Animals Unit

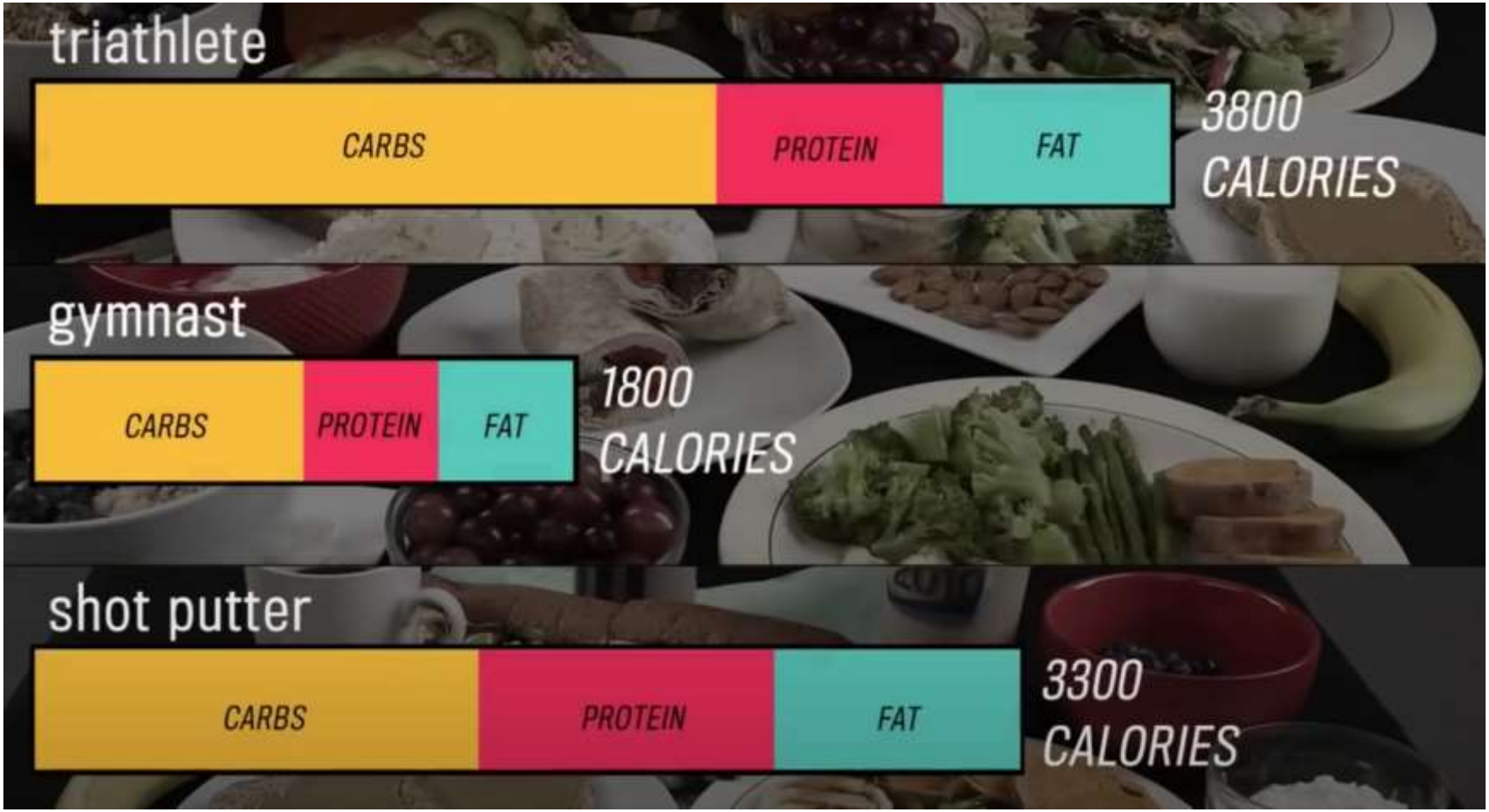
Week 1 – What happens to food when it is consumed?

Waterford Biology

Animals Unit - W2 Driving Question

- **<u>This week's driving question</u>: What happens to food when it is consumed?**
- What are the cells of animals made from?
- How are cells similar and different at the atomic level compared to the food we consume?
- Why do athletes need more food and different kinds of food?

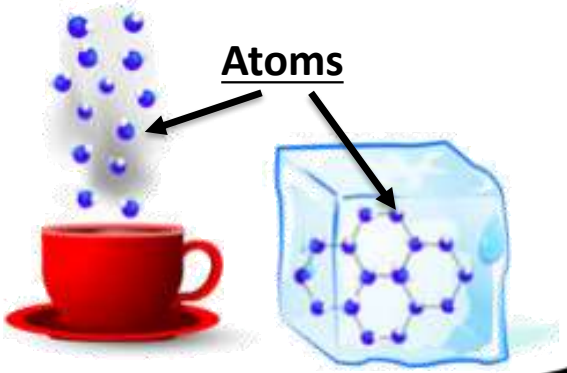
Part 1 Recap



- What claims can we make based on the data above?

Reminders from Matter & Energy

- Rule #1: **All solids, liquids, and gases are made of tiny particles called atoms**.
  - The more atoms something has, the more mass it has.
  - Multiple atoms can bond together to form molecules.
  - *For example, water molecules consist of 1 oxygen atom and 2 hydrogen atoms*.



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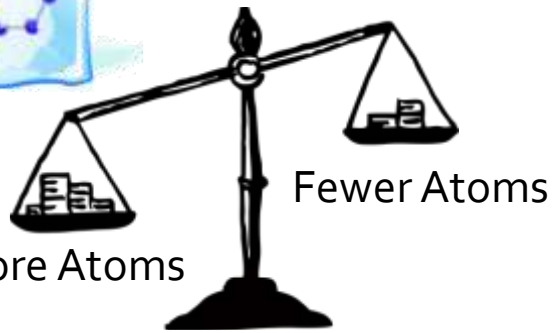
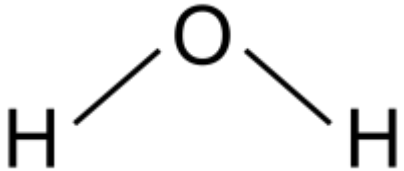


Source: Pixabay

If atoms were like students, a class would be like a molecule.



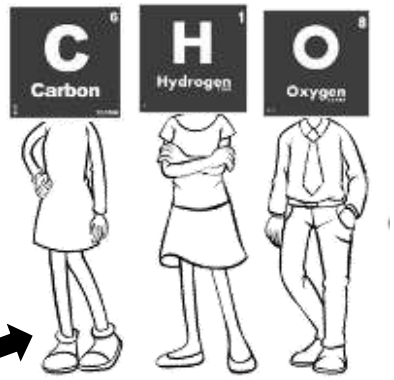
A group of bonded atoms = a molecule.

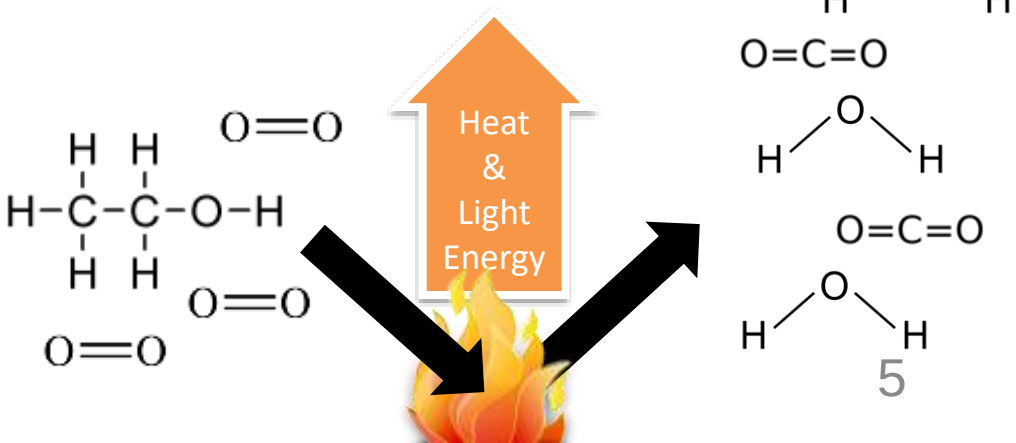
A group of students = a class.

Source: Pixabay

Reminders from Matter & Energy

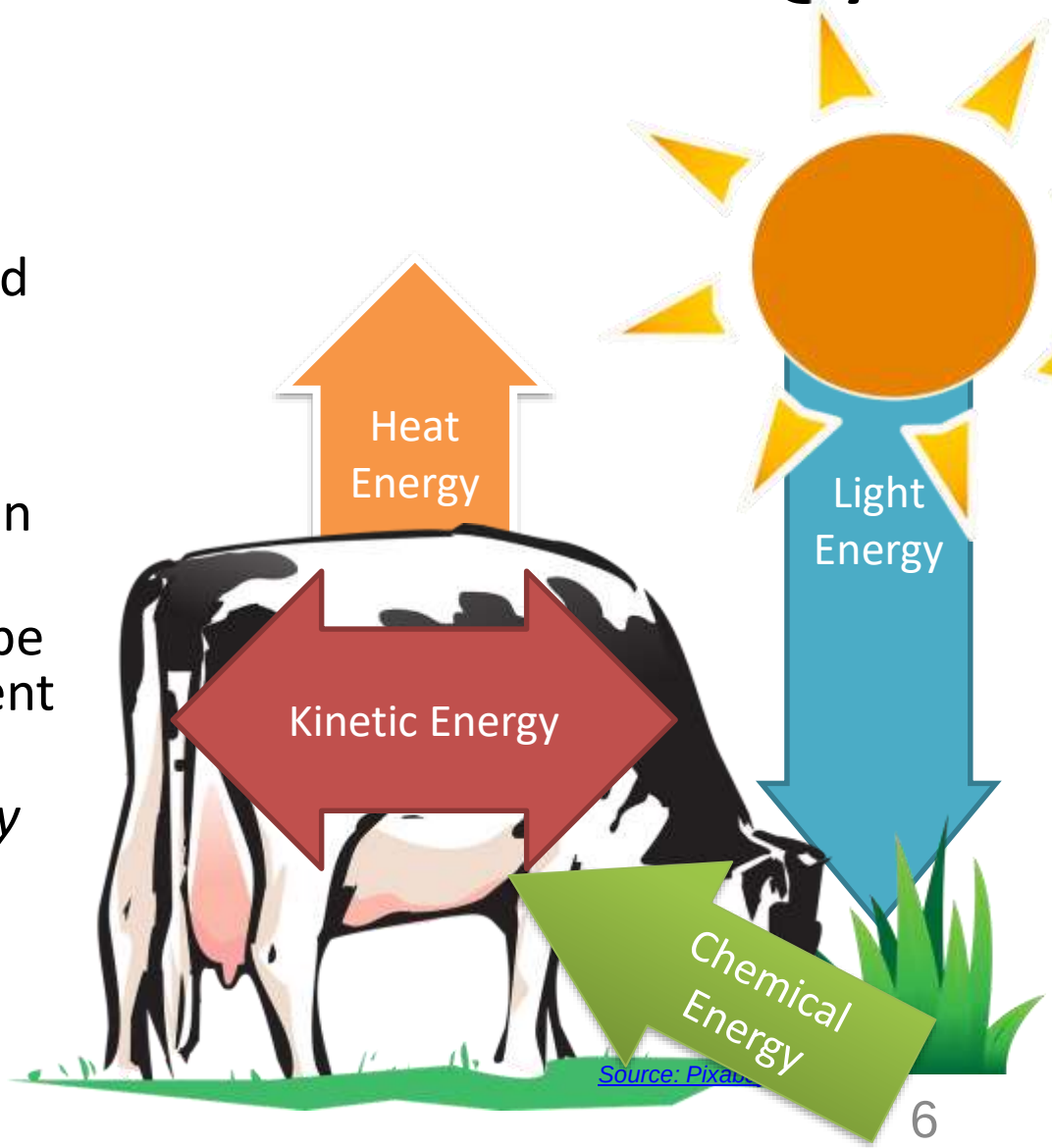
- Rule #2: In biology, **atoms last forever**.
  - Atoms cannot be created or destroyed.
  - *For example, a carbon atom is always a carbon atom*).
  - Different kinds of atoms are called *elements.*
  - Atoms found on one molecule can be rearranged to form a new molecule →





Reminders from Matter & Energy

- Rule #3: 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.
  - *For example, light energy can be transformed into heat energy*.

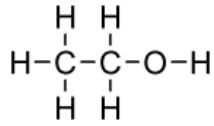


Chemical bonds = stored energy

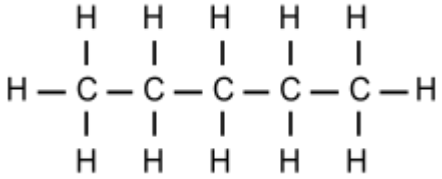
- **When atoms form molecules, they store energy in their chemical bonds**.
  - Chemical bond energy holds atoms together in molecules.
- **Carbon-carbon bonds and carbon-hydrogen bonds are <u>high-energy bonds</u>**.
  - The more C-C and C-H bonds, the higher the chemical energy.
  - This is why sugars like glucose can provide large amounts of energy.

Source: Wikimedia Commons

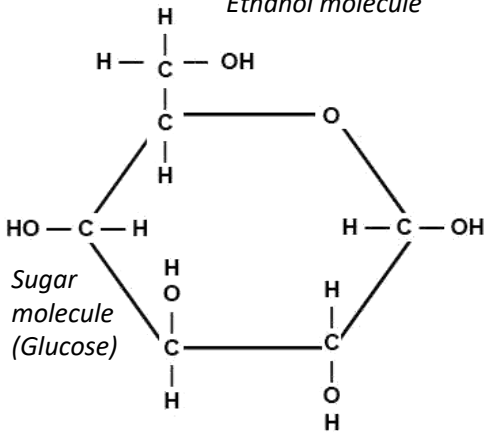
Chocolate has large amounts of chemical energy (measured in calories) stored in the C-H and C-C bonds of its sugar & fat.



Ethanol molecule



Gasoline molecule

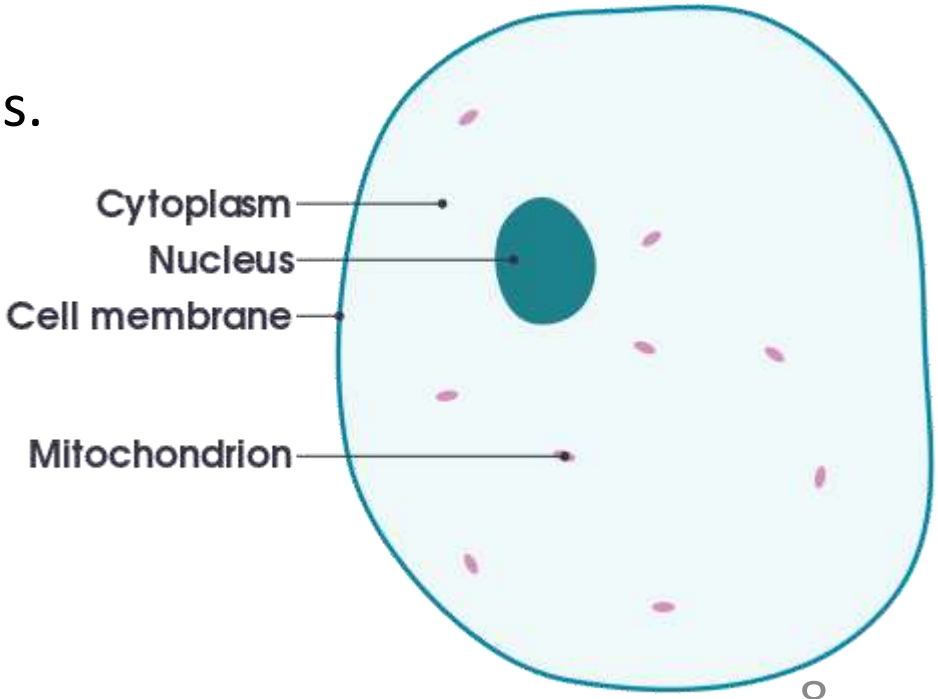


Sugar molecule (Glucose)

Gasoline, ethanol, and sugar molecules have large amounts of high-energy C-C and C-H bonds.

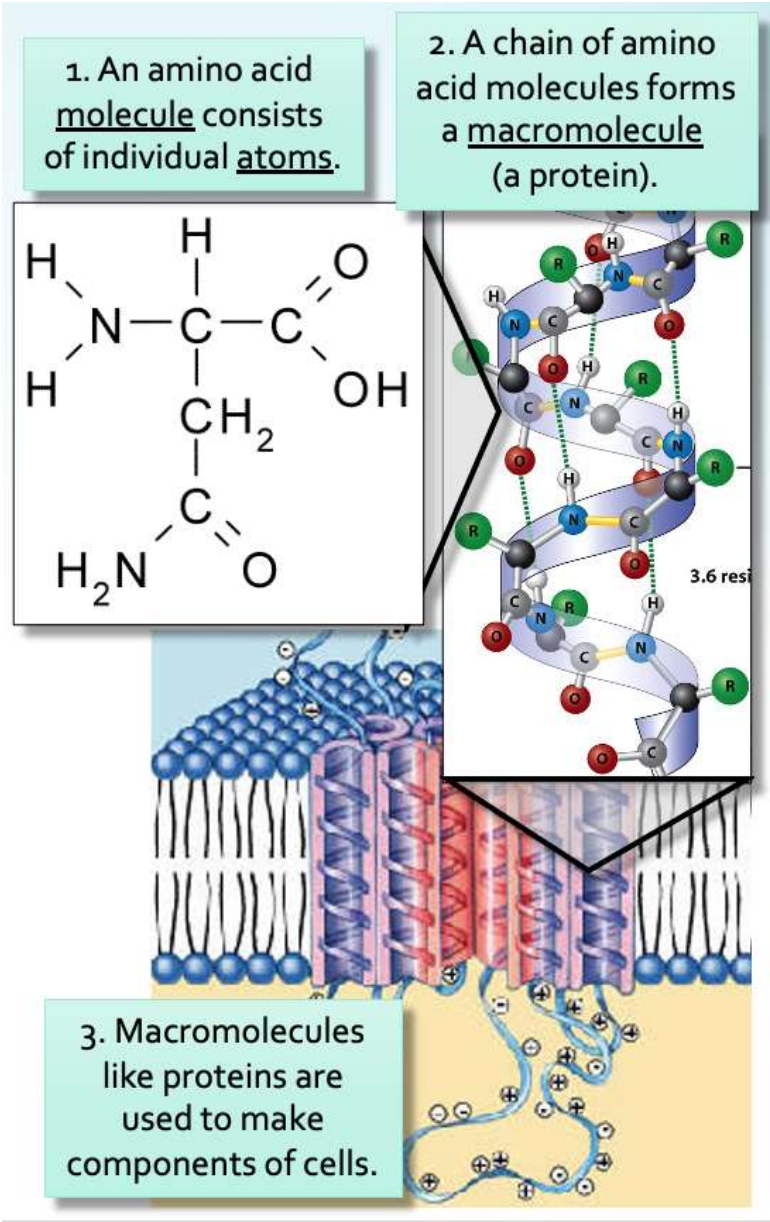
Introduction to Cells

- **<u>Cells</u> are basic building blocks of life**.
  - Cells are the smallest thing that can be alive.
- **Anything that is alive is comprised of a cell or of multiple cells**.
  - All animals, plants, fungi, and bacteria are made of cells.
- **Cells are matter and are comprised of atoms**.
  - Organisms depend on the food they eat (or, the food they produce) to provide the atoms that make up their cells.



Macromolecules

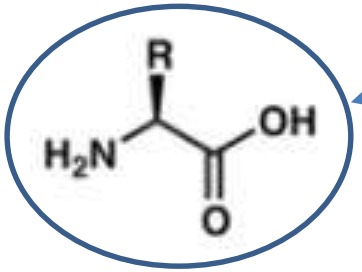
- **Atoms from food are organized into molecules and then into macromolecules.**
  - A macromolecule is a long chain of individual molecules bonded together.
  - Macromolecules do all the work of cells.
- **Examples of macromolecules include carbohydrates, proteins, and fats.**
  - These substances play key roles in cell function.
  - For example, cell membranes are mostly comprised of fatty acid chains.
  - Proteins are like molecular machines in the cell and can also provide structure.
  - Carbohydrates provide a source of chemical energy, and provide structure in plant cells.
- **Macromolecules are made mostly of carbon, hydrogen, and oxygen atoms.**
  - These molecules have high-energy bonds.



Individual amino acid molecules are strung together to form a large macromolecule called a *protein*.

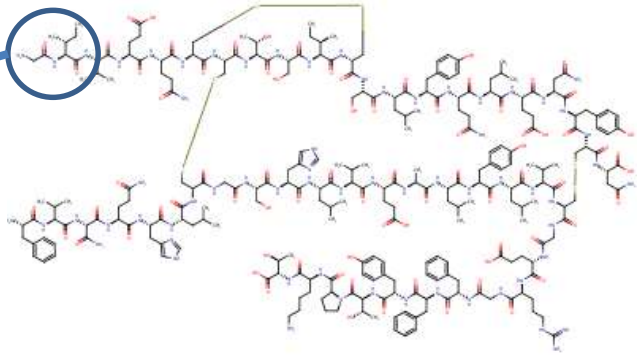
Macromolecules

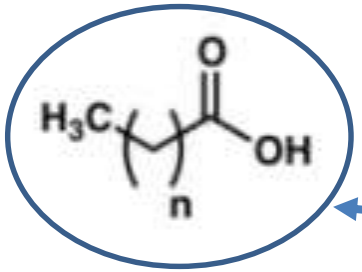
- <u>Amino Acids</u> combine to form *proteins*.
- <u>Fatty acids</u> combine to form *fats*.
- <u>Glucose</u> molecules combine to form *carbohydrates*



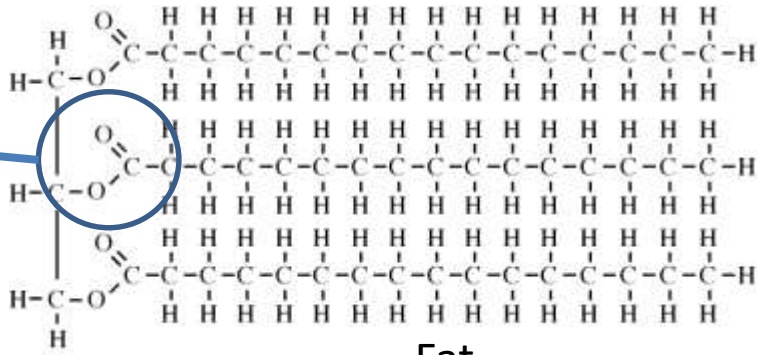
Amino Acid

Protein

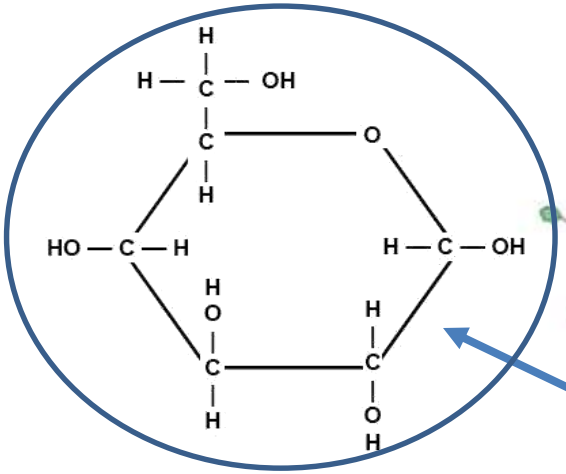




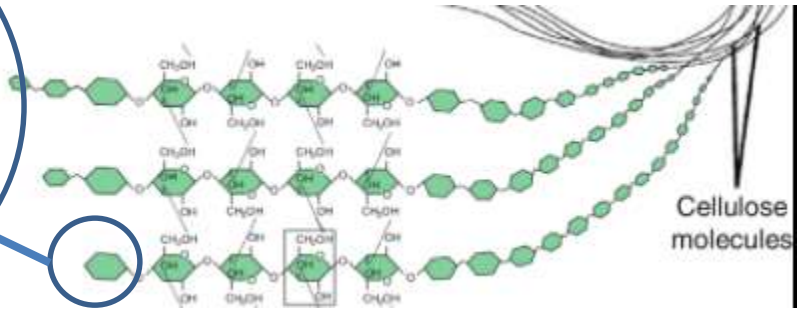
Fatty Acid



Fat



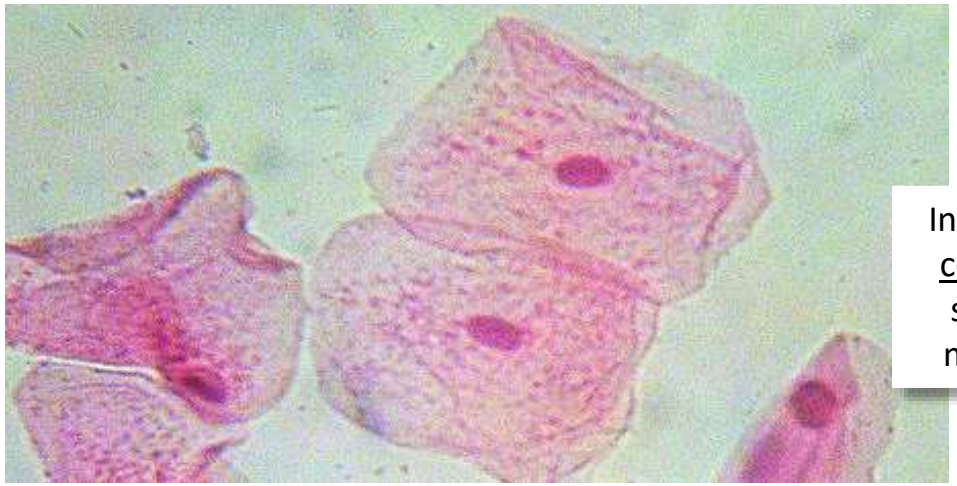
Glucose



Carbohydrate

Greasy Water Balloons

- **Cells are mostly made of water.**
  - Most of the volume of a cell is water.
  - Cells are sort of like greasy bubbles filled with water.
- **<u>Organelles</u> are structures within cells that perform specific functions.**
  - Organelles consist of a combination of membranes and proteins (sort of like tiny cells within cells).



In this picture of an animal <u>cell</u>, individual <u>organelles</u> such as the nucleus and mitochondria are visible.

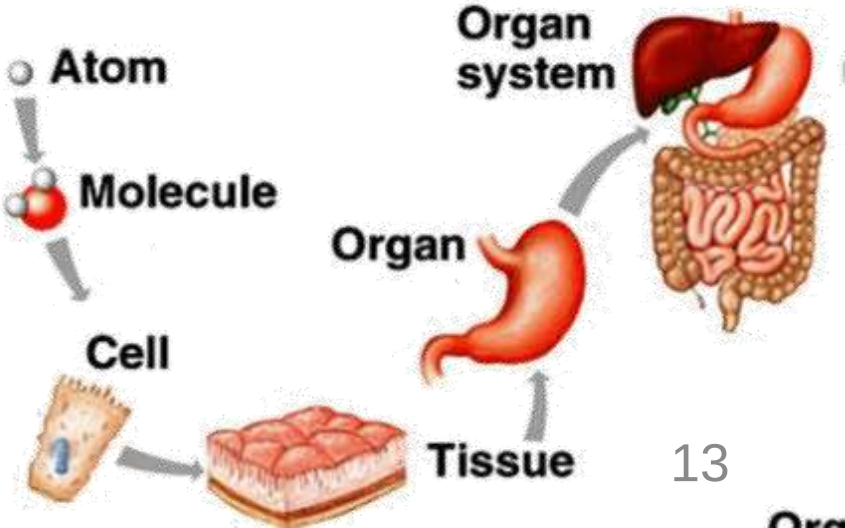
Organelles

- **Examples of organelles include the mitochondria, nucleus, and chloroplasts.**
  - The mitochondria transforms chemical energy in the bonds of glucose into a new form of chemical energy called ATP.
  - The nucleus stores the genetic information needed by a cell to carry out its functions and reproduce.
  - Chloroplasts can convert light energy into chemical energy found in the bonds of glucose.

In this picture of a plant cell, individual organelles called *chloroplasts* appear as tiny green disks inside the cell.

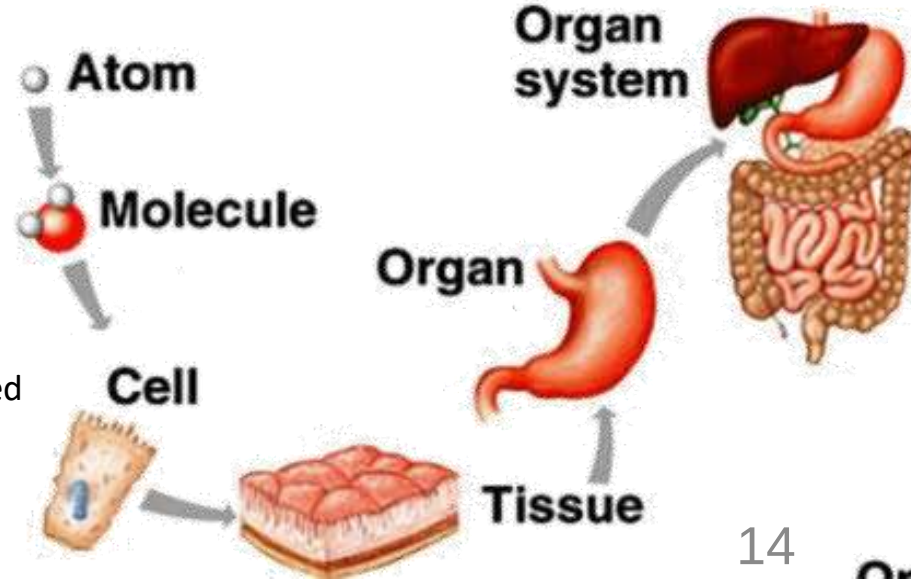
Cells, Tissues, Organs, and Systems

- **Cells are organized at four different levels to create a functioning organism.**
  - A group of similar cells form tissues.
  - Organs are comprised of different kinds of tissues (muscle, nerves, connective tissue, and lining).
  - Different organs with a similar function form a system.
  - A collection of systems comprises an individual organism.



The Digestive System

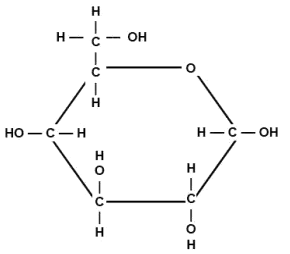
- **The digestive system is a good example of how cells form tissues, organs, and systems.**
  - The digestive system consists of organs (*mouth, esophagus, stomach, small & large intestine).*
  - Each organ is comprised of four kinds of tissue: (muscle, nerve, connective, and epithelial tissue).
  - Each of these tissues is made of similar kinds of cells.
  - Each cell (and each organelle) is comprised of macromolecules such as fats and proteins.
  - Each macromolecule is mostly carbon, oxygen, and hydrogen.

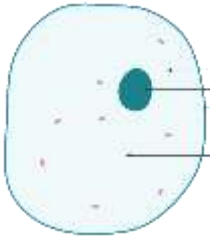


Plants and animals are comprised of systems, which are made of organs, which contain tissues, which are made of cells.

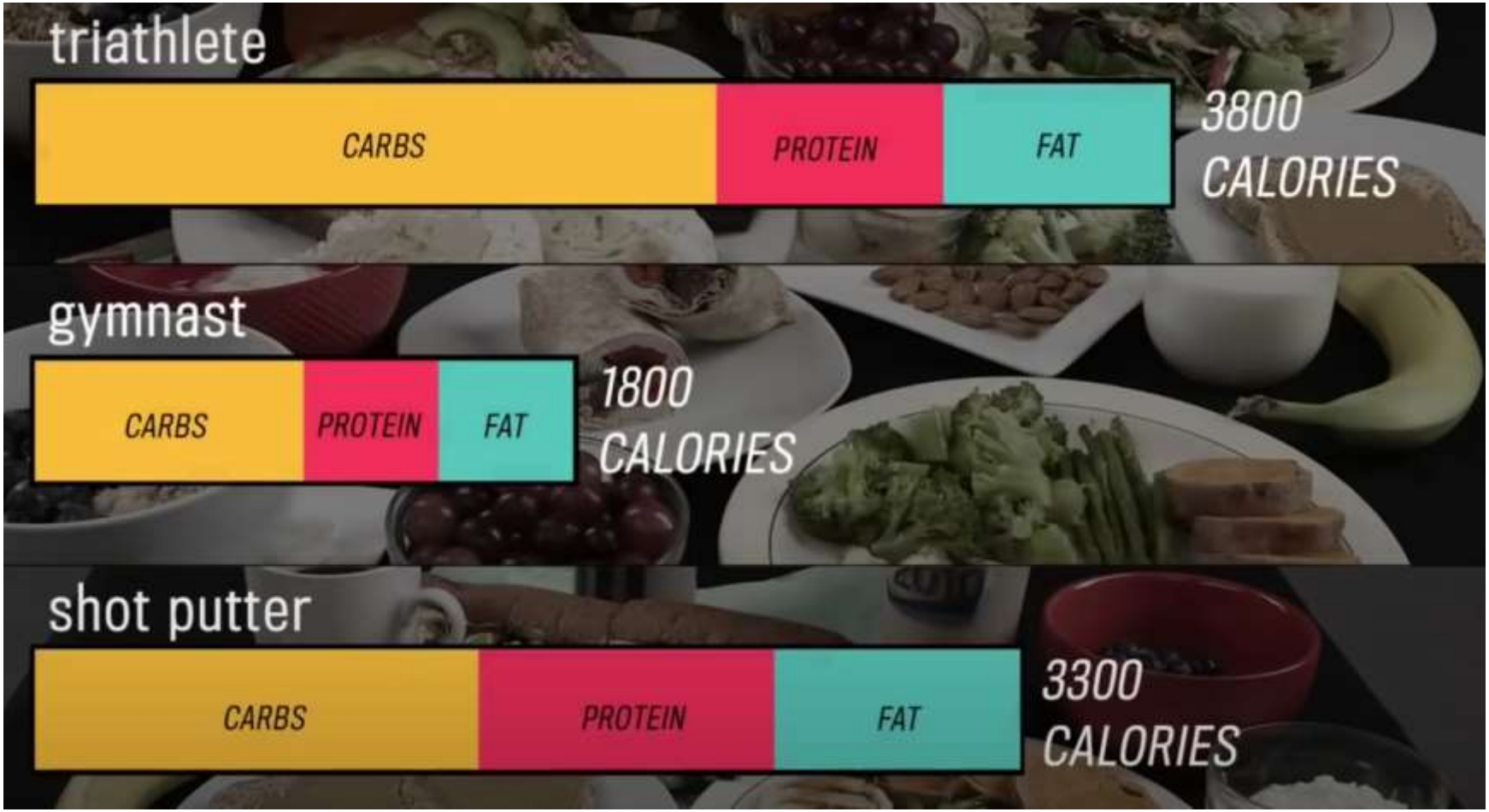
The Four Levels

- **In this class, we will investigate biological phenomena at four different levels.**
  - Atomic-molecular: how atoms are rearranged to form new molecules, and how energy is transformed from one kind to another.
  - Cellular: the processes that occur within cells to move matter and transform energy.
  - Organismal: how individual animals, plants, fungi, and bacteria function, survive, and reproduce.
  - Ecosystem-planetary: how living organisms interact with non-living resources, causing changes across large areas of the planet.
- **Understanding biology requires accurate reasoning across all four levels.**





Part 1 Revision



- Can we now improve our claims about the data above?

Looking Ahead: Part 3 Investigation

- In Part 3, you will be comparing food labels.
- The food labels of non-processed foods like carrots, beef, and peanuts can give us a sense of what macromolecules are found in the cells of living organisms.

Nutrition Facts

Serving size	**(100g)**
Amount Per Serving	
Calories	**250**
	% Daily Value*
Total Fat 21g	**27%**
Saturated Fat 7g	**35%**
Trans Fat 0g	
Cholesterol 70mg	**23%**
Sodium 70mg	**3%**
Total Carbohydrate 0g	**0%**
Dietary Fiber 0g	**0%**
Total Sugars 0g	
Includes 0g Added Sugars	**0%**
Protein 18g	**36%**
Vitamin D 0mcg	0%
Calcium 52mg	4%
Iron 1.8mg	10%
Potassium 0mg	0%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.