Animals Unit – Packet 1

Name: _____ Hour_____Date: _____

Date Packet is due: *after Part 5* Why late? _____
If your work was late, describe why

Score
- □ Above & Beyond
- □ Fully Complete
- □ Mostly Complete
- □ Incomplete – *fix the following pages:*

Driving Question: What are animal cells made from?

Anchoring Phenomenon: This week we are investigating why Olympic athletes must consume so much more food than usual, and why their diets vary depending on different sports. How does the food they consume affect their activities? And how do their bodies and their cells use the food they eat?

Deeper Questions

1. What are the cells of animals made from?
2. How are cells similar and different from molecules (and macromolecules)?
3. How do cells use the matter and energy in our food?

Schedule

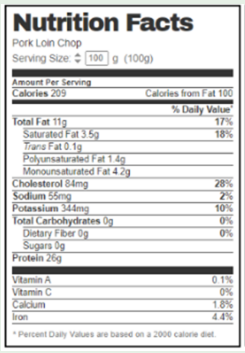
Part 1: Introduction
- Initial Ideas – How do our bodies use food?
- Data Dive – Olympic Diets Data
- Discussion & Developing Explanations

Part 2: Core Ideas
- Core Ideas
- Revisions of Part 1 Explanations

Part 3: Investigation
- Part A: Food Label Comparisons
- Part B: Cell Microscopy

Part 4: Review & Assessment
- Ranking Your Readiness
- Assessments (Formative Assessment & Mastery Check)

Part 5: Life Connections
- Life Connections - Carb's & Your Health



Nutrition Facts

Pork Loin Chop

Serving Size: 100 g (100g)

Amount Per Serving	
Calories 209	Calories from Fat 100
	% Daily Value
Total Fat 11g	17%
Saturated Fat 3.5g	18%
Trans Fat 0.1g	
Polyunsaturated Fat 1.4g	
Monounsaturated Fat 4.2g	
Cholesterol 84mg	28%
Sodium 55mg	2%
Potassium 344mg	10%
Total Carbohydrates 0g	0%
Dietary Fiber 0g	0%
Sugars 0g	
Protein 26g	
Vitamin A	0.1%
Vitamin C	0%
Calcium	1.8%
Iron	4.4%

* Percent Daily Values are based on a 2000 calorie diet.

NGSS Standards:
HS-LS1-2. How bodily systems interact to provide specific functions in multicellular organisms.
HS-LS1-6. How carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
HS-LS1-7. In cellular respiration, bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

Semester Schedule

Matter & Energy
Week 1: What happens when something burns?
Week 2: What happens to molecules during burning?
Week 3: Unit Assessment

Animals
Week 1: What are animal cells made from?
Week 2: What happens to food when it is consumed?
Week 3: What happens inside animal cells?
Week 4: Unit Assessment

Plants
Week 1: How do plant cells differ from animal cells?
Week 2: How do plants get their food and gain mass?
Week 3: How do plants get other needed molecules?
Week 4: Unit Assessment

Ecosystems
Week 1: Why do some places have more species than others?
Week 2: How does human activity affect living species?
Week 3: Unit Assessment

Part 1: Introduction – Food & Olympic Diets

Overview: In this activity, you will begin by discussing your initial ideas about what happens when we consume food. You will then analyze data and work in teams to develop your initial explanations.

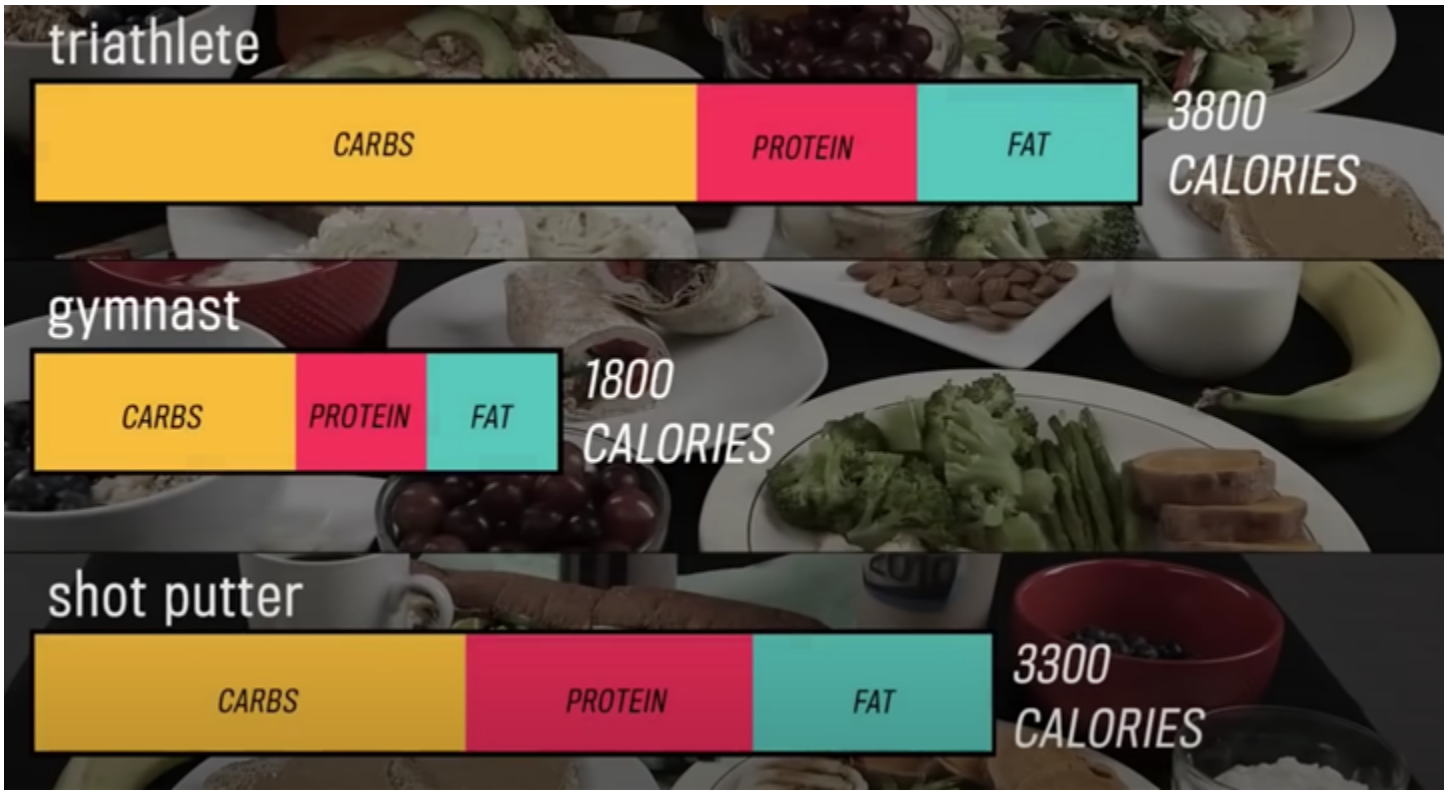
Initial Ideas:

1. A group of students are asked to explain what happens to food when consumed. Read the following responses from students. **Do you agree or disagree with each student's claim**?
    a. Avery thinks that most of the food that we eat passes through us and is lost as waste (feces).
    b. Bristol thinks that we mostly convert the food we eat into gasses that we breathe out.
    c. Chandra thinks that we turn the matter in food into energy that our cells use to function.

2. **Work in your small groups to discuss your ideas.** How are your ideas similar or different? Decide as a group whether each statement is correct (and why). Be prepared to present your ideas to the class.

Video: Next, watch this video individually or as a class (based on your teacher's instructions). Click here. (or visit - https://www.youtube-nocookie.com/embed/wvQ7tpBhxS0?playlist=wvQ7tpBhxS0&autoplay=1&iv_load_policy=3&loop=1&modestbranding=1&start=)

Data Dive: In this image, you can see differences in the diets of different kinds of athletes. This data shows the relative proportions of carbohydrates, protein, and fat in the diets of three different kinds of athletes. It also shows the total amount of calories each type of athlete needs to consume per day based on their activities.



Questions: record your group's ideas using materials provided by your instructor (such as a dry erase board).

1. **Begin by individually attempting to make sense of this image**. What trends or patterns do you notice? How does this relate to any prior knowledge or experience that you have?

2. **Next, work in your teams to discuss your ideas**. Where do you agree? Where do you disagree? Can you use this data to reach an agreement? Do others have prior knowledge or experience that could help?

3. **Based on this data, what is one conclusion that would be supported by this data?** How is this conclusion supported by this data? What specifically suggests that your claim is accurate?

4. **Based on this data, what is a second conclusion that would be supported by this data?** How is this conclusion supported by this data? What specifically suggests that your claim is accurate?

5. **Does this data support or refute any of the claims from Avery, Bristol, and/or Chandra on the previous page?** If so, explain.

Discussion & Developing Ideas

6. As a class, discuss your ideas about this data. What are the ideas that most agreed on? Where did your ideas differ as a class? Record your ideas in the spaces below.

We all agree that…	We disagreed or are unsure about…

7. **What happens to matter & energy in food when it is consumed?** Write down your initial explanation in the space below. Don't worry if you aren't completely sure about your answer! You will come back and revise this explanation as you gain more information during this unit.

_____

_____

_____

Throughout this packet, you will be updating this explanation as you gain more information and more experience. When you complete this packet, compare your early versions to your final version. You should see distinct improvement with each revision.

Part 2: Core Ideas

Overview: In this activity, you will begin with a short slideshow presentation. This will provide you with core ideas that will help you clarify your initial ideas. Your instructor will decide on how to implement this portion depending on your previous experience and capabilities with this content.

You will then work in small teams to answer the questions listed below. You should take notes in a notebook, on a dry erase board, or on scratch paper so that you are prepared to deliver your responses during the class discussion that will follow. *Note: your instructor may assign specific questions to your group if time is limited.*

Core Ideas Presentation: https://bit.ly/WUHS-Bio-AnimalsW1

Driving Questions:

1. What is a cell? Why are cells important to animals?
2. How are cells different from molecules? How are they similar?
3. Can a molecule be alive? Can a cell be alive? Explain .
4. What are cells made from? What are the main "ingredients" of a cell?
5. What is a macromolecule? How is it similar and different compared to molecules?
6. What is fat? What are fats made from? How do cells use fat?
7. What is a protein? What are proteins made from? How do cells use proteins?
8. What is a carbohydrate? What are carbohydrates made from? How do cells use carbohydrates?
9. What is an organelle?
10. How do organelles enable a cell to function?
11. How are the following related but different? *Cells, Organelles, Tissues, Organs, Systems.*
12. **Revising Explanations**: Return to your original explanation that you created at the end of Part 1. Based on this new information, how would you now respond to this question?

What happens to matter & energy in food when it is consumed?

Throughout this packet, you will be updating this explanation as you gain more information and more experience. When you complete this packet, compare your early versions to your final version. You should see distinct improvement with each revision.

Remember the "rules" for energy and matter:

- All solids, liquids, and gases are made of tiny particles called atoms. Multiple atoms can bond together to form molecules (e.g., water molecules consist of 1 oxygen atom & 2 hydrogen atoms).
- In biology, atoms last forever. Atoms cannot be created or destroyed (e.g., a carbon atom is always a carbon atom). Atoms found on molecules can be rearranged to form new molecules.
- In biology, energy lasts forever. Energy cannot be created or destroyed. Energy can exist as light, heat, motion, or as chemical energy stored in the bonds of molecules. Energy in one form can be transferred into a different form (e.g., light energy can be transformed into heat energy).

Part 3A Investigation: Food Label Comparisons

Adapted from materials by Carbon TIME

Overview: You will collect evidence to determine what happens to the mass of a substance during combustion.

Pre-Investigation Questions: Work as a group to determine the best response to each question. Be prepared to provide verbal responses for these questions for your instructor before you complete the investigation.

1. *What are cells? How are they different from and similar to molecules?*
2. *What are macromolecules? How are proteins, fats, and carbohydrates examples of macromolecules?*
3. *What is the role of each of the following in an animal cell? Proteins, fats, carbohydrates.*
4. *Summarize the relationships between each of the following: cells, tissues, organs, systems.*

When you think you are ready, **raise your hand**. Your instructor will listen to your verbal responses.

This activity was completed _____ (*instructor signature*)

Part A: Background on Cells & Macromolecules: Complete the reading below before moving onto Part B.

What are cells made from? Cells are primarily made from proteins and fats. The inner and outer membranes of cells are primarily made from fatty molecules called *lipids*. The structures inside of proteins are primarily made from proteins.

Both protein and fat are examples of macromolecules. Macromolecules are made from long chains of connected molecules (*macro* means “large”, so *macromolecule* literally means “large molecule”). Proteins are made from chains of amino acid molecules. Fats are made from chains of fatty acid molecules.

Cells also use carbohydrate macromolecules. Carbohydrates are made from long chains of glucose molecules. Examples of carbohydrates include sugars, starches, and fiber. Sugars are very short chains of glucose, starches are medium-length chains, and fibers are the longest chains of glucose. Animal cells mostly use carbohydrates (and fat) as a source of chemical energy.

Most of the mass of a cell consists of water, protein, and fat. Cells also contain trace amounts of other molecules, including minerals and vitamins. These substances make up only a very small percentage of the cell’s total mass. In nutrition, minerals and vitamins are often referred to as “micronutrients" because they are needed in smaller quantities. In contrast, macromolecules (fats, proteins, and carbohydrates) are known as “macronutrients" because they are needed in larger quantities.

The nutrient label on unprocessed food provides a summary of the different kinds of molecules found in those cells. The top of a food label shows the *calories* in that food for a given serving size. The amount of calories indicates the amount of chemical energy (high energy bonds) in the molecules and macromolecules found in the cells of that food. The nutrient label also shows the mass of different macromolecules found in the cells of that food. For example, a 100 g serving of beef (muscle cells of cows) contains 18 g of fat and 26 g of protein.

Part B: Comparing Nutrient Labels: In this investigation, you will compare nutrient labels for different kinds of meat to determine what kinds of macromolecules are found in animal cells.

Methods: Check each box as you complete each step.

1. ☐ First, predict what kinds of macromolecules are most prevalent in animal cells:

   I think that the following macromolecules are most common in animal cells: _____

   _____

2. ☐ Observe the nutrient label for beef (cow cells) shown here and use it to determine what these cells are made from. Complete the first row of the table below using this info. (Data taken from *nutritionix*).
   a. To determine how much water is in each kind of cell, add up the grams of a) total fat, b) total carbohydrates, and c) protein. Subtract this number from 100 grams (the serving size).
   b. We are ignoring the micronutrients (such as sodium and potassium) for now because these are measured in milligrams (*mg, or 1/1000 of a gram*). This is so small that we can disregard it.
3. ☐ Repeat the previous step for each kind of animal cell to complete the rest of the table.
4. ☐ Use this information to complete the questions on the next page.

Nutrition Facts

Steak

Serving Size: 100 g (100g)

Amount Per Serving	
Calories 280	Calories from Fat 170
	% Daily Value*
Total Fat 18g	**28%**
Saturated Fat 7g	35%
Polyunsaturated Fat 1g	
Monounsaturated Fat 8g	
Cholesterol 97mg	32%
Sodium 52mg	2%
Potassium 320mg	9%
Total Carbohydrates 0g	0%
Dietary Fiber 0g	0%
Sugars 0g	
Protein 26g	
Vitamin A	0%
Vitamin C	0%
Calcium	1%
Iron	10%

* Percent Daily Values are based on a 2000 calorie diet.

Nutrition Facts

Pork Loin Chop

Serving Size: 100 g (100g)

Amount Per Serving	
Calories 209	Calories from Fat 100
	% Daily Value*
Total Fat 11g	17%
Saturated Fat 3.5g	18%
Trans Fat 0.1g	
Polyunsaturated Fat 1.4g	
Monounsaturated Fat 4.2g	
Cholesterol 84mg	28%
Sodium 55mg	2%
Potassium 344mg	10%
Total Carbohydrates 0g	0%
Dietary Fiber 0g	0%
Sugars 0g	
Protein 26g	
Vitamin A	0.1%
Vitamin C	0%
Calcium	1.8%
Iron	4.4%

* Percent Daily Values are based on a 2000 calorie diet.

Nutrition Facts

Chicken

Serving Size: 100 g (100g)

Amount Per Serving	
Calories 220	Calories from Fat 120
	% Daily Value*
Total Fat 13g	20%
Saturated Fat 4g	20%
Polyunsaturated Fat 3g	
Monounsaturated Fat 5g	
Cholesterol 94mg	31%
Sodium 71mg	3%
Potassium 200mg	6%
Total Carbohydrates 0g	0%
Dietary Fiber 0g	0%
Protein 24g	
Vitamin A	12%
Vitamin C	1%
Calcium	1%
Iron	9%

* Percent Daily Values are based on a 2000 calorie diet.

Nutrition Facts

Fish Fillet

Serving Size: 100 g (100g)

Amount Per Serving	
Calories 110	Calories from Fat 8
	% Daily Value*
Total Fat 1g	2%
Saturated Fat 0g	0%
Polyunsaturated Fat 0g	
Monounsaturated Fat 0g	
Cholesterol 94mg	31%
Sodium 110mg	5%
Potassium 530mg	15%
Total Carbohydrates 0g	0%
Dietary Fiber 0g	0%
Protein 24g	
Vitamin A	4%
Vitamin C	0%
Calcium	1%
Iron	8%

* Percent Daily Values are based on a 2000 calorie diet.

Food Name	Organism it comes from	Calories *(chemical energy)*	Fat (g)	Carb's (g)	Protein (g)	Water (g)
Steak	Cow					
Pork Chop	Pig					
Chicken	Chicken					
Fish Filet	Fish					

Post-Investigation Questions:

1. **Briefly summarize the roles and functions of each of the following macromolecules in animal cells**:

   Fats:_____

   Carbohydrates: _____

   Protein: _____

2. **Which macromolecule was *most* prevalent in animal cells?** _____
   Why do you think this is? **Develop a hypothesis that might explain this:**

   _____

   _____

3. **Which macromolecule was *least* prevalent in animal cells?** _____
   Why do you think this is? **Develop a hypothesis that might explain this:**

   _____

   _____

4. **Was the fat content in the cells of different animals similar or did it vary?** _____
   Why do you think this is? **Develop a hypothesis that might explain this:**

   _____

   _____

5. **Is there a correlation between a) the amount of fat in the cells of an animal and b) the caloric content of the meat from that animal? Explain.**

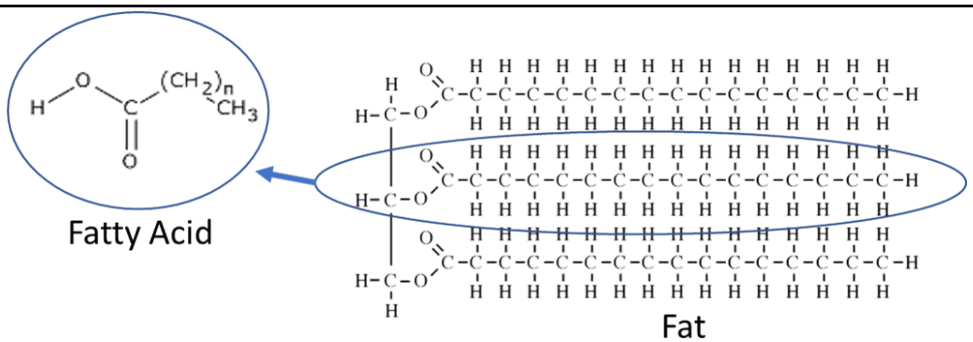
   _____

   _____

6. A fatty acid molecule and a fat macromolecule are shown below. **Are there high-energy bonds (C-C and C-H) in fat? How do you know? How might this affect your answer to the previous question?**

   _____

   _____



7. Our cells are primarily made from protein and fat. Incidentally, protein and fat are the most common macronutrients in many foods, including meat. **Develop a hypothesis that might explain this:**

_____

_____

8. Carbohydrates are typically more abundant in plant-based foods. If carbohydrates are largely absent from animal cells, **how do you think our own cells use the carbohydrates that we consume?**

_____

_____

Revising Explanations: Return to your original explanation from Parts 1 & 2. Based on this new information, how would you now respond to this question?

9. **What happens to the matter and energy in food when consumed?** _____

_____

_____

Be prepared to discuss and defend your ideas in small groups and as a class.

Part 3B Investigation: Cell Microscopy

Overview: In this lab, you will be examining animal cells under a microscope at varying magnifications. You will try to identify as many organelles as you can within each cell.

Materials needed (per group of 4): A light microscope, prepared microscope slides of animal cells.

Directions: Your instructor will demonstrate how to use a microscope in front of your class. As they do so, they will address each of the following concepts. **After they finish, review these questions as a group and be prepared to answer each question.** Your instructor will listen to your responses to determine your readiness.

1. Where does your instructor want you to get your microscopes from?
2. How should you carry your microscopes?
3. Where has your instructor placed your needed materials?
4. How should you use your microscope to effectively view cells without causing damage to the slides or the microscope?
5. What should you do when you think you are done?

When you think you are ready, **raise your hand**. Your instructor will listen to your verbal responses.

This activity was completed _____ (*instructor signature*)

Methods: Check each box as you complete each step.

1. ☐ Place the prepared microscope slide on the microscope's stage (the flat space with clips beneath the lenses). Turn on the microscope's light.
2. ☐ Switch to the lowest magnification (lens with the smallest number). Use the coarse and then the fine adjustment knob to focus the image. Record your observations in the space provided.
3. ☐ Switch to the middle-range magnification(s). Use the coarse and then the fine adjustment knob to focus the image. Record your observations in the space provided.
4. ☐ Finally, switch to the highest magnification (lens with the highest number). ONLY use the fine adjustment knob to focus. Record your observations in the space provided.
5. ☐ Turn off your microscope's light. Return your prepared slide to the appropriate location as determined by your instructor.
6. ☐ If your instructor has provided additional slides, repeat the steps above with the new slides.

Observations: Describe what you saw below using complete sentences. What organelles could you identify at each level of magnification? Examples include: *cell membrane, nucleus, mitochondria, ribosomes, etc*. What organelles were you unable to find at any magnification?

Lowest Power Lens Observations: _____

_____

Middle Power Lens Observations: _____

_____

Highest Power Lens Observations: _____

_____

Part 4: Review & Assessment

Overview: Rank each Driving Question in Part 2 as a 1 (*completely unsure*), 2 (*somewhat unsure*), or 3 (*completely sure*) based on your comprehension. Then work in teams to review each item and prepare a response. Next, write a final explanation below. You will conclude by completing a formative assessment.

What happens to the matter and energy in food when consumed?

_____

_____

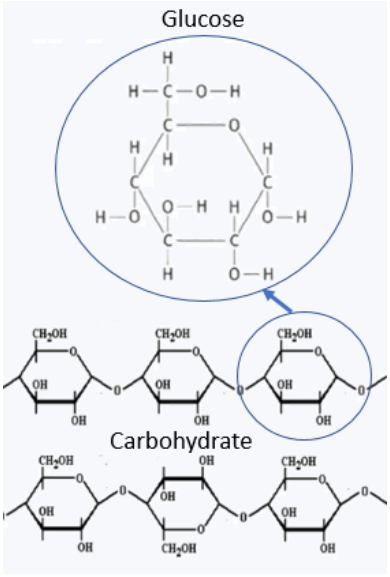
Go back and compare your early versions of your explanation to your final version above. You should see distinct improvement compared to your first attempts.

Part 5: Life Connections – Carb's and Your Health

Adopted with permission from Carbon TIME.

Directions: Complete the reading below. As you read the texts, underline any words that are challenging or unfamiliar. Complete an initial read-through, and check with your group to reach an initial consensus about the key points of the excerpt. Then use an internet search engine to look up unfamiliar terms and/or find additional information to help you make sense of these readings. *(Adapted from materials by the American Diabetes Association).*

Food generally contains three main macromolecules: carbohydrates, protein and fat. A macromolecule is a large molecule made of connected chains of smaller repeating molecules. You need all three kinds of macromolecules to stay healthy, but each person needs a different amount.



Carbohydrates, or "carbs", break down into individual glucose molecules when consumed. This glucose provides chemical energy to our cells. When we consume any carbohydrate, the body's blood glucose (or blood sugar) level rises. All carbohydrates are macromolecules made from connected chains of glucose molecules. What differentiates each type of carbohydrate is the lengths of these chains of sugars. Carbs come in many different forms, but the main three are sugar, starch, and fiber.

The smallest carbohydrate macromolecules are the sugars. Sugars rapidly break down into glucose when they are consumed, and quickly enter our bloodstream. There are two main types of sugars: 1) naturally occurring sugars like those in milk or fruit, and 2) added sugars, which are added to items like soda, sweets and baked goods. Sometimes other terms are used for added sugars, including dextrose, fructose, and corn syrup. Added sugars have been linked to health concerns. These include obesity, type 2 diabetes, and cardiovascular (heart) disease.

Starches are medium-sized carbohydrate macromolecules. Foods such as breads, pasta, crackers, corn and potatoes are often high in starch content. Starches enter our bloodstream more slowly than sugars, but more rapidly than fibers. Excess consumption of starches can also be unhealthy.

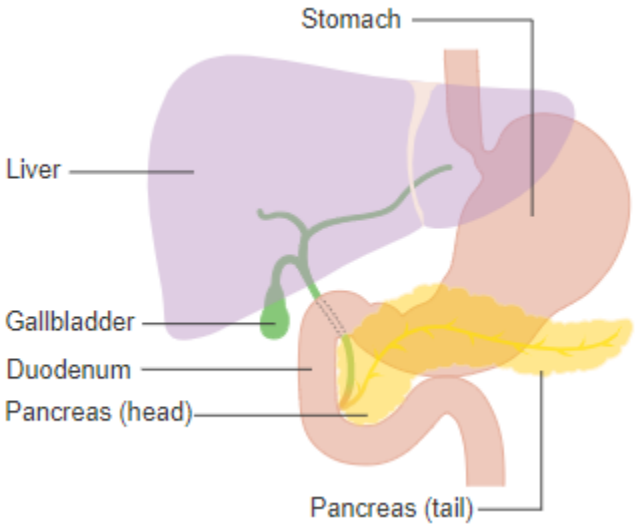
Fibers are the largest carbohydrate macromolecules - i.e., they are the longest chains of glucose molecules. Fibers break down the most slowly when consumed. Fiber comes from plant-based foods, including fruits, vegetables and whole grains. Fiber acts like your body's natural scrub brush—it passes through your digestive tract, carrying a lot of bad stuff out with it. It also keeps us feeling full, and helps lower cholesterol. Those aren't the only benefits: eating foods higher in fiber can also improve your digestion, help you manage your blood sugar and reduce your risk of heart disease.

Diabetes is a disease that emerges when someone is unable to properly regulate their blood sugar (or blood glucose) levels after consuming carbohydrates. Blood sugar levels rise after eating. In people without diabetes, the body's insulin response keeps levels from rising too high. Insulin is a protein, and it is produced in the cells of an organ called the pancreas. Among those who have diabetes, the process doesn't work as designed. People with diabetes are unable (or less able) to regulate their blood sugar levels.

There are two kinds of diabetes, and each works slightly differently. Among those with Type 1 diabetes, their pancreas no longer makes insulin. These individuals have to inject insulin into their blood. Type 1 diabetes is thought to be caused by an immune reaction (the body attacks itself by mistake).

Individuals with Type 2 diabetes are resistant to insulin and may not produce enough of it. While these individuals need to avoid blood sugar spikes, they generally do not need to take insulin at meals. Unhealthy diets (such as those high in sugars) increase the risk for Type 2 diabetes. You can prevent or delay type 2 diabetes by the following:

- *Drinking more water and fewer sugary drinks*
- *Eating more fruits and vegetables*
- *Finding healthy versions of your favorite foods.*
- *Making physical activity more fun*



Deeper Questions: Work in your assigned groups to answer the questions below. Record your group's ideas using scratch paper, a dry erase board, a digital document, or another option.

1. Summarize this reading. What are the key points?
2. How might this information relate to our content from this week?
3. What are the three kinds of carbohydrates? Provide a brief summary of each.
4. What is diabetes? How does this disease relate to carbohydrates?
5. What are the different kinds of diabetes? What are their causes and how can they be avoided?
6. Which kind of carbohydrate do you think is most likely to affect individuals with diabetes? Why?
7. Of the three kinds of carbohydrates, which are most likely to negatively affect your health? Why?
8. Of the three kinds of carbohydrates, which are most likely to positively affect your health? Why?

When you think you are ready, raise your hand. Your instructor will listen to your verbal responses. All group members should be involved in providing verbal responses.

This activity was completed _____ (*instructor signature*)

Be prepared to discuss and defend your ideas in small groups and as a class.

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Animals Unit, Packet 1 Formative Assessment

Name: _____ Hour____ Date:_____ Score:_____

Directions: A 3x5 notecard with *handwritten* notes can be used to guide your answers. Your instructor may allow you to work in assigned groups. If so, have a different person write each response while others assist.

1. Three students are discussing what living things are made from. Do you agree or disagree with what each student claims? <u>Circle "Agree" or "Disagree" for each of the three claims below</u>.

A) Avery - "Living things are made of cells. Non-living things are made of atoms." AGREE/DISAGREE

B) Bristol - "Living things are made from cells; cells are made from molecules." AGREE/DISAGREE

C) Chandra - "Living things are made from cells, which are made from organelles." AGREE/DISAGREE

2. Provide an explanation. Why did you agree or disagree with each student's claim?

a) _____

b) _____

c) _____

Writer:

3. Fats, proteins, and carbs are all macromolecules. What is a macromolecule? Include and <u>underline</u> each of the following in your response: *molecules, macromolecules, fatty acids, amino acids, glucose.*

_____

_____

_____

Writer:

4. How do animal cells use fats, proteins, and carbohydrates? Explain the role of each macromolecule.

Fat: _____

Protein: _____

Carbohydrate: _____

Writer:

5. How are the following related to each other? *Cells, Organisms, Organs, Systems, Tissues.*

_____

_____

_____

Writer: