		

What is one piece of feedback that you received?

What did you add or change to address this feedback?

Name: _____

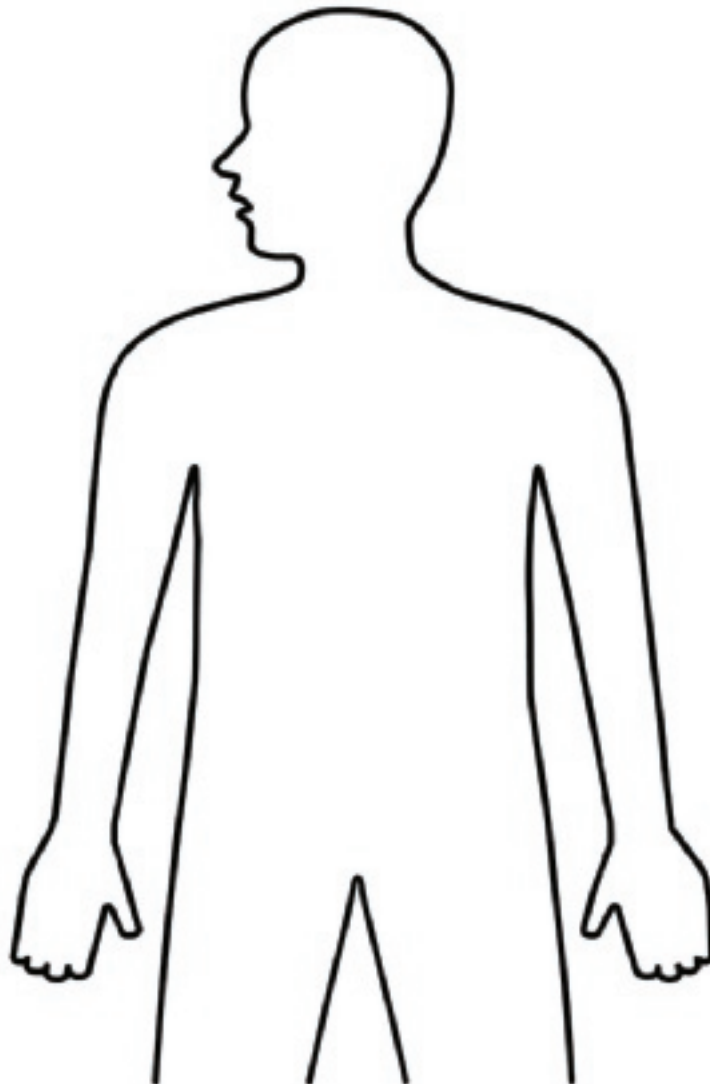
Date: _____

Revised Model (optional)

Build a revised model to explain the following question:

How does a healthy digestive system work?

- Use pictures, symbols, and words to explain how a healthy digestive system works.
- Record questions that you have if you become stuck.



Name: _____

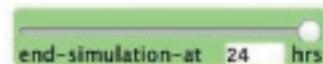
Date: _____

Connecting the Structure of Villi to Their Function

Procedure

1. Use your Chrome browser to go to this website: <https://openscienced.org/villi-absorption/> A simulation will load.

2. Adjust the “end-simulation-at” slider to be any value above 12, and keep it at that value for all simulation runs.



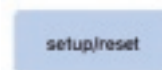
3. Adjust the “initial-#-small-food-particles” slider to be any value above 100, and keep it at that value for all simulation runs. You can also adjust the “large particles” slider if you wish.



4. You can adjust the “villi-height” slider to be any of the values you want to test for villi heights.

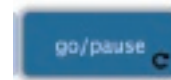


5. Press the **SETUP/RESET** button to initialize the model.



6. Then press the **GO/PAUSE** button to run the model.

7. When the model stops running, record the percentage of food particles absorbed into the blood in a data table you make below.



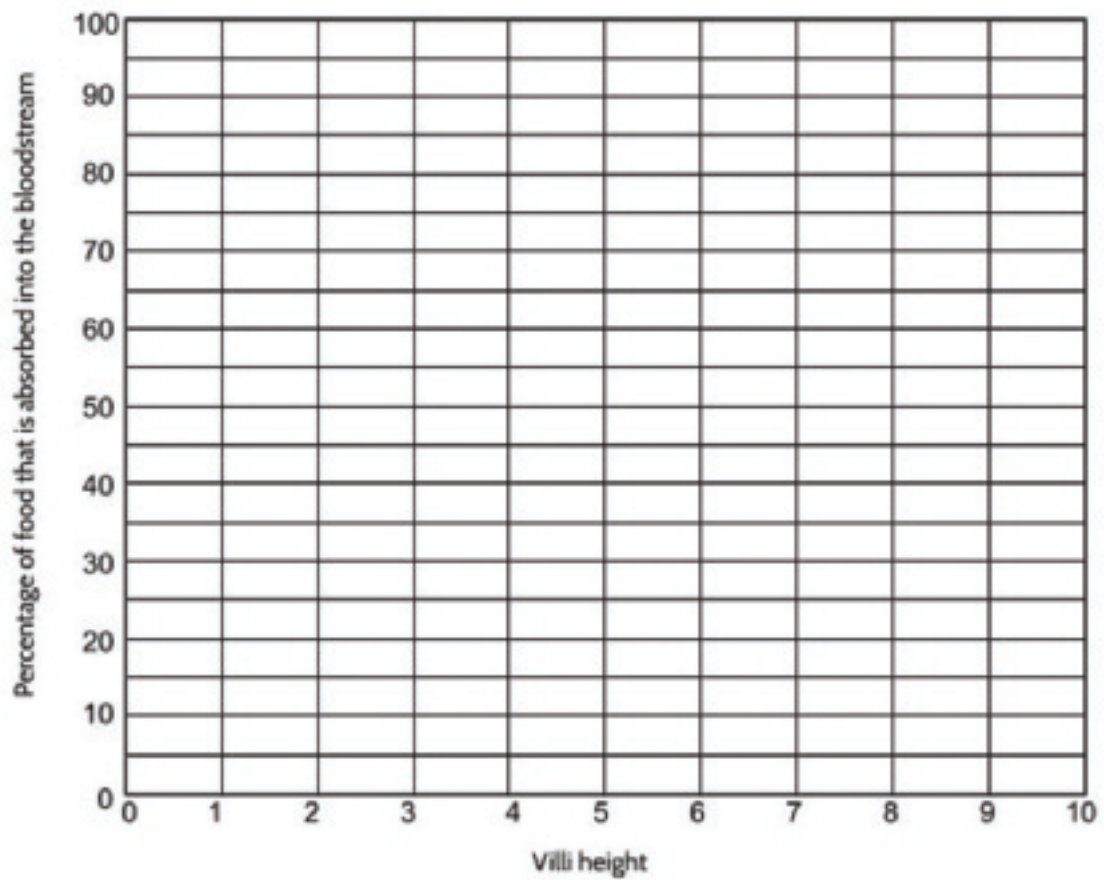
Repeat steps 5–7 if you want to do more than one trial for this villi height. When you are ready to test a new villi height, go back to step 4, make your changes, and repeat the remaining steps.

Create a data table on the next page record each of your results.

Data Table Create a data table in the space below, recording the following information for each trial you run:

- Villi height
- Number of cells present (students should count these on their screens)
- Percentage of food absorbed into the blood

Graphing Data Graph your data to show the relationship between the height of the villi and the percentage of food that is absorbed into the bloodstream.



Making Sense

1. How did villi height affect the percentage of food particles absorbed into the blood?

2. In this model, when small food molecules run into a cell membrane, they have a 50% chance of hitting the membrane at a spot where there is a door they can pass through. If this is always constant in every simulation run, then why would simply changing the shape of the villi **cause** a change in the percentage of food particles absorbed in a fixed time period?

3. Describe the relationship between the height of the villi and the rate of absorption. Use the word “cells” in your description. Cite evidence from your data to support your ideas.

Name: _____

Date: _____

Lesson 8 Self-Assessment: Giving and Receiving Feedback

Giving Feedback

How well did you give feedback today?

Today, I...	YES	NO
Gave feedback that was specific and about science ideas .		
Shared a suggestion to help improve my peer's work.		
Used evidence from investigations, observations, activities, or readings to support the feedback or suggestions I gave.		

One thing I can do better next time when I give feedback is:

Receiving Feedback

How well did you receive feedback today?

Today, I...	YES	NO
Read the feedback I received carefully		
Asked follow up questions to better understand the feedback I received		
Said or wrote why I agreed or disagreed with the feedback		
Revised my work based on the feedback		

What is one piece of feedback you received?

What did you add or change to address this feedback?

Name: _____

Date: _____

Revisit Questions from Our DQB!

Look through the list of questions from our DQB, and mark which ones you think we've made progress on. Then pick three of the questions you marked and write what you think that answer would be. Extra boxes are provided in case you want to add to this list later in the unit.

Question	Answer and Supporting Evidence

Symptoms and Systems

Part 1: Which of M’Kenna’s symptoms could be connected to what we’ve figured out?	
Symptom	Evidence and Reasoning

Part 2: Which of M’Kenna’s symptoms have we not found a connection to yet?	
Symptom	Noticings and Wonderings

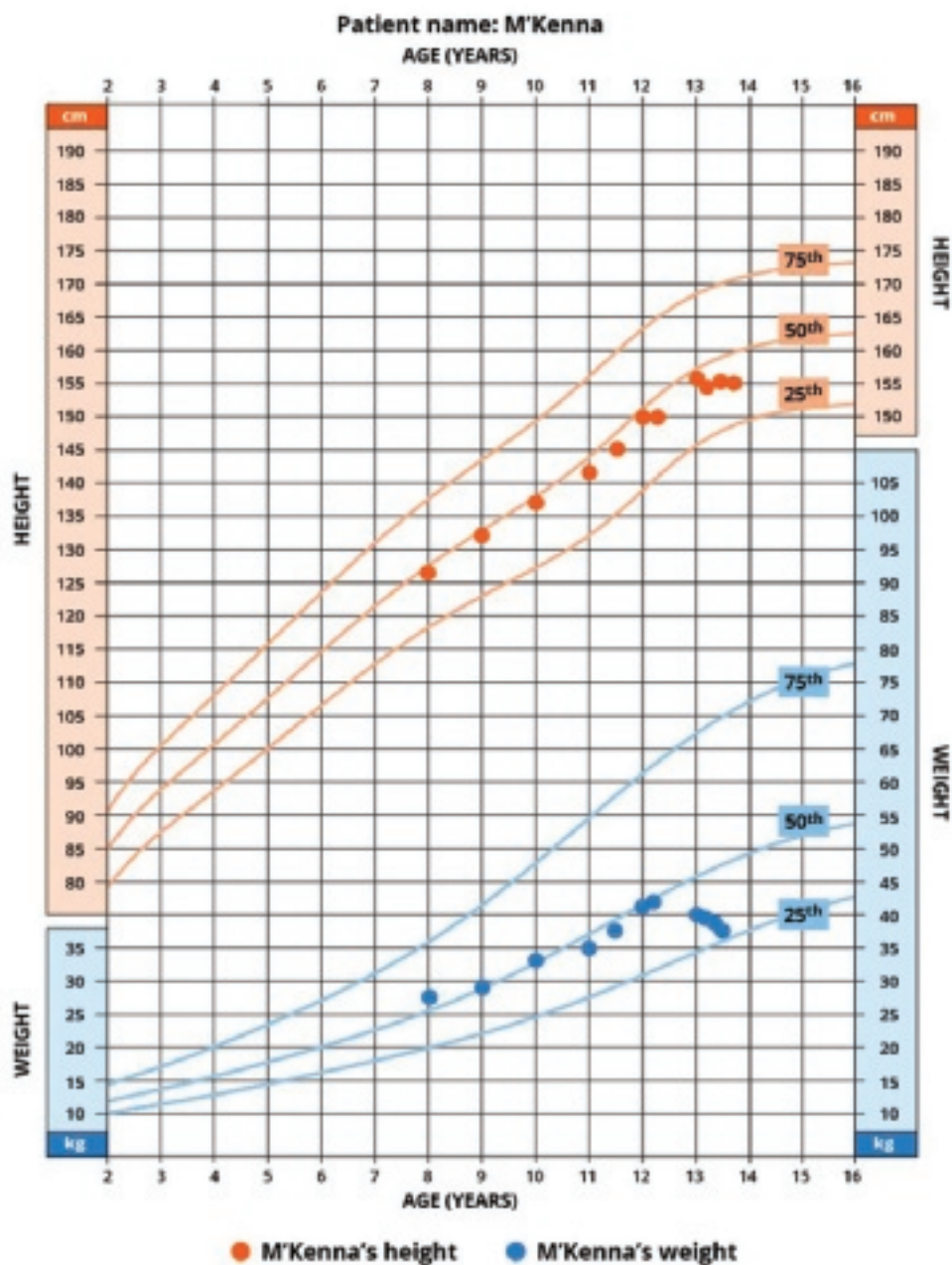
Name: _____

Date: _____

Patterns in M'Kenna's Weight

GROWTH CHART - 2 TO 16 YEARS: GIRLS

Height and Weight for age percentiles



Focus on just M’Kenna’s weight.

1. What was the pattern in M’Kenna’s weight before she got sick (ages 8-12)?
2. How did M’Kenna’s weight pattern change? If M’Kenna’s weight continues on the new pattern, where do you expect her weight to be at age 14?
3. If M’Kenna was your patient and you saw this change in her weight pattern, would you be alarmed? Why or why not?

Name: _____

Date: _____

What Happens to Fat When It Burns?

Observations			
Sample	1. Wick only	2. Vegetable fat and wick	3. Animal fat and wick
A. Observations of the substances in the container before the burn			
B. Mass of the substances in the container before the burn			
C. Observations of the substances in the container after the burn			
D. Mass of the substances in the container after the burn			

Part 3: Make Sense of Your Results

Complete the making-sense questions in your science notebook.

1. How does the color, odor, and hardness of the substances that you ended up with compare to what you started with?
2. Based on the property changes you observed, what claim can you now make about what happened to the original substances in these containers beyond just saying “they burned”?
3. Compare the masses of the substances in each container before and after they burned. If matter can’t disappear, how can you explain the patterns in your data?
4. What clues does this give you about what might be happening to food inside our bodies and M’Kenna’s body when it is used for energy? Or what new questions does this raise for you?

Burning Fat in Open and Closed Systems

Part 1: Burning Fat in Open and Closed Systems			
System	Mass of the entire system before the burn	Mass of the entire system after the burn	Additional Observations
System 1:			
System 2:			

Part 2: Measuring the Products of Burning Fat in a Closed System				
Substance	A. What do we predict will happen to the amount of this substance in the system?	B. Amount of substance measured (before the burn)	C. Amount of substance measured (after the burn)	D. What happened to the amount of this substance in the system?

Name: _____

Date: _____

Making Sense of Burning Fat Investigation Results

Part 3: Making sense of your results

- Record the states of matter of the air, oil, water vapor, and carbon dioxide in the table below. Then answer the question in the last column.

Products of Burning Fat in a Closed System		
Substance	What is the state of matter of each of these substances?	Describe what happened to the amount of the substance during the investigation.
Something from the air		
Vegetable Oil (Fat)		
Water Vapor (H ₂ O)		
Carbon Dioxide (CO ₂)		

- Think about when we burned the vegetable oil. Where do you think the matter from this fat is going?

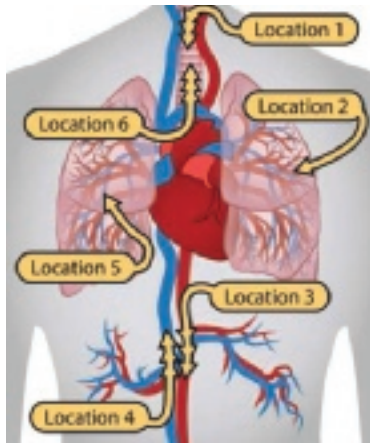
3. What do you think is causing these changes to occur when a food item is burned? Explain your reasoning.

4. What clues does the claim give you about what might be happening to food inside our bodies and M’Kenna’s body when it is used for energy? Or, what new questions does this raise for you?

Name: _____

Date: _____

Oxygen and Carbon Dioxide in the Blood - Part 1



Location	Oxygen (pO ₂)*	Carbon dioxide (pCO ₂)*
1: Air inhaled	100	40
2: Gases entering into the blood from the lungs	98	40
3: Blood going to other parts of the body	95	40
4: Blood returning from other parts of the body	40	45
5: Gases entering into the lungs from the blood	40	46
6: Air exhaled	40	46

*p = partial pressure

Oxygen levels

1. Where are oxygen levels the highest?
2. Where are they the lowest?
3. Where do they change the most?

Carbon dioxide levels

4. Where are carbon dioxide levels the highest?
5. Where are they the lowest?
6. Where do they change the most?

7. What clues does this give us about where the chemical reaction might be happening that uses food and oxygen to provide energy?

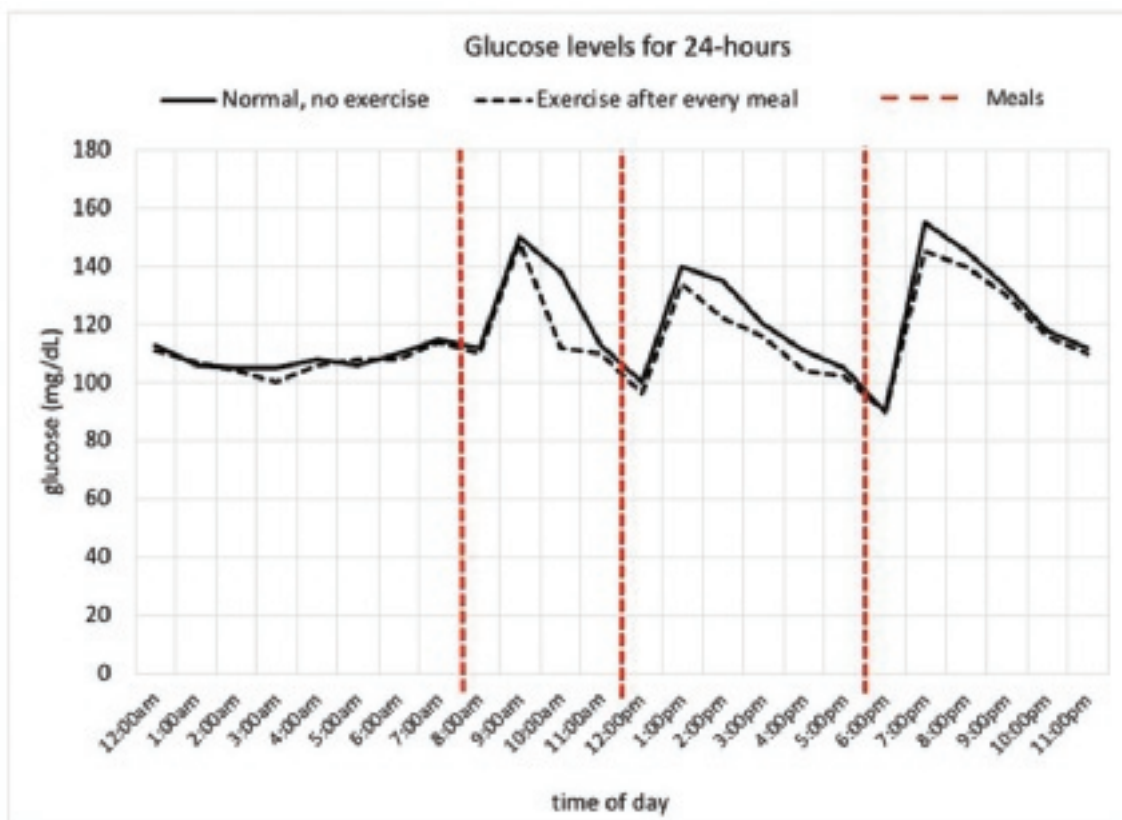
Name: _____

Date: _____

Interpreting Activity Data - Part 2

Draw arrows to parts of the data and write “What I see” (WIS) and “What it means” (WIM) comments.

Glucose levels in the blood over 24 hours



1. What happens to the glucose levels in the blood right after a meal? Why does this happen?
2. What is different about how glucose levels change when you exercise after meals versus when you don't?

4. Why would more of that reaction need to occur when we exercise?

Name: _____

Date: _____

Revisiting Symptoms and Systems

Which of M’Kenna’s symptoms could be connected to what we’ve figured out now?	
Symptom	Evidence and Reasoning

Name: _____

Date: _____

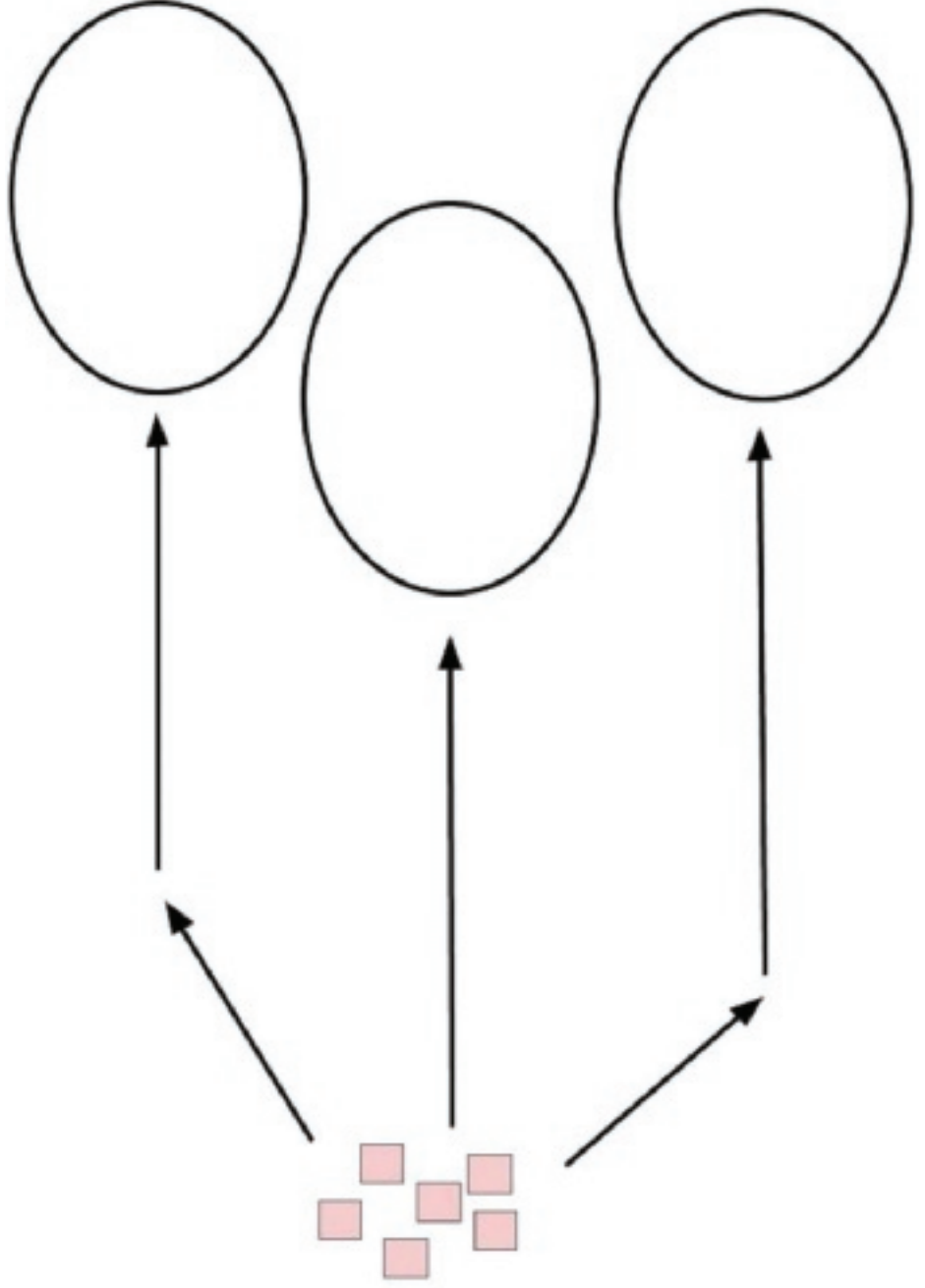
Three Pathways Inside Our Bodies

Build a revised model to explain the following questions that your class has agreed upon:

1. _____

2. _____

3. _____



Name: _____

Date: _____

Gotta-Have-It Checklist

Instructions: Use your Progress Tracker and your science notebook to make a checklist of the most important ideas you need to make a new model to explain this question:

- *How do our bodies use food for energy?*

What our model needs to have to answer the question, How do our bodies use food for energy?	Check off pieces of the model as you use them.	
	Used	Did not use
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Use your checklist to make a new model for answering your question. As you use ideas from your checklist, put a check in the "Used" column and label the concept on your model with its row number from the checklist. If you do not use an idea, place a check in the "Did not use" column.

Then add ideas to your Gotta-Have-It Checklist that explain the other questions your class is trying to figure out.

2. _____

3. _____

Who is M’Kenna, and what happened to her?

Who is M’Kenna?

M’Kenna was born in Oklahoma but soon moved to West Texas. She attends a small rural school and is active in all sports and her local FFA (Future Farmers of America) chapter. In the summers, she works for her family business cleaning new houses that her dad has built.

What happened when M’Kenna got sick?

Around the time that M’Kenna turned 13, she started to get really sick. M’Kenna had always been healthy, so this was unusual for her. She complained of constant stomach pain, diarrhea, and vomiting, especially after eating. She started to lose weight quickly, and she and her parents were worried. She also struggled to run cross-country and to play basketball, her favorite sport. M’Kenna didn’t have the energy to keep up in basketball practice and had to sit out from cross-country track meets.

While M’Kenna had an average weight and height most of her life, her weight dropped a lot in just a few months. While M’Kenna tried to eat healthy foods, eating only made her feel sick.

What made her sick?

Similar to what you did, M’Kenna’s doctor collected evidence from M’Kenna and from medical tests to diagnose her problem. Like you already figured out earlier in the unit, M’Kenna has celiac disease. A person with celiac disease has an immune response when they eat food with a protein called gluten in the food. Gluten is found in foods with wheat and other grains but is also a common ingredient in many other foods. The immune response causes damage to the lining of the small intestine, flattening the villi, which are important for absorbing nutrients from food. The disease can become very serious because the person cannot get enough nutrients from food and risks using all of their stored food molecule sources.



M’Kenna’s doctor did an endoscopy exam to look at the villi in her small intestine. Similar to what you found, the doctor also found “decreased folds and flattening of the villi in the beginning and middle of the small intestine.” The endoscopy exam confirmed that M’Kenna did have celiac disease. The only known treatment to help someone like M’Kenna is to avoid gluten and all foods that may contain gluten.

How is M’Kenna now?

M’Kenna was prescribed a gluten-free diet. The doctor said that if she avoided gluten, her small intestine would heal, and over time it did heal. M’Kenna’s abdominal pain, vomiting, and diarrhea stopped, and she regained weight. M’Kenna is at average weight and height again. She also regained energy to play sports like basketball. M’Kenna still sees her doctor for regular blood tests to make sure she is keeping gluten out of her system. If M’Kenna ever eats something with gluten, she can quickly tell because her symptoms return.

Name: _____

Date: _____

Self-Assessment: Giving and Receiving Feedback

Giving Feedback

How well did you give feedback today?

Today, I...	YES	NO
Gave feedback that was specific and about science ideas .		
Shared a suggestion to help improve my peer's work.		
Used evidence from investigations, observations, activities, or readings to support the feedback or suggestions I gave.		

One thing I can do better next time when I give feedback is:

Receiving Feedback

How well did you receive feedback today?

Today, I...	YES	NO
Read the feedback I received carefully		
Asked follow up questions to better understand the feedback I received		
Said or wrote why I agreed or disagreed with the feedback		
Revised my work based on the feedback		

What is one piece of feedback you received?

What did you add or change to address this feedback?

Name: _____

Date: _____

Let's Answer Questions from Our DQB!

Look through the list of questions from our DQB. Mark questions that you think the class has answered by putting different symbols next to each question:

- We did not answer this question or any parts of it yet: ○
- Our class answered some parts of this question, or the ideas we developed help me see how I could now answer some parts of this question: ✓
- Our class answered this question, or the ideas we developed help me see how I could now answer this question: ✓ +

Then pick three new questions you marked and write what you think that answer would be.

Question	Answer and Supporting Evidence

Name: _____

Date: _____

Engaging in Argument from Evidence

Claim	Category			Feedback
	Missing	Developing	Mastered	
There is a claim that is relevant to the question, problem, or solution posed.				
Justification Clearly represents or describes the following:	Category			Feedback
	Missing	Developing	Mastered	
evidence or empirical data that supports the claim				
scientific principles or ideas that explain how each piece of evidence supports the claim (<i>reasoning</i>)				
Rebuttal Clearly represents or describes the following:	Category			Feedback
	Missing	Developing	Mastered	
a critique of the evidence of an alternate claim				
a critique of the reasoning of an alternate claim				

Engaging in Argument from Evidence

Claim	Category			Feedback
	Missing	Developing	Mastered	
There is a claim that is relevant to the question, problem, or solution posed.				
Justification Clearly represents or describes the following:	Category			Feedback
	Missing	Developing	Mastered	
evidence or empirical data that supports the claim				
scientific principles or ideas that explain how each piece of evidence supports the claim (<i>reasoning</i>)				
Rebuttal Clearly represents or describes the following:	Category			Feedback
	Missing	Developing	Mastered	
a critique of the evidence of an alternate claim				
a critique of the reasoning of an alternate claim				

Name: _____

Date: _____

Science Literacy Exercise Page 1

Use with Reading Collection 1

Roadmap for Reading

This week's reading collection focuses on metabolic reactions inside our bodies that affect weight loss and gain. The selections include information about ways to determine healthy weight, different ways the body loses weight, and how doctors can learn more about the digestive organs.

"Collection 1: Changing Body Weight" consists of 4 selections.

- 1 "Healthy" Body Weight
- 2 What Gets Lost in Weight Loss?
- 3 Weight Loss Bunk and Junk
- 4 Clues About Weight Change

As you read:

- Consider the general purpose of each part: is it a description, an explanation, a procedure, or an attempt to persuade?
- Consider how data and graphics support the narrative text and how narrative text clarifies the data and graphics.
- Consider how each part of the reading relates to knowledge you gained from the previous part.

Written Response

There is so much misinformation about diet and weight. Your writing exercise is to create a poster to persuade other people your age to be healthy, using the information you learned in the selections.

Plan your poster.

- Determine the major argument you want to make related to diet. You may want to argue for one of the following:
 - importance of healthy weight
 - how to determine healthy weight
 - a healthy food to eat
 - a good way to exercise or move around
 - healthy habits
- Research your topic to make sure what you are arguing for is a healthy choice.
- Include the reasons you know why your choice is healthy.
- Design your poster. Use images or graphics to help make your case.
- Review your poster. Then attach this page to the front of it when you turn it in.
- Before you begin, review the criteria in the Evaluation Guidelines that follow to help you clearly understand the expectations of the exercise.

Evaluation Guidelines

Element	1	2	3	Feedback
Content	Poor example of a healthy choice with little or no supporting argument	Good example of a healthy choice	Great example of a healthy choice	
Argument	Little or no supporting evidence or argument	Some supporting evidence	Solid supporting evidence that the choice is healthy	
Organization and graphics	Hard to follow or determine what the argument is	Message can be understood but is lacking engagement	Engaging and easy to understand and remember	
Grammar and mechanics	Six or more errors in punctuation, capitalization, or spelling	Three to five errors in punctuation, capitalization, or spelling	Fewer than three errors in punctuation, capitalization, or spelling	

Additional Feedback Notes:

Name: _____

Date: _____

Science Literacy Exercise Page 2

Use with Reading Collection 2

Roadmap for Reading

This week's reading collection focuses on the metabolic reactions inside our bodies in the digestive system. The selections include information about good and bad bacteria in the body, what poop can tell us about the health of digestive systems, feed conversion ratios, and how cows can turn food we can't eat into food we *can* eat.

"Collection 2: Gut Reactions" consists of 4 selections.

- 1 Microbiome Balance
- 2 Poop Science
- 3 Feed Conversion Ratios
- 4 Ruminants

As you read:

- Consider the general purpose of each part: is it a description, an explanation, a procedure, or an attempt to persuade?
- Consider how data and graphics support the narrative text and how narrative text clarifies the data and graphics.
- Consider how each part of the reading relates to knowledge you gained from the previous part.

Written Response

Think of making a meal, like breakfast, lunch, or dinner, of some of your favorite foods. Now consider what you've read about good and bad bacteria, feed conversion ratios, and poop. Your writing exercise is to create a menu for a meal that you can present other people your age as healthy and energy efficient, using the information you learned in the selections.

Plan your menu.

- Choose from among these food groups for your meal.
 - Dairy
 - Vegetables
 - Fruits
 - Grains
 - Protein
- Select your foods for your meal. Then research them to learn about their feed conversion ratios.
- Support each food on your menu with the reasons you know why your choice is healthy and efficient.
- Design your menu. Use images or graphics to help present your foods.
- Review your menu. Then attach this page to the front of it when you turn it in.
- Before you begin, review the criteria in the Evaluation Guidelines that follow to help you clearly understand the expectations of the exercise.

Evaluation Guidelines

Element	1	2	3	Feedback
Content	Poor example of a healthy choice with a low FCR	Good example of a healthy choice with a low FCR	Great example of a healthy choice with a very low FCR	
Argument	Little or no supporting evidence or argument	Some supporting evidence	Solid supporting evidence that the choice is healthy and efficient	
Organization and graphics	Incomplete menu with few or no graphics and little clear relationship to the topic of a healthy meal	Complete menu with supporting graphics but choppy or sloppy tie-in to the concept of “healthy”	Appealing menu with enticing graphics and ideas that make the concept of “healthy” make sense	
Grammar and mechanics	Six or more errors in punctuation, capitalization, or spelling	Three to five errors in punctuation, capitalization, or spelling	Fewer than three errors in punctuation, capitalization, or spelling	

Additional Feedback Notes:

Name: _____

Date: _____

Science Literacy Exercise Page 3

Use with Reading Collection 3

Roadmap for Reading

This week's reading collection focuses on the metabolic reactions inside our bodies in the digestive system. The selections explore the purpose of the digestive system, how the different organs function, and what happens when they don't function properly or can't digest certain foods.

"Collection 3: Digestion Chemistry" consists of 5 selections.

- 1 Digestive Aid Advertisements
- 2 Digestive System Products
- 3 Lactose Intolerance
- 4 Stones, Clay, and Plastic
- 5 Post-Surgery Diary

As you read:

- Consider the general purpose of each part: is it a description, an explanation, a procedure, or an attempt to persuade?
- Consider how data and graphics support the narrative text and how narrative text clarifies the data and graphics.
- Consider how each part of the reading relates to knowledge you gained from the previous part.

Written Response

Create a diagram of your entire digestive system, including all the organs mentioned in this collection.

Plan your diagram.

- Research the location of the parts of the digestive system, including each of the following.
 - Mouth
 - Pharynx
 - Epiglottis
 - Esophagus
 - Liver
 - Gallbladder
 - Stomach
 - Pancreas
 - Small Intestine
 - Colon
 - Large Intestine
 - Anus
- Draw a diagram of your digestive system, including illustrations and graphics.
- Label each structure of the diagram with its correct name.
- Write the function of each structure in parentheses.
- Add the name of a disease that is associated with that structure of the digestive system. Draw a circle around it.
- Review your diagram to make sure it is complete and accurate.
- Before you begin, review the criteria in the Evaluation Guidelines that follow to help you clearly understand the expectations of the exercise.

Evaluation Guidelines

Element	1	2	3	Feedback
Content	Inaccurate or missing descriptions	Adequate completion of diagram but contains weak descriptions	Accurate and thorough diagram with complete descriptions	
Graphics	Little or no graphics to illustrate the digestive system	Some basic graphics to illustrate the digestive system but may contain some errors	Engaging graphics that illustrate the digestive system accurately	
Supporting details (names of diseases)	Missing names of diseases for each part of the digestive system	Supporting details present but may contain some inaccuracies	Supporting details present and accurate	
Grammar and mechanics	Six or more errors in punctuation, capitalization, or spelling	Three to five errors in punctuation, capitalization, or spelling	Fewer than three errors in punctuation, capitalization, or spelling	

Additional Feedback Notes:

Science Literacy Exercise Page 4

Use with Reading Collection 4

Roadmap for Reading

This week's reading collection focuses on how calories contribute to the metabolic reactions inside our bodies. The selections explore how calories in food are the measurement of energy food can provide.

"Collection 4: Burning Calories" consists of 4 selections.

- 1 What's a Calorie?
- 2 Diet Pills
- 3 Hunting for Calories
- 4 Carb Loading

As you read:

- Consider the general purpose of each part: is it a description, an explanation, a procedure, or an attempt to persuade?
- Consider how data and graphics support the narrative text and how narrative text clarifies the data and graphics.
- Consider how each part of the reading relates to knowledge you gained from the previous part.

Written Response

Create a two-column chart that plans a balanced diet for you for one day. One column will list the activities you plan to do and how many calories you expect to burn. The other column will list all the foods you plan to eat and the caloric content of each food. The list of foods should be balanced so that you get enough of each of the following foods.

- Proteins
- Carbohydrates
- Fats

Plan your chart.

- Before you begin, review the criteria in the Evaluation Guidelines that follow to help you clearly understand the expectations of the exercise.
- Research how many calories are burned by certain activities you plan to do in a day.
- List the foods you plan to eat. Research how many calories are in each serving of the foods on your list.
- Identify any foods on your list that have a lot of calories but no nutritional value.
- Identify the content of each food. Assign fats, carbohydrates, and proteins each a different color for your chart.
- Tally up the calories burned and the calories taken in. Adjust your activities or foods until the numbers are balanced.

Create your chart.

- Write, draw, or use graphics to identify each activity and food in your chart.
- Make it clear how many calories are expended and taken in. Write a numerical expression to show how the two sides of the chart have equal numbers.
- Review your chart to make sure it is complete and accurate.
- Discuss your chart with others, and determine whether it represents a balanced, healthy diet.

Evaluation Guidelines

Element	1	2	3	Feedback
Content	Chart is incomplete or does not represent a balanced diet among the types of foods.	Adequate completion of chart, but food choices are weak	Thorough completion of chart with a good, healthy selection of food choices	
Graphics	Caloric intake versus caloric output are not balanced or are not calculated correctly.	Caloric intake versus caloric output are not balanced but are calculated correctly.	Chart reflects a variety of activities and foods that equal a balanced intake and output of calories.	
Organization and graphics	Incomplete chart with no or few graphics or missing color codes for fats, carbs, and proteins	Adequate completion of chart but lacking in organization of graphics	Engaging chart with compelling graphics and information and color codes for fats, carbs, and proteins	
Grammar and mechanics	Six or more errors in punctuation, capitalization, or spelling	Three to five errors in punctuation, capitalization, or spelling	Fewer than three errors in punctuation, capitalization, or spelling	

Additional Feedback Notes:

Name: _____

Date: _____

Science Literacy Exercise Page 5

Use with Reading Collection 5

Roadmap for Reading

This week's reading collection focuses on what a balanced diet for humans is and how that affects health and growth.

"Collection 5: Built from Food" consists of 3 selections.

- 1 Nutrition, Growth, and Disease
- 2 All-World Eating Team
- 3 Digesting Protein

As you read:

- Consider the general purpose of each part: is it a description, an explanation, a procedure, or an attempt to persuade?
- Consider how data and graphics support the narrative text and how narrative text clarifies the data and graphics.
- Consider how each part of the reading relates to knowledge you gained from the previous part.

Written Response

Write a short essay arguing why a balanced diet is important for health and growth. Include the following information:

- What a balanced diet is
- How a balanced diet affects health

Plan your essay.

- Before you begin, review the criteria in the Evaluation Guidelines that follow to help you clearly understand the expectations of the exercise.
- Write down all of the ideas you have gotten from the selections you have read.
- Do some research using credible sources to add to or edit your ideas.

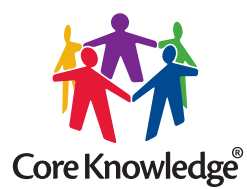
Create your essay.

- Use your notes and outline to write your essay on a separate sheet of paper.
- Read your essay to make sure it reflects everything you want to say.
- Exchange your essay with one of your classmates, and discuss how what you wrote compares to what the other person wrote.
- Attach this page to the front of your essay when you turn it in.

Evaluation Guidelines

Element	1	2	3	Feedback
Content	Inaccurate or missing information	Describes a balanced diet and the effects of eating a balanced diet	Uses examples from credible research and selections to accurately and thoroughly describe a balanced diet and how it affects health and growth	
Argument	Little or no credible source information	Uses basic source information	Uses logical reasoning and relevant, accurate data and evidence	
Organization	Disorganized information that is difficult to follow	Evidence of logical reasoning	Claims and evidence are organized and supported in an easy-to-follow logical progression	
Grammar and mechanics	Several errors or omissions	Some errors	No errors	

Additional Feedback Notes:



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