

LESSON 2.1 - AN INTRODUCTION TO DIGESTION

Overview:

By reading a set of introductory notes and learning from a website animation, students will learn about the parts of the digestive system and their functions.

Suggested Timeline: 1.5 hours

Materials:

- An Introduction to Digestion (Student Handout)
- computers with internet access
- QUIZ – An Introduction to Digestion (Student Handout)

Method:

1. Have students complete their vocabulary list on ‘An Introduction to Digestion’ (Student Handout) by using their student handout notes and/or other textbooks or resources available.
2. Instruct students to read through their handout and answer the question at the end. Have students use the online digestion review animation to complete the flowchart at the end.
3. Review the answers to questions with students.

Assessment and Evaluation:

- Assessment of student understanding via their answers to assigned questions
- Student grade on quiz

An Introduction to Digestion

VOCABULARY

alimentary canal –

hydrolysis –

teeth –

mucus –

saliva –

tongue –

pharynx –

esophagus –

lumen –

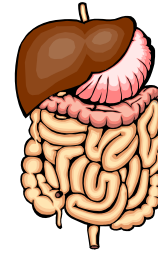
mucosa –

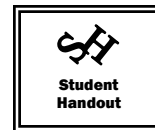
peristalsis –

stomach –

sphincter –

gastric juice –





pancreas –

liver –

bile –

gall bladder –

small intestine –

duodenum –

jejunum –

ileum –

large intestine/colon –

appendix –

feces –

rectum –

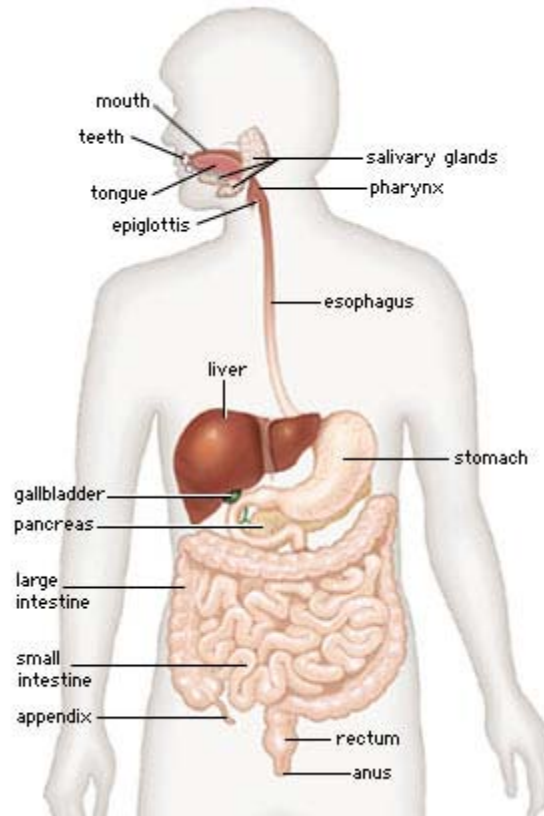
PART I – Reading and Questions

Digestion is necessary to break a complex mixture of proteins, carbohydrates, lipids, and other substances into small molecules, which can move through cell membranes. It takes place in the **alimentary canal**, a continuous tube running from the mouth to the anus.

Digestion is both mechanical and chemical. Chemical digestion is the breakdown of larger molecules into smaller ones. Proteins, carbohydrates, and lipids can be broken down by combining them with water. This is called **hydrolysis**. Proteins are hydrolyzed into amino acids. Polysaccharides are hydrolyzed into simple sugars (glucose). Triglycerides (complex fats) are hydrolyzed into fatty acids and glycerol (simple parts of fat molecules). Mechanical digestion is the physical breakdown of food into smaller particles. This involves chewing and

muscular churning. These processes expose more surface area to the enzymes, therefore, it speeds up chemical digestion.

As you read about the following parts of the digestive system, find these parts in the diagram below:



Parts of The Digestive System

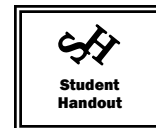
Teeth - cut, tear, and grind food. A variety of types of teeth indicates adaptation to an omnivore (organism that eats both plants and animals).

Mucus - from cells lining the mouth; it makes food easier to swallow.

Saliva - from three pairs of salivary glands; lubricates food and adds the enzyme amylase which breaks down starch.

Tongue- muscular organ; keeps food where it can be chewed and pushes food to the back of the mouth to be swallowed. Also contains sensory organs for taste.

Pharynx- large area at the back of the mouth; food passes from here, past the epiglottis (which prevents food from entering the lungs).



Esophagus - takes food from the pharynx and carries it to the stomach. The hollow interior of the esophagus is the **lumen**. The cells that line the lumen, and secrete mucus are the **mucosa**. Beneath the mucosa are two layers of muscle. In the innermost layer, muscle fibers wrap around the esophagus. Fibers of the outer layer run lengthwise along the esophagus. These layers alternately contract and relax causing waves of constriction. These waves push food along ahead of them. This rhythmic muscular contraction is called **peristalsis**. It moves food in the esophagus, and the rest of the alimentary canal.

Stomach- the opening is controlled by a muscular **sphincter**, which opens and closes the tube. The stomach is J-shaped; one of its primary functions is food storage (about 2L). It too, is lined with mucosa. There are three kinds of cells in the stomach mucosa (one secretes mucus; one secretes enzymes; one secretes hydrochloric acid and water). The enzymes, water and hydrochloric acid combine to form **gastric juice**. The pH of gastric juice is about 1.0. It helps break up connective tissue and cell membranes; it also kills harmful bacteria.

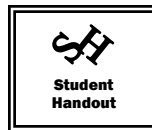
Chemical digestion is aided by mechanical digestion in the stomach. Peristalsis of the stomach wall churns food for several hours. Mucus in the stomach is resistant to attack by gastric juice; this protects the stomach cells. Sheets of fat molecules resist digestion because they digest so slowly. Digestive enzymes are only activated by an acidic environment. When these factors are out of balance, stomach cells are attacked. The result is an ulcer; this may require a change in diet, or surgery. The other end of the stomach also has a sphincter. When it relaxes, partially digested food moves into the small intestine.

Pancreas/Liver- These are not part of the alimentary canal, but they are very important to digestion.

The pancreas produces hormones that regulate homeostasis (fairly constant level) of blood glucose. It also produces pancreatic juice which neutralizes the acidic stomach contents before they enter the small intestine. Pancreatic juice also contains a number of digestive enzymes, including many different proteases (chemical enzymes that break down protein that you eat). Pancreatic juice reaches the small intestine via the pancreatic duct.

The liver takes glucose from the blood and converts it to glycogen. It stores the glycogen until it is needed by the body. The liver also produces **bile**. Bile contains no enzymes, but does aid in the digestion of fats and oils in the intestine, breaking them down into tiny droplets (fats are not water soluble).

Bile travels through ducts to the **gall bladder** for storage. During digestion, it is released through the common bile duct into the small intestine. Gallstones develop from insoluble materials in the bile. They can block the bile duct and cause bile to accumulate in the gallbladder. In serious cases, the gall bladder may be surgically removed with no serious long-lasting effects.



Small Intestine- Food from the stomach enters the first 30 cm of the small intestine, called the **duodenum**; this is where bile and pancreatic juice enter. Cells of the intestinal lining also produce digestive enzymes.

The next several metres of small intestine are called the **jejunum**. Many small molecules are absorbed here. The last half of the small intestine is called the **ileum**. By now, most chemical digestion is complete. The ileum is primarily responsible for absorption of nutrients.

Blood from the small intestine moves to the liver where excess glucose and some broken down proteins are removed.

Stretched out, the small intestine measures about 6 meters.

Large Intestine- Also known as the **colon**, it is about two meters long, but larger in diameter than the small intestine (about 2X). Where the small and large intestines join, there is a small projection known as the **appendix**. It has no known function in humans, but in some plant eating species it helps digest the tough outer part of plant cells. Appendicitis results when bacteria lodge, grow, and secrete toxins in the appendix. It is more common in children, because the opening is much larger.

The major role of the large intestine is water absorption. The volume of water in the human body must remain relatively constant. A great deal of water enters the stomach as gastric juice. The only food residue left at the end of the colon is indigestible waste, called **feces**.

Feces is about 75% water and 25% solid matter. Of the solid matter, about 30% is dead bacteria, 10-20% inorganic matter, 2-3% protein, and 30% undigested fiber. Feces also contains epithelial cells (cells that line and cover body parts) and bile pigments.

The last 20-30 cm of the colon is called the **rectum**. Feces is stored here until eliminated from the body.

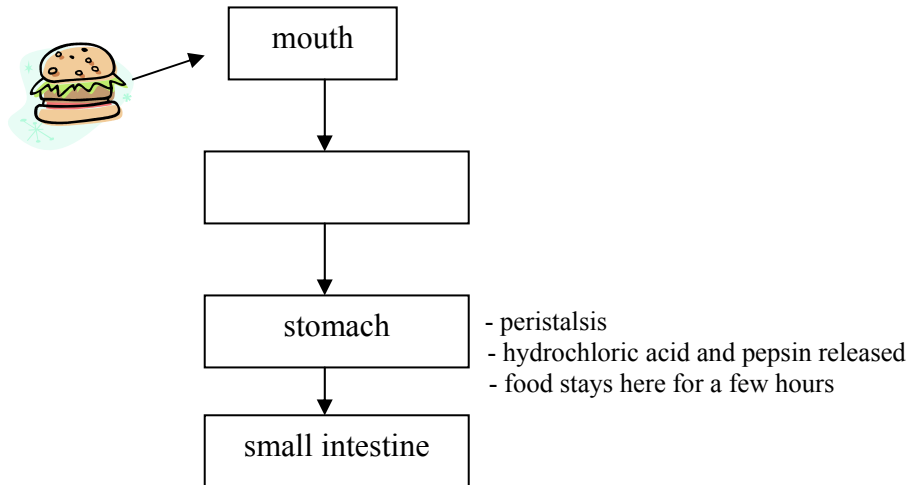
Adapted from *Heath Biology*, p. 629 and *BSCS Biology*, p. 393

PART II – Online Review

Access the following website:

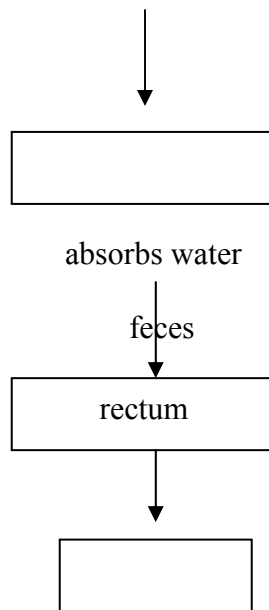
http://www.pennhealth.com/health_info/animationplayer/digestion.html

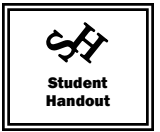
Use the information in the animation to fill in the following flowchart:



The first part is called the _____. Bile from the _____ and enzymes from the _____ enter here to help in digestion. (e.g., lactase breaks down the sugars in milk)

The small intestine absorbs the _____ that the body needs. These nutrients enter the bloodstream and go to the liver where _____ are removed.





Name: _____ Date: _____ Period: _____

QUIZ – An Introduction to Digestion

Fill in each blank with the correct word from the pool of words below. Each word may only be used once, but there are more words than blanks. Each blank is worth **1 MARK**.

tongue	saliva	alimentary canal	rectum	sphincter
teeth	peristalsis	hydrolysis	peristalsis	gastric juice
anus	ileum	stomach	feces	pancreas
small intestine	jejunum	large intestine	esophagus	liver
pancreas	mucus	appendix	pharynx	bile
gall bladder	duodenum			

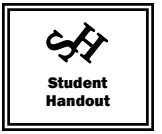
The long tube, made up of many structures, through which food passes and is digested, and through which wastes exit the body is called the _____.

Digestions begins in the mouth, where _____ grind the food and enzymes in the _____ start to chemically break down the food. The food is moved around the mouth by the _____, a muscular, pink structure.

The partially digested food then passes down a long tube called _____ that eventually leads to the _____. Muscular contractions of the wall of the esophagus help to move the food along. This is called _____. The stomach churns to digest the food and contains acidic juices to help to break down the food. The opening to the stomach and the place where food leaves the stomach is a muscular ring that can open and close. This is like your mouth or your anus. Such a structure is called a(n) _____.

Food then passes to a long, coiled structure called the _____. Here, nutrients are absorbed and returned to the bloodstream. The _____, _____, and _____ are all parts of the small intestine. The undigested food then passes into a larger-diameter and shorter coiled structure called the _____. Water is reabsorbed here and reused by the body.

A small sac attached to the large intestine that can become infected and sometimes has to be removed is called the _____.



The liver and the pancreas are organs that are associated with the alimentary canal and are part of the digestive system. The liver produces _____ while is stored in the gall bladder and aids in the digestion of fats. The pancreas produces digestive juices that sent to the small intestine.

The last section of the large intestine is called the _____. Undigested materials, dead bacteria, dead cells, water and other materials make up the _____ which is pushed out from the body.

LESSON 2.2 - CARBOHYDRATES, LIPIDS AND PROTEINS

Overview:

In a reading assignment, students first learn basic information about carbohydrates, lipids and proteins. Students then consider examples of food containing organic compounds and the importance of these three compounds in their diet.

Suggested Timeline: 1 hour

Materials:

- Carbohydrates, Lipids and Proteins (Student Handout)
- student access to computers with internet access

Method:

1. Have students complete their vocabulary list on the student handout by using their student handout notes and/or other textbooks or resources available.
2. Introduce the concept of organic molecules by asking the following questions:
Who here has run a long-distance race before? What kinds of things might you eat the day before the race? Discuss the concept of ‘carbo-loading.’ Allow this to lead into a discussion of what else one needs in one’s diet.
3. Instruct student to read the information on carbohydrates, lipids and proteins. Using computers with internet access and other resources from the library, have students research sources and the importance of each organic compound to their diet. Also encourage them to think of ethnic foods that they may eat and what category each may fall into.
4. Review the researched information with students or have them hand in it for assessment.
5. If time allows, discuss the following:
Which types of foods come with a lower environmental impact? (This can build on students’ knowledge of energy pyramids and pollution from Science 10.)

Assessment:

- Quality of student’s researched information on each of the three organic molecules

Carbohydrates, Lipids and Proteins

VOCABULARY

carbohydrate –

organic compound –

monosaccharide –

dissacharide –

polysaccharide –

starch –

glycogen –

lipids –

saturated –

unsaturated –

polyunsaturated –

fats –

oils –

protein –



amino acid –

dipeptide –

polypeptide -

CARBOHYDRATES are **organic compounds** (substances that contain the element carbon) that are used primarily as a source of energy for living things. They are also one of the main building blocks that make up the bodies of living things. For example, the walls of plant cells are made up of cellulose, a substance made up of carbohydrates.

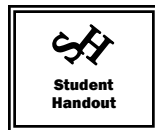
Simple carbohydrates (**monosaccharides**) are often referred to as sugars and taste sweet. When two simple sugars link up, they form **dissaccharides**. Some of these taste sweet and some do not. Complex carbohydrates made up of more than two simple ones linked together are called **polysaccharides** and do not taste sweet.

An important complex carbohydrate to humans is **starch**. Starch is a polysaccharide found in plants. Foods like potatoes contain starch. When you take starch into the body, the chemical enzyme amylase (present in the mouth and small intestine) breaks it down into smaller parts. After further digestion, many glucose units, smaller carbohydrates, are released from the starch and can be absorbed into the bloodstream and used by cells as fuel.

Another important polysaccharide is **glycogen**. As you may remember, glycogen found in the liver and the muscles and is made up of excess glucose molecules linked together. When the body is low on glucose, some of the glycogen can be converted back to glucose for the body's cells to use as energy. Glycogen is often referred to as 'animal starch.'

LIPIDS are commonly known as fats, oils and waxes. They are a second type of organic compound that are non-polar (do not dissolve in water). Because of this, lipids serve valuable functions. These include acting as a barrier between the cell and its watery environment, acting as insulation in animals and acting as a water repellent on the feathers of birds, like ducks. Lipids also store a lot of energy and therefore are a source of energy for us!

The building blocks of an important group of lipids are **fatty acids**. These molecules are long chains of carbon atoms with a carbon, oxygen and hydrogen bonded to the end. If the carbon chain has a maximum number of hydrogen atoms attached, it is said to be **saturated**. These are usually solid at room temperature and are known as **fats**. Lipids with a double bond, and therefore not the maximum number of hydrogen atoms are **unsaturated**. These are usually liquid at room temperature, come from plants and are known as **oils**. The majority of fat in organisms consists of molecules called triglycerides. These are made up of three fatty acid molecules plus a glycerol molecule. If the fatty acids of a triglyceride have more than two double bonds, they are **polyunsaturated**.



Energy released from a triglyceride is more than twice that released from a equal amount of carbohydrate. Humans can store less than a day's worth of glycogen (a carbohydrate) but can store three month's worth of energy in the form of triglycerides (lipids).

Since lipids store a lot of energy, they give us a lot of energy when eaten. If you consume more lipids than necessary, your body converts the excess to triglycerides. This is then stored in the fatty tissues of your body.

PROTEINS are the third kind of organic compound. There are many different kinds of proteins. For example, hair, spider webs, feathers and turtle shells are all very different, but are all made up of proteins!

Proteins serve as the raw material for the creation of new body parts. They also serve as a source of energy for the cell when supplies of carbohydrates and lipids are low. Eating other animals is a great way to get proteins, but soybeans and beans are also an excellent source.

Proteins are made up of **amino acids**. Each amino acid has four parts bonded to it. Each has a hydrogen atom, an amino group and a carboxyl group (made of C, H and O). A fourth part is different in every amino acid. All organisms are composed of combinations of the same 20 amino acids.

Amino acids are linked together by peptide bonds. When two amino acids join, the molecule that forms is called a **dipeptide**. The bonding of more than two forms a **polypeptide**. Proteins are long polypeptide chains averaging 200 or more amino acids.

The sequence of the amino acids is what makes every protein unique. The protein is also twisted and folded before it begins to function. Every protein made by a cell has a specific function. This function is due to its unique 3 dimensional shape, caused by the folding and twisting. If even one amino acid is out of order, the entire protein can fold differently. This will change its function.



For each of the three organic compounds research:

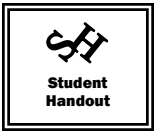
- what sources of food contain each
- why each organic compound is important in the diet
- what ethnic foods that you may eat fall into each category

CARBOHYDRATES

Sources: _____

Importance: _____

Ethnic foods: _____

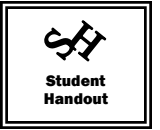


LIPIDS

Sources: _____

Importance: _____

Ethnic foods: _____



PROTEINS

Sources: _____

Importance: _____

Ethnic foods: _____

What else do you need to have in your diet? _____

Why? _____

LESSON 2.3 - MEASURING FOOD ENERGY

Overview:

- Students have the opportunity to perform a laboratory activity to find the caloric content of several types of nuts.

Suggested Timeline: 1 hour

Materials:

- Measurement of Food Energy Lab (Student Handout)
- Per lab group: scale, 100 mL graduated cylinder, thermometer, long pin, two types of nuts, matches, lab goggles

Method:

1. Introduce the lab by discussing how calories present in food are determined.
2. Review lab safety protocol with students.
3. Have students complete 'Measurement of Food Energy Lab' (Student Handout) and submit their lab when finished.

Assessment and Evaluation:

- Affective assessment of students' group work
- Student grade on lab

Name: _____ Date: _____ Partner(s): _____ Period: _____

Measurement of Food Energy Lab



INTRODUCTION:

A biologist can measure the amount of chemical energy in foodstuffs by burning the food. The heat energy released from burning food can be used to heat water. The change in temperature of the water enables biologists to calculate the energy change.

In this investigation, you are to measure the amount of heat released when different nuts are burned and use this information to calculate the number of kilocalories per gram contained in the nuts.

MATERIALS:

- scale
- large cork
- 100 mL graduated cylinder
- thermometer
- long pin
- two types of nuts (2 of each type) – almond, pecan, walnut or peanut
- matches
- lab goggles

PROCEDURE:

1. Put on your lab goggles and wear them throughout this lab.
2. Using the scale, find the mass of the each nut you are going to use. Record these values in your table.
3. Insert the pin into the cork. Place the nut at the other end of the pin.
4. Pour exactly 100 mL of water into the graduated cylinder.
5. Using your thermometer, find the temperature of the water. Record this value in your table.
6. Hold the cork with the pin and nut stuck in it. Using a match, ignite the nut. Hold the graduated cylinder about 1 cm about the burning point of the nut.
7. When the nut has totally burned, measure the temperature of the water in the test tube. Record this in your table.
8. Repeat steps 3-7 for a second nut of the same type (trial 2).
9. Repeat steps 3-7 two more times, this time using a different type of nut.
10. At this point, you should have the first four rows of your table filled in. When this is done, clean up all of your materials and return to your seat to complete the data and analysis section of the lab.

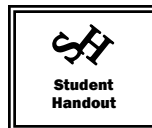
**DATA AND ANALYSIS:**

Table of Mass, Temperature Changes, and Energy Released for Various Nuts, Used to Find Kilocalories Present

	NUT #1 TRIAL 1	NUT #1 TRIAL 2	NUT #2 TRIAL 1	NUT #2 TRIAL 2
Mass of Sample (g)				
Mass of Water (g)	100 g	100 g	100 g	100 g
Initial Temp. of Water (°C)				
Final Temp. of Water (°C)				
Amount of Heat (Q) In Joules				
Calories				
Kilocalories				
Kilocalories/Gram				

Completed chart is worth **28 marks**

1. A calorie is the amount of energy needed to raise the temperature of 1 gram of water by 1°C. The calories in a food sample are calculated from the amount of temperature increase of the water. This can be found using the following equation:

$$Q = mc\Delta T$$

where Q = amount of heat (Joules)

m = mass of water (grams)

c = specific heat of water = 4.18 J/g°C

ΔT = change in temperature of water (°C)

= final temperature – initial temperature

Using the information in your table for mass of water and initial and final temperature of water, calculate the amount of heat present in the nuts in Joules. Record these values in your table. Show your calculations in the space below. (1 mark per calculation x 4 calculations = 4 marks)



2. For many people, calories are a more familiar unit for dealing with food energy. The relationship between calories and Joules is as follows: 1 calorie = 4.18 Joules

To find the amount of calories in each sample, divide each value that you found (in Joules) by 4.18. Record these values in the 'CALORIES' row of your table.

3. When one reads a food label, the number of 'Calories' are reported. Interestingly, 'Calories' with a capital 'C' is actually a 'kilocalorie'! Confusing, isn't it! So, if we are to find the number of 'Calories' in our nuts, we must convert our 'calorie' values to 'kilocalories'.

Multiply each 'calorie' value by 1000 to find the number of 'kilocalories' in each sample. Record these values in your data chart.

4. To find the number of 'kilocalories per gram' in each type of nut, divide your kilocalorie values by the mass of that nut sample (1st row of your chart). Record these values in your chart.
5. Calculate the average number of kilocalories per gram for nut #1: _____ (1 mark)

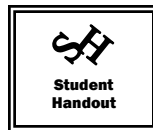
Calculate the average number of kilocalories per gram for nut #2: _____ (1 mark)

6. Given the average number of kilocalories per gram of your samples, compare your results with the data in the chart below.

Known Kcal Values for Various Foods	
SAMPLE	KILOCALORIES/GRAM
sugar	4.1
almond	6.9
pecan	6.6
peanut	5.8
walnut	6.2

- a) What difference(s) do you notice? (2 marks)

- b) Give *three* possible sources of error in the experiment that may have made your experimental values different from the known values. (3 marks)



7. Most people can live on 1600 kilocalories per day.
- How many grams of peanuts would you have to eat to obtain this many kilocalories?
Show your calculations. (2 marks)

 - How many grams of sugar would you have to eat to obtain this many kilocalories?
Show your calculations. (2 marks)

 - Would a diet of peanuts or sugar be a proper way of getting your required calories?
Explain. (2 marks)
8. Given what you have learned in this lab, why are snack foods sometimes called ‘junk foods’?
(1 mark)
9. Grizzly bears are known to eat the fatty parts of many animals. What is it about the fatty tissues that makes them a good food source for the bears? (2 marks)

LESSON 2.4 - CALORIE COUNTING

Overview:

In this lesson, students research the caloric content of various foods (including several fast food meals) and watch the video *Supersize Me*.

Suggested Timeline: 2 hours

Materials:

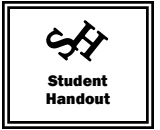
- *Supersize Me* video
- computers with internet access
- Calorie Counter (Student Handout)
- Fast Food Calories (Student Handout)
- *Super Size Me* Video Viewing Guide (Student Handout)

Method:

1. Have students work on the internet to complete Calorie Counter (Student Handout) and Fast Food Calories (Student Handout).
2. Introduce the video *Super Size Me* by discussing or having students individually answer the pre-video questions found on the student handout.
3. While watching the video, have students complete *Super Size Me* Video Viewing Guide (Student Handout).

Assessment:

Affective assessment of students' individual work habits during research time

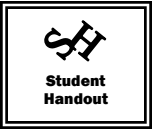


CALORIE COUNTER

Find a website that will show you how many calories are in various foods. Record the web address, and then fill in the chart. Fill the empty spots with 5 of your favorite foods.

Web address: _____

Food	Calories	Food	Calories
Apple		Potato Chips (bag)	
Banana		Chocolate Bar	
Orange		Taco chips	
Grapefruit		Egg	
Peach		Pancake	
Pear		Peanut butter sandwich	
Grapes		Toast	
Tomato		Bacon	
Carrots		Ham	
Potato (boiled)		Tomato Soup	
Potato (mashed)		Chicken Noodle Soup	
Fries		Apple Pie	
Hot dog		Donut	
Steak		Pudding	
Pork chop			
Burger			
Sausage			
Stew			
Chili			



FAST FOOD CALORIES

Go to <http://www.foodfacts.info/> and find 6 different meal combinations, from 6 different restaurants, that you might eat. List the foods in each and the total calories from each.

Meal One

Meal Two

Meal Three

Meal Four

Meal Five

Meal Six



Name: _____ Date: _____ Period: _____

SUPER SIZE Me Video Viewing Guide

Pre-video Questions:

1. How many meals do you eat at a fast-food restaurant in an average month? _____
2. What are the advantages and disadvantages of eating fast-food?

Video Questions:

Morgan Spurlock is the person featured in this documentary. Watch as he undergoes a month long experiment to assess the effects of fast food on his body. As you watch the video, answer the questions below:

1. Worldwide, how many people eat at McDonald's in an average day?
2. What are the three types of doctors that Morgan sees at the beginning of his experiment?
3. What is Morgan's starting cholesterol and triglyceride levels?
Cholesterol:

Triglyceride:
4. What is Morgan's starting weight and body fat percentage?
Weight:

Body fat:
5. How many McDonald's are in Manhattan?
6. What is Morgan's girlfriend's occupation?
7. How does Morgan feel after his first super size meal?



8. After five days on the McDonald's diet, how many calories is Morgan getting?

9. How are chicken McNuggets made?

10. Who do the first graders recognize?

11. What is a calorie?

12. What is the health of Morgan's liver at day 18? How about his blood pressure?

Liver:

Blood pressure:

13. What is gastric bypass surgery?

14. On day 21, what do Morgan's doctors tell him to do?

15. What are the results of Morgan's final weigh in?

16. What were the results of the McDonald's court case?

17. Choose ONE of the questions below and write a paragraph explaining your opinion.
 - a) Should fast food companies be held responsible for the obesity problem among young people? Explain.
 - b) Does your school provide healthy choices for a nutritious lunch? What would you change about the school lunches to make them healthier?
 - c) What can be done to solve the obesity epidemic among young people in the US and Canada?

Adapted from Science Movie Worksheets – <http://www.NewYorkScienceTeacher.com/movies>

LESSON 2.5 - HOW MANY CALORIES DO I BURN?

Overview:

Students research online to find the number of calories burned during different physical activities, learn about their metabolic rate and caloric requirements and consider the number of calories they consume at a restaurant meal.

Suggested Timeline: 1 hour

Materials:

- Calorie Calculations (Student Handout)
- student access to computers with internet access
- field trip permission forms
- Calories in My Meal (Student Handout)

Method:

- a) Have students use the internet to complete their 'Calorie Calculations' (Student Handout). Review student answers together or have students hand in their sheets for assessment.
- b) If possible, have take students to a restaurant for a meal together. Use the sample field trip form (Teacher Support Material) to make your own form to be sent home prior to the day of the outing. Have students fill out 'Calories in My Meal' (Student Handout).

Assessment:

Assessment of 'Calorie Calculations' (Student Handout) and 'Calories in My Meal' (Student Handout)



Sample Field Trip Form

Our Science 21 class has been studying digestion and the chemical energy found in foods. As a wrap-up to this section, we would like to have a meal together at a local restaurant and use accepted values to calculate how many calories have been consumed. We would then take these values and calculate how much work would have to be done to burn these calories.

Students would travel to and from the restaurant in the school van. Each student would be responsible for the cost of his/her own meal.

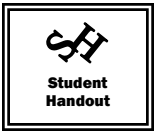
Please complete the section below and return it to the school as soon as possible.

Yours truly,

_____ (student's name) has my permission to participate in the Science 21 field trip to a local restaurant.

(Date)

(Parent/Guardian Signature)



Name: _____ Date: _____ Period: _____

CALORIE CALCULATIONS



1. Go to <http://www.primusweb.com/fitnesspartner/jumpsite/calculat.htm>. Calculate the calories burned in 30 minutes while:

Bowling:	Hack sacking:	Welding:	Plumbing:
Vacuuming:	Skateboarding:	Waterskiing:	Sleeping:

Fill in the 8 empty spaces with other activities that you might do and find the calories burned for each in 30 minutes.

2. Go to <http://www.nutristrategy.com/activitylist.htm>
- What does BMR stand for? _____
 - What does RMR stand for? _____
 - Calculate your BMR. _____
 - Calculate your RMR. _____
3. Go to http://www.coolnurse.com/calories_burned.htm. Figure out how many calories you would burn per hour if you were 155 pounds and were:
- Fencing: _____ Doing carpentry: _____
- Playing darts: _____ Mini golfing: _____
- Milking: _____ Ice fishing: _____
4. Go to <http://www.everything2.com/index.pl?node=calorie> Pick an activity that you could do to burn 1000 calories. Show/explain how you figured this out.
5. Go to http://www.caloriesperhour.com/index_burn.html. Use the “Scientific Method” to calculate the following for *one day*:
- basal calories _____
 - activity calories: _____
 - total calories: _____

LESSON 2.6 - DISORDERS OF THE DIGESTIVE SYSTEM

Overview:

Students research a digestive system disorder, prepare a handout and teach their classmates about the disorder via an oral presentation or poster display.

Suggested Timeline: 3 hours research time plus presentation time (if applicable)

Materials:

- Digestive Disorders Assignment (Student Handout – Individual)
- Digestive Disorders Assignment (Student Handout - Group)
- student access to computers with internet access

Method:

INDIVIDUAL FORMAT:

1. Go through the expectations of the project with the student(s), paying particular attention to the details of the rubric. Use the Digestive Disorders Assignment (Student Handout – Individual) as a guide.
2. Have the student(s) display his/her information on a poster(s) in an area of the classroom for a certain time period.

GROUP FORMAT:

1. Go through the expectations of the project with students, paying particular attention to the details of the rubric. Use Digestive Disorders Assignment (Student Handout - Group) as a guide.
2. Have students present their information to the class and provide their peers with a handout of information.

Evaluation:

Evaluation of project using grading rubric

Name: _____

DIGESTIVE DISORDERS

A Research Project



Due Date: _____

YOUR TASK:

Choose one disease or disorder of the digestive system and research it. Present your information on a series of posters to be displayed in the classroom.

Your choice of disease/disorder must be approved by the teacher before you begin to prepare your project. Each disease/disorder can only be chosen once. If you have an idea in mind already, ask your teacher for approval now. Otherwise, access the following website for ideas: http://pennhealth.com/health_info/animationplayer/digestion.html

Topic choice: _____ Teacher signature: _____

A CLOSER LOOK AT EXPECTATIONS:

After you have chosen your topic and have had it approved, begin your research. The information that you include on your handout and present to the class must include the following:

- a) The organ(s) involved
- b) How the organ(s) become infected/damaged
- c) What happens when the organ doesn't function properly
- d) How the disease/disorder can be prevented and/or treated

Your poster(s) must have a large and clear title. Information should be written or typed clearly and should be large enough for others to read.

You must provide a list of *at least three* references. These must be included somewhere on the front of a poster.

Be creative in the way that you present your information. How will you *attract others* to your poster(s) and make them want to keep reading about your digestive disorder?

EVALUATION:

Your project will be graded according to the following rubric. It is strongly advised that you read through the rubric carefully so that you know what is expected of you and can set a goal for yourself!



Digestive Disorders Poster Display Grading Rubric

CRITERIA	15	9	4
<p>Scientific Accuracy and Clarity of Explanation</p> <ul style="list-style-type: none"> accuracy of the presented information the extent to which the explanations given are clear, concise, and are explained in a way that another student in the class would understand <p style="text-align: center;">/15</p>	<ul style="list-style-type: none"> information given is accurate and explained very clearly at a level that another science 21 student would understand information given is summarized well and provides enough detail for a good understanding of the disorder researched 	<ul style="list-style-type: none"> most information given seems accurate it is likely that another science 21 student would not understand all of the information as it is presented too much or not enough detail given so that the reader's understanding would be lacking 	<ul style="list-style-type: none"> the accuracy of much of the information is questionable it is likely that another science 21 student would not understand much of the information, since too much or not enough detail is given explanations are confusing
	6	4	2
<p>Creativity and Presentation Style</p> <ul style="list-style-type: none"> the extent to which the student displays the information in a way that is unique and 'grabs' the attention of the viewer how well the student adheres to the expectations for presentation format <p style="text-align: center;">/6</p>	<ul style="list-style-type: none"> title is large, centred, neat and descriptive information is typed or written clearly and large enough to read information is presented in a way that will surely attract attention and enhance ones understanding of the information at least 3 sources are cited clearly on one of the posters 	<ul style="list-style-type: none"> title is visible and fairly neat information could be typed or written clearer some creative elements present, but it is likely that the reader's understanding is not enhanced by these 2-3 sources cited clearly 	<ul style="list-style-type: none"> title is not large enough and/or lacks neatness information is not typed or written clearly it is unlikely that the method of presentation would attract a reader 1-2 sources cited
	4	2	0
<p>Timing</p> <ul style="list-style-type: none"> posters are put up and taken down at the times designated by your teacher <p style="text-align: center;">/4</p>	<ul style="list-style-type: none"> posters are put up AND taken down at the correct time (as set out by your teacher) all materials are taken home and the area is left clean of debris (ie: staples, bits of tape) 	<ul style="list-style-type: none"> posters are EITHER put up or taken down at the correct time, but not both most debris is removed 	<ul style="list-style-type: none"> posters are NEITHER put up nor taken down at the correct time some materials and debris are left behind

Name: _____

DIGESTIVE DISORDERS

A Research Project



Due Date: _____

YOUR TASK:

Choose one disease or disorder of the digestive system and research it. Prepare a handout for your classmates on your disease or disorder and present your information orally to the class.

Your choice of disease/disorder must be approved by the teacher before you begin to prepare your project. Each disease/disorder can only be chosen once. If you have an idea in mind already, ask your teacher for approval now. Otherwise, access the following website for ideas: http://pennhealth.com/health_info/animationplayer/digestion.html

Topic choice: _____ Teacher signature: _____

A CLOSER LOOK AT EXPECTATIONS:

After you have chosen your topic and have had it approved, begin your research. The information that you include on your handout and present to the class must include the following:

- The organ(s) involved
- How the organ(s) become infected/damaged
- What happens when the organ doesn't function properly
- How the disease/disorder can be prevented and/or treated

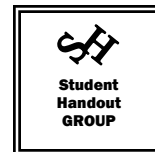
Your presentation must be 3-5 minutes in length. You must include a good introduction, closing and some time for questions at the end. Speak loud and clear and make frequent eye contact with your audience.

You must provide a list of *at least three* references. These must be included on the student handout and be given to your teacher.

Be creative in the way that you present your information. How will you *get and keep* the attention of your audience?

EVALUATION:

Your project will be graded according to the following rubric. It is strongly advised that you read through the rubric carefully so that you know what is expected of you and can set a goal for yourself!



Digestive Disorders Presentation Grading Rubric

CATEGORY	15	12	8	4
Scientific Accuracy <ul style="list-style-type: none"> the extent to which the digestive disorder is explained clearly and accurately 	<ul style="list-style-type: none"> thorough understanding of disorder demonstrated through thoughtful descriptions student's answers to questions asked give clear evidence of deep understanding 	<ul style="list-style-type: none"> satisfactory understanding demonstrated student answers questions asked with thoughtful answers that give evidence that adequate research has been done 	<ul style="list-style-type: none"> some understanding demonstrated some of the 'science' of the disorder clearly absent student answers most questions with a basic response 	<ul style="list-style-type: none"> inadequate understanding demonstrated; some scientific concepts not included in explanation student unable to correctly answer most questions
	5	3	2	0.5
Handout <ul style="list-style-type: none"> how well the typed notes on the student handout explain the disorder at a level that another Science 21 student would understand the extent to which the information is organized on the handout in a way that would make learning about the disorder easier 	<ul style="list-style-type: none"> notes provided about the disorder summarize well the info presented to the class; all main points included it is likely that the organization of the notes on the handout would make learning about the disorder easier info is at a level that another Science 21 student would understand 	<ul style="list-style-type: none"> notes provided about the disorder include most of the main points of the presentation; either less or more info could be included info on the handout is fairly organized some information presented is either too simple or too complex for another Science 21 student 	<ul style="list-style-type: none"> notes provided about the disorder do not include main points of the presentation info is hard to follow and lacks organization much of the info is too simple or too complex for another Science 21 student 	<ul style="list-style-type: none"> notes provided largely inadequate; main points of the presentation are not included info lacks organization and appears to have been put together with haste it is likely that another Science 21 student would not understand the disorder given the info on the handout
	5	4	3	1
Creativity <ul style="list-style-type: none"> the extent to which the student explains the digestive disorder in an unpredictable manner that engages others 	<ul style="list-style-type: none"> exceptionally unique approach that is engaging, captivating, unique and thoughtful 	<ul style="list-style-type: none"> somewhat unique method of explaining information most students engaged and seemingly interested by method(s) of delivery 	<ul style="list-style-type: none"> method chosen for presentation not unique or innovative, but some of the audience's interest and attention is still maintained 	<ul style="list-style-type: none"> chosen method of delivery is predictable and mundane audience is not engaged and their attention wanes



CATEGORY	1.0 each	0.75 each	0.50 each	0.25 each
Presentation Body Language	<ul style="list-style-type: none"> • movements seem fluid and help the audience to visualize 	<ul style="list-style-type: none"> • made movements or gestures that enhanced articulation and aided in emphasis of important points 	<ul style="list-style-type: none"> • some movements or gestures that could sometimes be considered useful in emphasis and articulation 	<ul style="list-style-type: none"> • very little movement or descriptive gestures
Eye Contact	<ul style="list-style-type: none"> • Hold attention of entire audience with the use of direct eye contact and animated eye expressions 	<ul style="list-style-type: none"> • consistent use of direct eye contact with audience; some eye expressions aid in information delivery 	<ul style="list-style-type: none"> • often uses direct eye contact with audience 	<ul style="list-style-type: none"> • displayed minimal eye contact with audience
Pacing and Voice	<ul style="list-style-type: none"> • good use of drama • student meets time guidelines (3-5 min) • use of fluid speed, inflection and good enunciation to maintain the interest of the audience 	<ul style="list-style-type: none"> • delivery includes appropriate drama and pace, but does not quite meet time guidelines • satisfactory use of inflection, but does not consistently use fluid speech and does not always enunciate well 	<ul style="list-style-type: none"> • delivery is in bursts • presentation quite off from time guidelines • displays some level of inflection throughout the delivery 	<ul style="list-style-type: none"> • delivery is either much too quick or too slow • presentation far off time guidelines • very little inflection • monotone voice • frequently mumbles • speech is not fluid
Poise	<ul style="list-style-type: none"> • student displays relaxed, self-confident nature about self with no mistakes 	<ul style="list-style-type: none"> • makes minor mistakes, but quickly recovers from them; displays little or no tension 	<ul style="list-style-type: none"> • displays mild tension; has trouble recovering from mistakes 	<ul style="list-style-type: none"> • tension and nervousness is obvious; has trouble recovering from mistakes
References	3	2	1	0
	<ul style="list-style-type: none"> • 3 or more sources cited 	2 sources cited	1 source cited	no sources cited