2.1 - Animals Unit, Packet 1

Score
□ Above & Beyond
□ Meets Expectations
□ Near Expectations
□ Incomplete – *fix the following pages*:

First & Last Name: _____ Period/Hour: _____

NOTE: Packets are due after completing Part 5. Check each page to be sure all blanks are completed.

Driving Question: How do animal cells use food?

Anchoring Phenomenon: Different people require different diets. This is especially true among Olympic athletes, who require specialized diets tailored to their individual needs. How does their diet impact their bodily functions and cellular processes? What do our bodies do with the food we consume?

Deeper Questions

1. What are animal cells made from?
2. How do atoms and molecules relate to cells and bodies?
3. How do cells use the matter & energy in the food we consume?

Schedule

Part 1: Introduction
- Initial Ideas & Data Dive
- Discussion & Developing Explanations

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

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

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

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

NGSS Standards (*PEs* & *CCCs are summarized below. SEPs are noted throughout the packet*).
HS-LS1-2. How bodily systems interact in multicellular organisms. HS-LS1-6. How carbon, hydrogen, and oxygen from sugar molecules form amino acids and/or other molecules. HS-LS1-7. How 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

1. Matter & Energy
1.1: What happens when something burns?
1.2: How does burning change matter & energy?
1.3: Unit Assessment

2. Animals
2.1: How do animal cells use food?
2.2: What happens to food when it is consumed?
2.3: How do cells acquire atoms from food?
2.4: Unit Assessment

3. Plants
3.1: How do plant cells differ from animal cells?
3.2: How do plant cells obtain matter and energy?
3.3: How can we investigate plant growth and function?
3.4: Unit Assessment

4. Ecosystems
4.1: Why do different places have different amounts of species?
4.2: How does human activity affect species?
4.3: Unit Assessment

Resource Links: Class Website; Core Ideas; Summary Video; Practice Test; Part 1 Video; Part 2 Video; Part 3A Data; Part 3B Data; Macromolecule Images;

Part 1: Introduction – Changing Molecules (2.1.1)

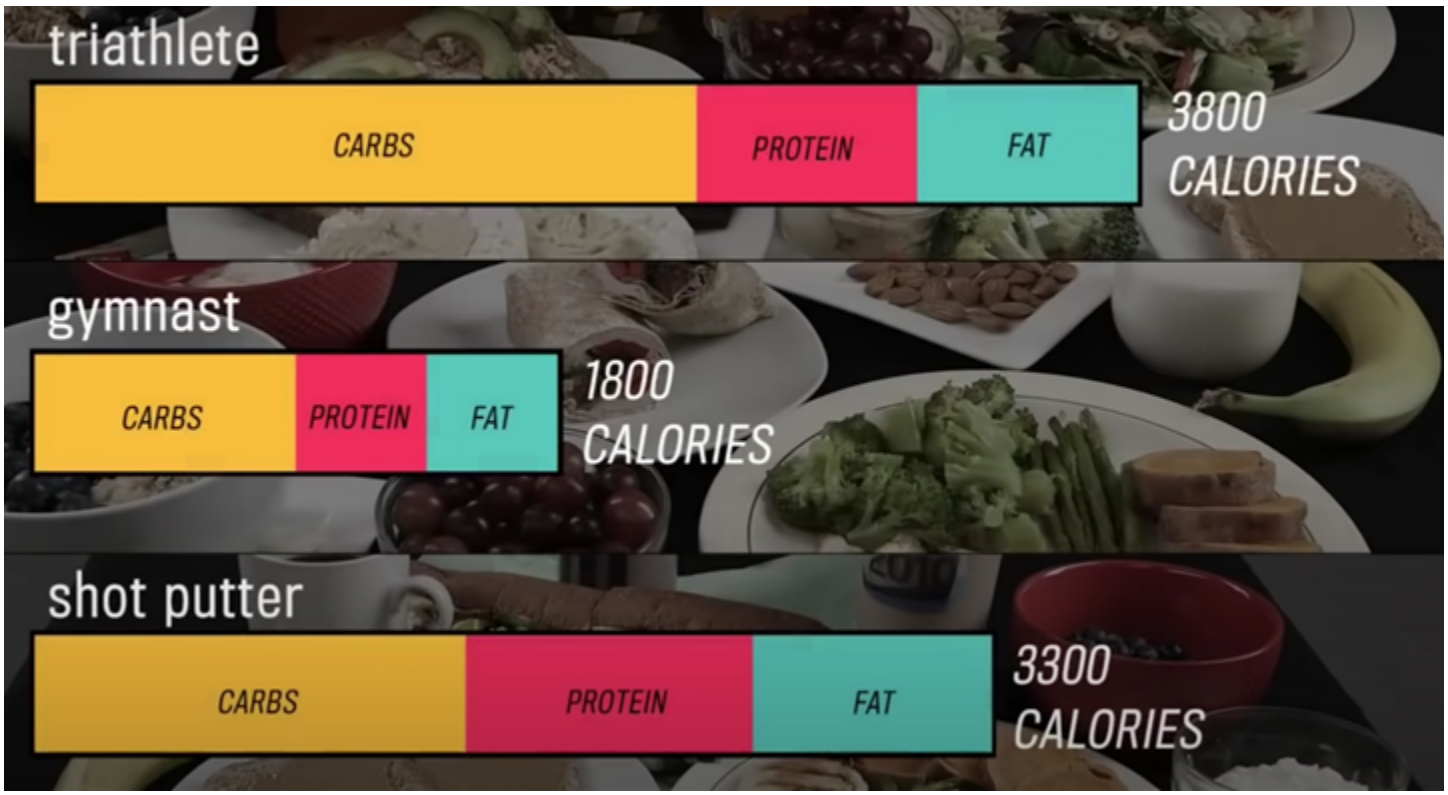
Overview: **Overview**: In this activity, you will begin by discussing your initial ideas about what happens when we consume food. You will then analyze data and work in teams to develop your initial explanations.

Initial Ideas - *Record your ideas separately (e.g., on a white board or scratch paper).*
SEP: Engaging in Argument from Evidence

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 gases 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.

Data Dive - *Read the directions below.* *SEP: Analyzing & Interpreting Data*

Video: Next, watch this video individually or as a class (based on your teacher's instructions). Then, examine the data below, which shows the percentages of carbohydrates, protein, and fat in the diets of three athlete types. This also shows each type of athlete's daily calorie requirements based on their activities.



Data Dive Questions - *Record your ideas separately (e.g., on a white board or scratch paper).*

1. **Begin by individually attempting to make sense of this data**. 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/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 initial claims on the previous page?** If so, explain.
6. **Why would different athletes need differing amounts of carbs, fats, and protein?**

Discussion - *Record your ideas in the spaces below.* *SEP: Asking Questions & Defining Problems*

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 generally agree that…	***We disagreed or were unsure if…***

Initial Explanations - *Record your ideas in the spaces below.* *SEP: Constructing Explanations & Designing Solutions*

How do our cells use the matter and energy in the food we consume? Write down an initial explanation in the space below. Don't worry if you aren't completely sure about this. 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 initial explanation to your final version. You should see clear improvement with each revision.

Part 2: Core Ideas (2.1.2)

Overview: In this activity, begin by watching this video (individually on an approved device or as a class as determined by your instructor). Next, you will use a short presentation to provide you with information that will help you improve and revise your initial ideas. Your instructor will decide on how to implement this portion. You will then work in small teams to address the questions listed below.

Driving Questions - *Record your ideas separately (e.g., on a white board or scratch paper).*
SEP: Developing & Using Models

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. How are each of the following an example of a macromolecule? *Fats, carb's, proteins*.
7. What is fat? What are fats made from? How do cells use fat?
8. What is a protein? What are proteins made from? How do cells use proteins?
9. What is a carbohydrate? What are carbohydrates made from? How do cells use carbohydrates?
10. What is an organelle?
11. How do organelles enable a cell to function?
12. How are the following related but different? *Cells, Organelles, Tissues, Organs, Systems.*

Revising Explanations - *Record your ideas in the spaces below.* *SEP: Constructing Explanations & Developing Solutions*

How do our cells use the matter and energy in the food we consume? Based on this new information, how would you now respond to this question?

_____

_____

_____

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

Part 3A: Food Label Comparisons (2.1.3a)

Pre-Investigation Questions - *Work as a group to prepare verbal responses for these questions. When you think you are all ready to provide responses, raise your hand. Your instructor will listen to your explanations, provide feedback, and determine if you are ready to move on to the investigation.*
SEP: Developing & Using Models

1. What are cells? How are they different from and similar to molecules?
2. What are macromolecules? How are proteins, fats, and carbs examples of macromolecules?
3. Summarize 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.*

This activity was completed _____ (*instructor signature*)

Overview: In this investigation, you will analyze food labels from meat products to determine what animal cells are made from..

Directions - *Complete the reading below before moving on. Use the column on the right to record key ideas, identify challenging words, and keep track of questions.* *SEP: Finding & Communicating Information.*

Cells are mainly composed of proteins and fats. Proteins are made of amino acids, and fats are made of fatty acids. The cell membrane is formed from a type of fatty acid called a *lipid*. The internal cell structures are primarily composed of proteins. Both proteins & fats are examples of macromolecules, or large molecules made from chains of smaller molecules.

Carbohydrates, another type of macromolecule, are also used by cells. Carbohydrates consist of long chains of glucose molecules. Examples of carbohydrates include sugars, starches, and fiber. Animal cells primarily use carbohydrates and fats for energy.

The majority of a cell's mass consists of water, protein, and fat. Cells also contain trace amounts of other molecules, including minerals and vitamins; these are often referred to as micronutrients because they are needed in smaller quantities. In contrast, fats, proteins, and carbohydrates are known as macronutrients because they are needed in larger quantities.

The nutrient label on unprocessed food summarizes the molecules found in the cells of the organisms we eat. These labels display the serving size and calorie content (the chemical energy stored in the high energy bonds of molecules). Nutrient labels also show the mass of different macromolecules in the food. For instance, 100 g of beef contains 18 g of fat and 26 g of protein.

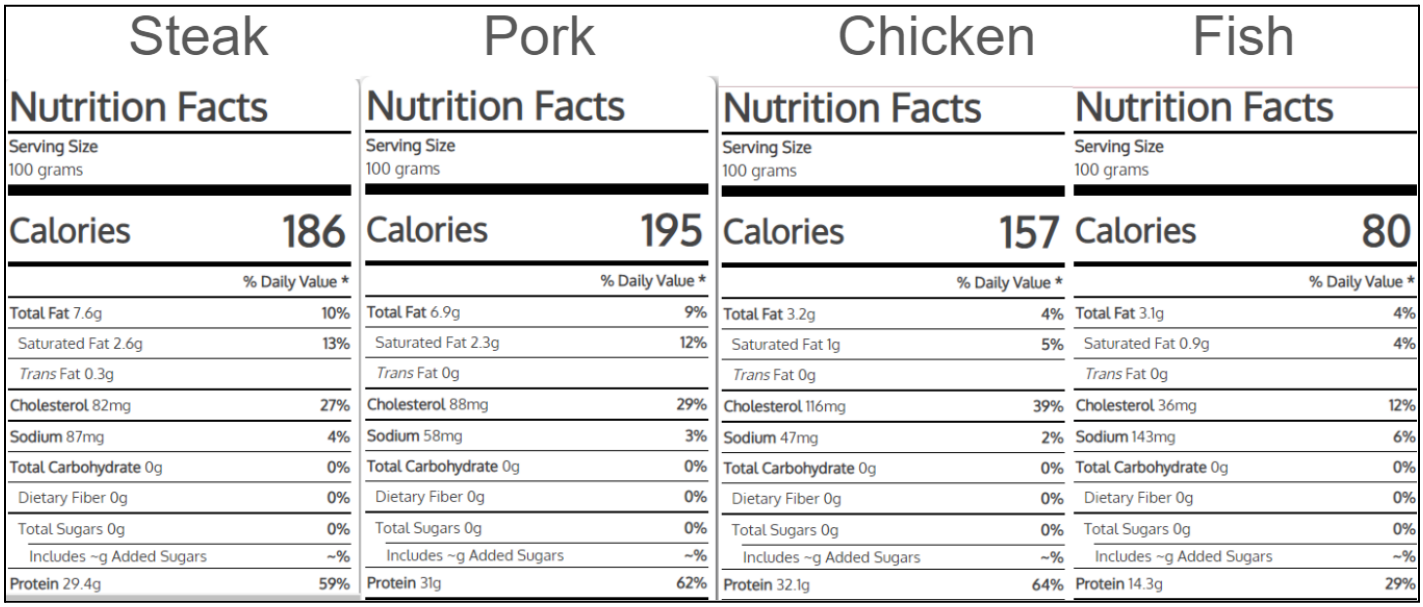
Food Label Analysis: compare nutrient labels for different meats to determine what macromolecules are found in animal cells. *SEP: Engaging in an Argument from Evidence. Analyzing & Interpreting Data*

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 below 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 micronutrients such as sodium and potassium because these are measured in milligrams (*mg = 1/1000 of a gram*). This is so small 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.



Steak

Nutrition Facts

Serving Size
100 grams

Calories	186
	% Daily Value *
Total Fat 7.6g	10%
Saturated Fat 2.6g	13%
Trans Fat 0.3g	
Cholesterol 82mg	27%
Sodium 87mg	4%
Total Carbohydrate 0g	0%
Dietary Fiber 0g	0%
Total Sugars 0g	0%
Includes ~g Added Sugars	~%
Protein 29.4g	59%

Pork

Nutrition Facts

Serving Size
100 grams

Calories	195
	% Daily Value *
Total Fat 6.9g	9%
Saturated Fat 2.3g	12%
Trans Fat 0g	
Cholesterol 88mg	29%
Sodium 58mg	3%
Total Carbohydrate 0g	0%
Dietary Fiber 0g	0%
Total Sugars 0g	0%
Includes ~g Added Sugars	~%
Protein 31g	62%

Chicken

Nutrition Facts

Serving Size
100 grams

Calories	157
	% Daily Value *
Total Fat 3.2g	4%
Saturated Fat 1g	5%
Trans Fat 0g	
Cholesterol 116mg	39%
Sodium 47mg	2%
Total Carbohydrate 0g	0%
Dietary Fiber 0g	0%
Total Sugars 0g	0%
Includes ~g Added Sugars	~%
Protein 32.1g	64%

Fish

Nutrition Facts

Serving Size
100 grams

Calories	80
	% Daily Value *
Total Fat 3.1g	4%
Saturated Fat 0.9g	4%
Trans Fat 0g	
Cholesterol 36mg	12%
Sodium 143mg	6%
Total Carbohydrate 0g	0%
Dietary Fiber 0g	0%
Total Sugars 0g	0%
Includes ~g Added Sugars	~%
Protein 14.3g	29%

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 cells with the greatest amount of fat and b) the calorie content of the meat from those animals? Explain.**

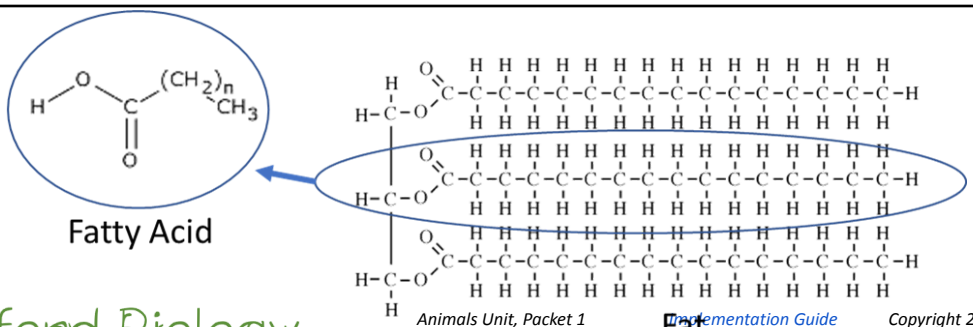
   _____

   _____

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. Protein and fat are the most common macronutrients in many foods, particularly 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. **How do our cells use the matter and energy in the food we consume?** _____

_____

_____

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

Part 3B Investigation: Cell Microscopy (2.1.3b)

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 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*)

Directions - *Carefully read the directions below before beginning. Record info where prompted.*
SEP: Developing & Using Models

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 organelles could you identify within the cells at each level of magnification. Examples include: *cell membrane, nucleus, mitochondria, ribosomes, etc*.

Organelles seen at highest magnification: _____

_____

What are these organelles and cells made from? _____

_____

How do these cells relate to the food the animal consumes? _____

_____

_____

Part 4: Review & Assessment (2.1.4)

Step 1: Rank each Driving Question in Part 2 based on your comprehension (you can rank them as *1,2,3* or *green/yellow/red*, or any other method). Then work in teams to review anything that is still unclear.

Step 2: Identify any remaining areas of confusion or concern. Then review these topics with your instructor.

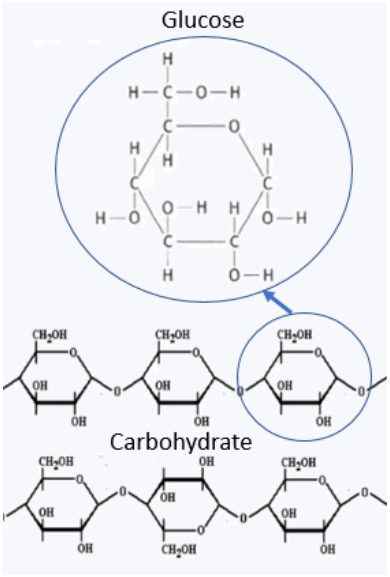
Step 3: Complete the Formative Assessment (*last page of the packet*). Your instructor will determine if you will work individually, in pairs, or in small groups. Then compare and evaluate your responses as a class.

Step 4: Individually complete a Mastery Check. If your performance indicates that additional support is needed, your instructor will determine how to help you move forward.

Part 5: Life Connections – Carb's and Your Health (2.1.5)

Adopted with permission from Carbon TIME.

Background - *Complete the reading before answering the questions below.*
SEP: Engaging in an Argument from Evidence. Constructing Explanations & Designing Solutions.



Background: *Carbohydrates (or "carbs") are macromolecules composed of chains of glucose molecules. These glucose molecules provide a source of chemical energy for our cells. When we consume carbs, the glucose enters our bloodstream, which initially raises our blood sugar levels.*

Carbohydrates come in three main types: sugar, starch, and fiber. Sugars are the smallest carbohydrate macromolecules. They rapidly break into individual glucose molecules when consumed. Sugars can exist in food naturally, such as fruit sugar. Some foods have added sugars (e.g., in soda and sweets); these foods are more likely to cause health issues like obesity and diabetes.

Starches are medium-sized carbohydrate macromolecules found in foods like bread and pasta. They enter the bloodstream more slowly than sugars but can still be unhealthy if consumed too often.

Fibers are the largest carbohydrate macromolecules They are formed from long chains of glucose molecules. They break down slowly when consumed and come from plant-based foods like fruits, vegetables, and whole grains. Fiber aids digestion, lowers cholesterol, helps control blood sugar, and reduces the risk of heart disease.

Diabetes is a condition where the body struggles to regulate blood sugar levels after eating carbohydrates. Normally, insulin (a protein produced by the body) keeps blood sugar in check. However, in diabetes, this process is disrupted.

There are two types of diabetes. In Type 1 diabetes, the pancreas stops producing insulin, requiring individuals to inject insulin. It's often triggered by an immune reaction.

In Type 2 diabetes, individuals become insulin-resistant and may not produce enough insulin. Unhealthy diets, especially high sugar intake, increase the risk of Type 2 diabetes. To prevent or delay Type 2 diabetes, consider 1) Drinking more water and fewer sugary drinks; 2) Eating more fruits & vegetables; 3) Choosing healthier versions of your favorite foods; and 4) Staying physically active by finding and choosing activities you enjoy.

Deeper Questions: Work in your assigned groups to answer the questions below. Record your group's ideas separately. When you think you are ready, raise your hand. Your instructor will listen to your verbal responses.

1. Summarize this reading. What are the key points? How does this relate to our content from this week?
2. What are the three kinds of carbohydrates? Provide a brief summary of each.
3. What is diabetes? What are the different kinds of diabetes? How does this relate to carbohydrates?
4. Which kind of carbohydrate do you think is most likely to affect individuals with diabetes? Why?
5. Which kinds of carbohydrates most positively affect your health? Which are more harmful? Why?

This activity was completed _____ (*instructor signature*)

Animals, Packet 1 Formative Assessment (2.1.4)

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? Circle "Agree" or "Disagree" for each of the three claims below.

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 underline 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:

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