Lesson Topic: Conversion of Food into Matter and Energy

Objective:
Students will be able to:

1. Describe the two types of digestion.
2. Explain the areas of the body that chemical digestion takes place.
3. Draw and identify how the body converts food into energy.

Time Required: 90 minutes

Materials Needed:

- Conversion of Food into Matter and Energy Video:
  - https://www.youtube.com/watch?v=RPAien1dbEQ
- Saltine Crackers (1 per student)
- Small dixie cups (2 per student)
- Beaker of water (1 per small group of students)
- Measuring spoon
- Iodine (2 drops per student)
- Teacher computer with internet access
- Projector/Smartboard
- 1 computer/laptop/iPad per student with internet access
- Conversion of Food into Matter and Energy handout (attached)

Teacher Preparation:

- Assign a Legends of Learning Instructional Quick Play playlist for the day(s) you will be teaching the lesson.
  - Instructional - Middle School - Conversion of Food into Matter and Energy
- Assign a Legends of Learning Content Review Quick Play playlist for the day(s) you will be teaching the lesson.
  - Content Review - Middle School - Conversion of Food into Matter and Energy
- Make copies of Conversion of Food into Matter and Energy Worksheet (1 per student)

Engage (10 minutes):

1. Pass out the Conversion of Food into Matter and Energy handout.
2. Tell students “Today we are going to watch a video clip. Please write down the main idea of this video and at least 2 supporting details.
3. Play the video: Operation Ouch - Energy Machine | Science for Kids
4. Discuss what students wrote down in their handout.

Explore (20 minutes):

1. Have your students sign in to Legends of Learning. Instruct students to complete the Instructional playlist.
2. Assist students as needed during game play, pause playlist if you need to address content or questions to the entire class.

Explain (20 minutes):

1. Ask students “How do we get energy?” (We eat nutritious foods, we get enough rest, drink enough water, we exercise etc).
2. Tell students “Yes, we get the most energy from staying healthy, but what we are going to focus on today is the energy that comes from the food we eat and how that actually takes place. By eating food, we are able to get the nutrients our body needs to grow and develop.”
3. Tell students “All living things get food in some way. What are some ways that living things get food?” Make a list on the board
    a. Possible answers: plants make their own food, fungi use hyphae and absorb nutrients from decaying organisms, eating other plants or other animals, microorganisms have features to help them eat (cilia, flagella) etc.
4. Tell students “As humans, we must eat food to get the nutrients we need to make enough energy to survive. We go through two different types of digestion to break down the food into smaller pieces (Write the following on the board):
    a. Mechanical digestion is the physical movements of chewing and grinding up the food we put in our mouths to make smaller pieces of food we can swallow.
    b. Chemical digestion is when our food mixes with fluids and enzymes creating a chemical reaction. This chemical reaction breaks down the food so much the cells can use it.”
5. Ask students “Chemical digestion occurs in the mouth when we chew. Our saliva (spit) is actually a really important part to our digestion. Why?” Saliva makes food easier and smoother to swallow, it starts to break down the food we are eating. Note: students may not know about the saliva breaking down the food quite yet.)
    a. Tell students “Our saliva has an enzyme in it called amylase. Amylase takes the starches we eat and breaks them down.”
6. Tell students “Your stomach also helps in breaking down your food further. Digestive enzymes are released such as pepsin, for proteins. Your small intestine absorbs nutrients along with releasing enzymes to break down sugars and lactose found in milk.”
7. Tell students “The large intestine is the last stop for chemical digestion. It doesn’t use enzymes. Instead it uses bacteria to break down the remaining food.”
8. On the board, draw a brief sketch of the path of digestion labeling the mouth, stomach, small intestine, and large intestine (template of sketch attached).
    a. Have students draw a similar sketch in their handout.
9. Remind students “Remember that our food must be broken down so that our body and cells can use the nutrients as energy.”

Elaborate (30 minutes):

1. Tell students “In a moment, I will be passing out one cracker and 2 small cups to each of you. Please do not touch any of the materials until I tell you what to do.”
2. Pass out the crackers and cups.
3. Place a beaker of water on each table (1 per 4-5 students, whatever is convenient).
4. Complete the below experiment along with students so that they can easily follow along.
    a. Tell students, “Break the cracker in half. With one of the halves, break it into small little pieces and place it in one of the cups.
    b. Use the beaker of water near you, and on your crumbled cracker, pour two

tablespoons of water on it.

c. Do NOT swallow the other half cracker, however, take the half cracker and chew it in your mouth (for about 30 seconds).
d. Now as weird as it may sound, or as gross as it may be, carefully spit the cracker into the empty cup.
e. On your handout, record what you notice between the two cups of crackers.
    i. Draw what you see."

5. Ask students, "What do you notice between the two cups of crackers? (The chewed cracker should look more like paste, digestion is already beginning, the wet crumbs should just look like wet crackers).
6. Tell students "Iodine is a substance that is used to detect starch. If starch is present, it will turn purple. I am going to put a few drops in each cup. On your handout, record what happens."
7. Walk around and put a couple drops in each cup.
8. Tell students "With the person sitting next to you, discuss your findings. Then, answer the questions on the handout."
9. Once all students have answered the questions, come together as a class to discuss the answers.
    a. 1.Both mechanical (physical chewing and breaking food into smaller pieces) and chemical (saliva and amylase began breaking down the starch on a much deeper level)
    b. 2.Crackers have a lot of starch. When the iodine mixed with the regular wet crumbs, it became very purple because there was a lot more starch present. The chewed up cracker was purple, but less so, because amylase in the saliva already started to break it down.
    c. 3.It is important that our food is broken down because it allows the body to use the nutrients as energy.

Evaluate (10 minutes):

1. Have your students sign in to Legends of Learning. Instruct students to complete the Content Review playlist.
2. Analyze student results to determine what concepts need to be a focus for reteaching.

Additional Lesson Strategies:

- To use Legends for additional instruction, create a custom playlist with an instructional game and pre and post assessment.
- To use Legends for a quick formative assessment, create a 5-question assessment in a playlist.
- To use Legends for a student-directed experience, create a targeted freeplay playlist.
- Encourage students to play on their own at home in Legends of Learning: Awakening for a student-driven experience including avatars, battling, and quests all centered around topics they are covering in class.

Name:_____

Conversion of Food into Matter and Energy

During the video, write down the main idea and at least 2 supporting details.

Draw a sketch of the digestive tract to show how our food is converted to energy.

Observations

Wet Cracker	Chewed Cracker

After the Iodine has been added, what did you observe?

Wet Cracker	Chewed Cracker

Answer the following questions:

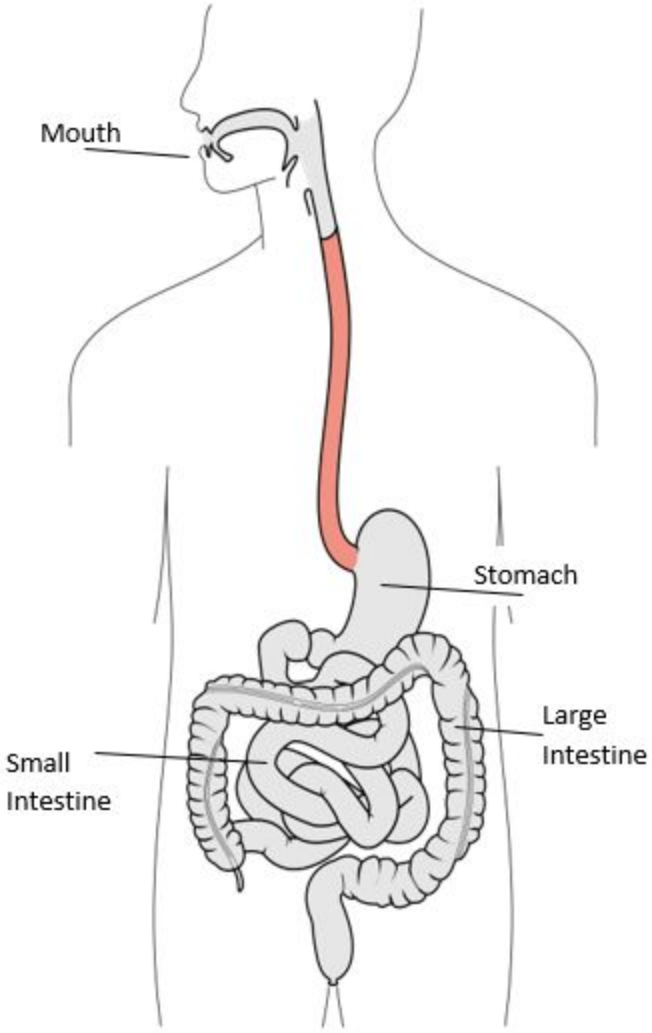
1. When you chewed up the cracker, what type(s) of digestion were taking place? Explain.

2. When the iodine was added, ***why*** was there a difference between two cups of crackers?

3. Why is it important that our food be properly digested?

Conversion of Food into Matter and Energy Answer Key

Draw a sketch of the digestive tract to show how our food is converted to energy.



After the Iodine has been added, what did you observe?

Wet Cracker	**Chewed Cracker**
Darker purple color	**Lighter purple color**

Answer the following questions:

1. When you chewed up the cracker, what type(s) of digestion were taking place? Explain.
    a. **Both mechanical (physical chewing and breaking food into smaller pieces) and chemical (saliva and amylase began breaking down the starch on a much deeper level)**
2. When the iodine was added, ***why*** was there a difference between two cups of crackers?
    a. **Crackers have a lot of starch. When the iodine mixed with the regular wet crumbs, it became very purple because there was a lot more starch present.**
    The chewed up cracker was purple, but less so, because amylase in the saliva already started to break it down.
3. Why is it important that our food be properly digested?
    a. **It is important that our food is broken down because it allows the body to use the nutrients as energy.**