

Name _____

Exploration 7 - Systems

August 29

- The company claims that the robot is "The perfect companion". Is this claim true or false?
 - The robot is the perfect companion. The robot isn't the perfect companion because...

System: a set of interacting components considered to be a distinct entity for the purpose of understanding

- Examples of systems
 - cars
 - ecosystem
 - body
- What is boundary of human body?
 - skin
 - cells
- What is boundary of robot?
 - metal / plastic / battery
- What are the inputs and outputs for humans and robots?
 - humans input \rightarrow food / calories
 - output - renal system
- robot input \rightarrow battery / electricity
 - output \rightarrow mechanical work

How do nonliving systems impact the environment?

- Cars output carbon dioxide which theoretically warms the environment

Name

Models

September 3

model: pattern, plan, or representation, or description designed to show the structure or workings of an object

What systems do biologists model?

DNA, Brain, Endocrine System, weather pattern

Exploration 1: Interacting Systems September 10

How do you think body systems within your body interact to produce sensations?

Because our body needs to function

- organ system: two or more organs that work together to perform a function
- cilia cells have hair like structures that filter particles out of the lungs. This protects the lungs.
- If someone's circulatory system did not function properly, how might other body systems be affected?
 - ↳ The nervous system would be impacted by a nonfunctioning circulatory system because the brain needs nutrients to function. A nonfunctioning circulatory

system would be unable to deliver the appropriate nutrients.

- How would homeostasis be impacted by body system imbalances?

Name

Exploration I: Interacting Systems

September 12

- organ: group of tissues that perform a specialized function
- tissue: group of cells that perform a specialized function.
- A tendon attaches muscle to other body parts. What type of tissue are tendons made of?
↳ Tendons are made of connective tissue because attach and connect are synonymous terms.
- cell: the most basic unit of life
- cell differentiation: process by which cells specialize to perform specific functions.

DO NOW

Name _____

- 1) Define biotic and abiotic factors. Give two examples of each.
-

Biotic factors are living things in a system such as animals or bacteria.

Abiotic factors are non living things in a system such as water or light.

- 2) What are the four major Earth systems. Give one example of two of the systems interacting.

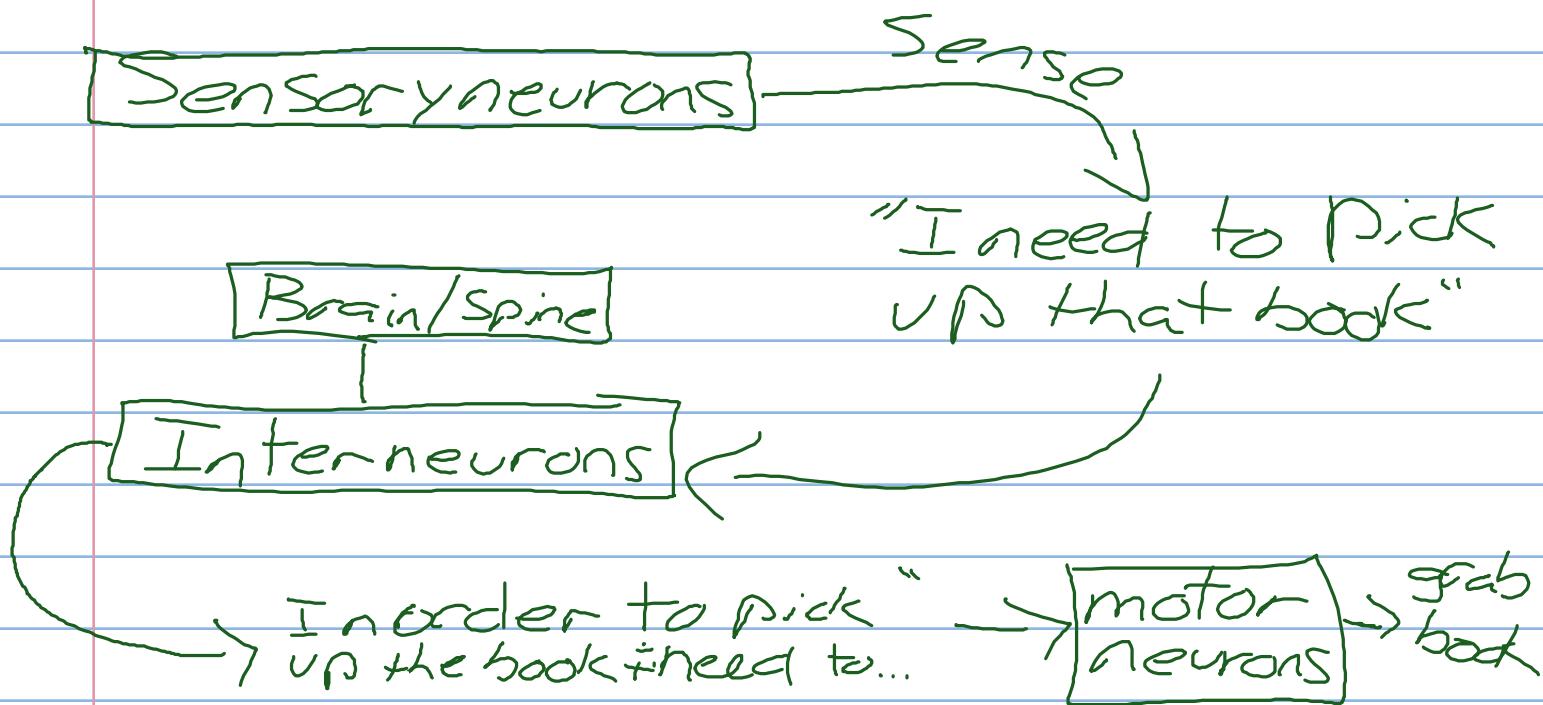
- Hydrosphere: all of the water on earth
- Geosphere: all of the rock on & below surface
- Atmosphere: all of the gas surrounding earth
- Biosphere: all living things on earth

The biosphere and atmosphere interact when living things breathe in oxygen from the atmosphere.

Exploration I: Interacting Systems

neuron: the most basic unit of the nervous system

- sensory neurons: detect sensory stimuli and send signal to interneurons
- interneurons: receive signal from sensory neurons, produce reaction stimulus and send it to motor neurons
- motor neurons: complete the response action sent by interneurons
- Draw a flowchart showing how the three types of neurons help a person pick up an object.



Name

Exploration 2: The Cell Body September 19

Do Now

How do the three types of neurons interact with each other?

Sensory neurons generates an electrical impulse based on external stimuli, and sends this signal to the interneurons located in the brain. The interneurons generate a reaction based on the stimulus, and send that reaction to the motor neurons. The motor neurons tell the body to carryout the action.

- cell membrane: controls what goes into and out of the cell

- What is the boundary that separates the cell system from the surrounding environment?

Exploration 2 The Cell Body

Name _____

September 26

nucleus: stores DNA

endoplasmic reticulum: creates proteins for cell

ribosome: helps the ER to produce proteins

Golgi Apparatus: stores and distributes proteins made by ER

mitochondria: creates energy for the cell

-Which cell type has more mitochondria, muscle cells or skin cells? Explain.

Name

Exploration 2: The Cell Body October 1

Evaluate the role of the endoplasmic reticulum in the synthesis and transport of cellular materials. How might a defect in the rough ER or smooth ER affect cellular functions?

The functions of the endoplasmic reticulum are to synthesize (make) proteins and to transport those proteins to the Golgi Apparatus. A defect in the endoplasmic reticulum causes protein production to stop therefore the cell does not have the necessary proteins to function. A defect might also prevent the transport of completed proteins to the Golgi Apparatus therefore the cell will not have the necessary proteins to function.

Compare the functions of the cell membrane and the cell wall. How are they similar and how are they different?

The functions of the cell membrane are to transport certain materials in and out of the cell, give the cell its shape and to protect the organelles.

The function of the cell wall is to protect the cell and to give the organism its shape. The cellular membrane and cell wall are similar in that they both provide protection for the cell.

The primary difference between the cell wall and cell membrane is that the cell wall is only found in plant cells whereas the cell membrane is found in both animal and plant cells.

List two organelles found in plant cells that are NOT found in animal cells

The cell wall and the chloroplast are found in plant cells only.

(central vacuole)

Name

October 3

Function	Root	Stem	Leaf
Drawing			

Name _____

Exploration I: Control Systems in Organisms October 10

Do Now

- 1) Endoplasmic Reticulum / Ribosomes
- 2) Nucleus
- 3) Mitochondria
- 4) Cell Wall
- 5) Central Vacuole

Why do some people respond to a fever with shivering?

- Identify a change in the environment that might affect homeostasis.
- Explain using the terms receptor, control center, stimulus, effector, imbalance, & balance.

Name

Exploration I: Mechanisms of Homeostasis October 11

DO NOW

Define homeostasis

-

What are the functions of...

Nucleus - stores genetic information

Endoplasmic Reticulum - synthesizes proteins

Golgi apparatus - stores & transports proteins

Cell membrane - protects cell, allows certain materials in

Mitochondria - creates energy for cell in & out of cell

Cell wall - protects & gives structure to plants

• negative feedback loop: an imbalance
that goes in one direction

Name

Exploration 2: Homeostasis in Humans October 15

DO NOW

1) Define eukaryote and prokaryote.

How are they different?

Eukaryotic cells have membrane bound organelles and make up multicellular organisms. Prokaryotic cells do NOT have membrane bound organelles and they make up unicellular organisms.

2) Define homeostasis, give one example.

Homeostasis is the regulation and maintenance of internal conditions.

An example of homeostasis in the human body is the regulation of body temperature.

If a person has too low or too high blood pressure, how are other organ systems impacted

Name

Exploration I: Atoms, Elements, & Compounds October 24

- What happened to the cheeseburger when it was dumped into hydrochloric acid
 - the burger dissolved, came apart, in the hydrochloric acid
 - looked gross
 - the content of the burger (proteins, lipids, carbohydrates) remain dissolved in the hydrochloric acid.

Ionic	Both	Covalent
- transfer electrons from one ion to another	- bring two or more atoms together	- electrons are shared between ions
- stronger bond	- rely on making combined atoms stable	- weaker bond

Name

Exploration 2: Properties of Water

October 29

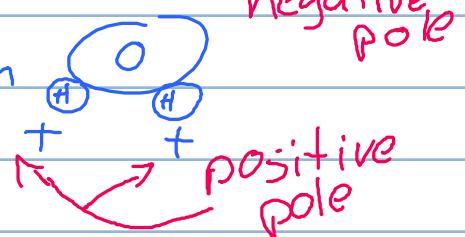
Do Now

1) How are ionic and covalent bonds different?

Ionic bonds donate an electron from one ion to another ion. Covalent bonds are when electrons are shared between two atoms.

- Water is a POLAR molecule meaning that the molecule has a positive and negative pole.

- Hydrogen bond: when hydrogen is bonded in a polar molecule



- How are hydrogen bonds similar to ionic bonds?

The electron from hydrogen spends more time in the electron cloud of the other ion but, the other ion does not actually take the electron from hydrogen. Since the electron is mostly in the electron cloud of the non hydrogen ion, the bond acts like an ionic bond.

Characteristics of Water Molecules

1) Specific Heat Capacity: ability of a substance to resist temperature change

- Water has a HIGH specific heat

2) Cohesive: molecules of same substance stick together

3) Adhesive: molecules of a substance stick to different substances.

- Why is it important for a solvent to dissolve many different things in organisms? Organisms need a variety of substances to maintain cellular function. Therefore, organisms need a solvent that can dissolve those varying substances.

- Acids: solution that has a high concentration of hydrogen ions

- Bases: solution that has a low concentration of hydrogen ions.

Name

Exploration 3: Reactions & Enzymes October 31

DO NOW

1) What are three properties of water?

Cohesion: ability for atoms to stick to like atoms

adhesion: ability for molecules to stick to diff molecules

specific heat capacity: ability to resist temp change

2) How are hydrogen bonds different from covalent?

Hydrogen bonds are different from covalent bonds because hydrogen bonds are significantly weaker due to the small size of hydrogen atoms.

- chemical Reaction: molecules are broken apart to form different molecules

- Conservation of Matter: atoms cannot be created or destroyed.

- How do the arrangement of bonds change during a chemical reaction?

The bonds changed by pulling one oxygen atom away from each of the hydrogen peroxide molecules leaving two water molecules and one diatomic oxygen molecule.

2) What are the inputs and outputs of reaction?

The input is hydrogen peroxide and the outputs are water and oxygen

3) How is matter conserved in the equation?
Matter is conserved because there are four hydrogen and oxygen atoms in the reactants and there are four of each in the product. Therefore, no atoms (matter) was created or destroyed.

- chemical equilibrium: balanced inputs & outputs
 - achieved by reversible reactions
- activation energy: amount of energy needed to start chemical reaction (breaking bonds apart or creating new bonds)
- endothermic reaction: energy of heat the products has greater absorbed amount of energy than reactant
- exothermic reaction: energy of product is heat released less than the energy of the reactant

Name

Exploration 3: Chemical Reactions

November >

DO NOW

1) What are the components of a chemical reaction?

Reactants and Products are part of chemical

2) What is the Law of Conservation of Matter?

Atoms cannot be created or destroyed

-catalyst: substance that increases the rate of a chemical reaction

-enzymes: catalyst that help organisms

-coenzyme increase the rate of reaction by reducing the activation carryout life functions.

↳ THE SHAPE OF THE ENZYME DETERMINES WHAT IT BOND TO.



-Why is a high fever dangerous for humans? Use enzymes as evidence.

Claim: A high fever is dangerous for humans.

Evidence: Proteins denature when there is an increase in temperature.

Reasoning: Enzymes are made of proteins and proteins become denatured when heated.

This denaturing changes the shape of the enzyme so that the enzyme no longer functions.

- 1) What happens to atoms during a chemical reaction? Bonds are broken or made
Bonds are broken or made during a chemical reaction.
- 2) How are chemical inputs and outputs related in a chemical reaction?
The inputs are the reactants which make the outputs called the products.
The reactants and products have the same amount of matter.
- 3) How do enzymes help living things carry out life functions?
Enzymes reduce the activation energy required for a chemical reaction to occur. This increases the rate of reaction in order to break down substances.

Name

Exploration 1: Properties of Carbon November 12

DO NOW

- 1) How are ionic and covalent bonds different?

Ionic bonds → electron gained/lost

Covalent bonds → electrons are shared

- 2) What does it mean for a molecule to be polar?

A polar molecule has one end that is positively charged, the other end is negative.

- 3) What is the function of an enzyme?

What feature of enzymes allow it to function?

The function is to increase rate of chemical reaction. The shape of the enzyme allows it to function.

- 4) What are three unique properties of water? Why does water have these properties (Think bonds)?

Adhesion: ability for diff molecules to stick

Cohesion: ability for like molecules to stick

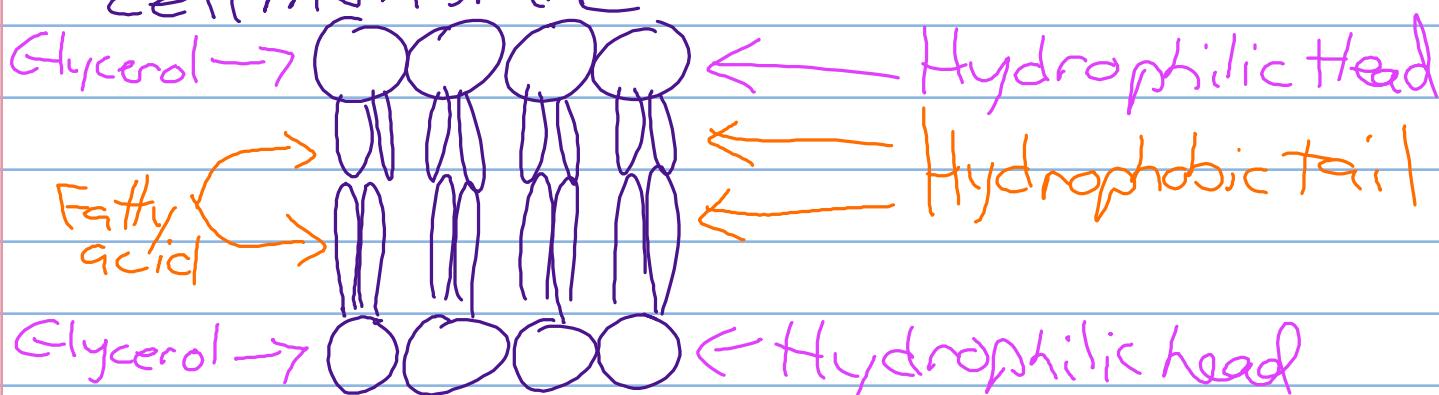
Specific Heat Capacity: ability to resist temperature change

- Hydrogen bonds give water these properties.

Name _____

Exploration 2: Structure of Carbon-Based Life November 4th

- Carbohydrates are made of oxygen, hydrogen, carbon
- monosaccharides: simple sugars
 - ↳ example: glucose
- polysaccharides: complex sugars
- phospholipid bilayer: makes up cell membrane



Carbon Based Macromolecules

Carbohydrate

Lipid

Protein

Nucleic Acid

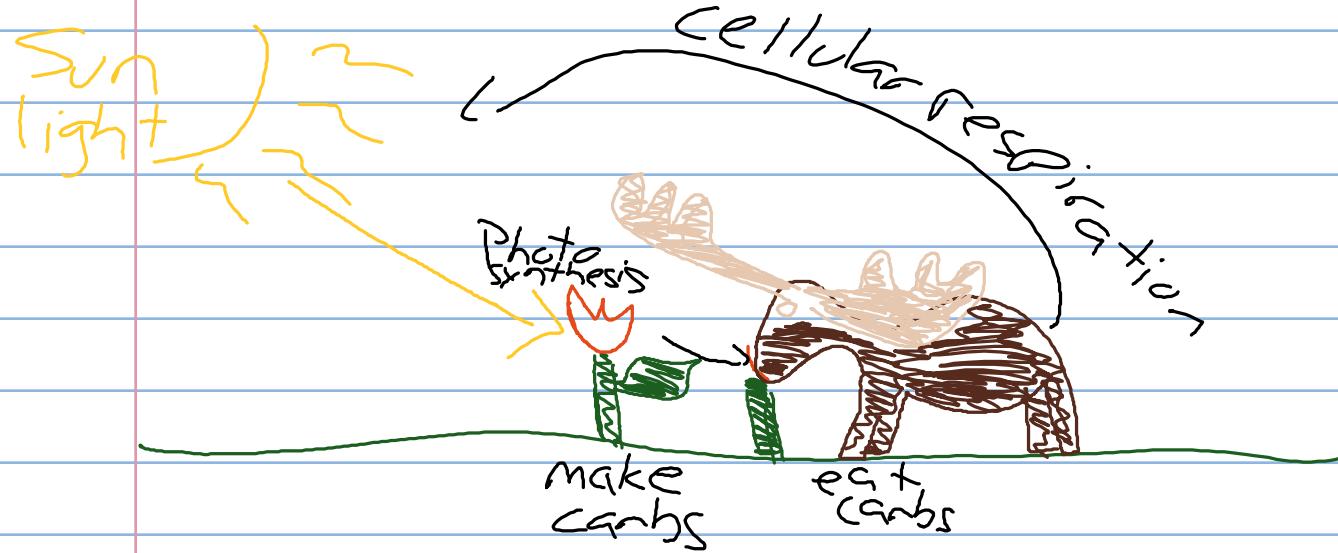
Monomer

Polymer

Elements

Structures

ATP = energy molecule

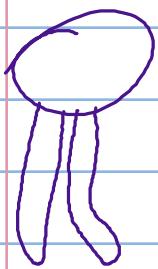


Name

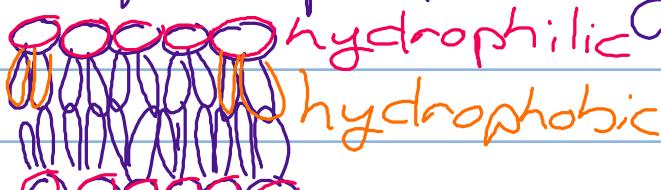
Exploration 4: The Cell Membrane December 5

- cell membrane: has specialized structures that allow certain molecules in and out of the cell.

Phos
pho
lipid



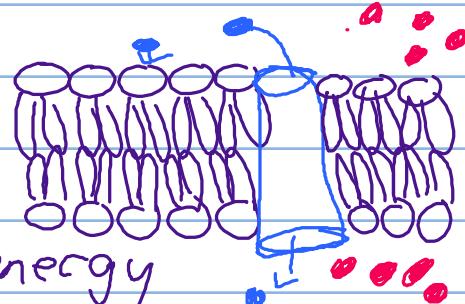
Phospholipid Bilayer



- Passive Transport

↳ Molecules cross

cell membrane w/o energy



1) Diffusion: molecules cross cell membrane from high concentration to low concentration

2) Facilitated diffusion: diffusion through an embedded transport protein.

3) Osmosis: movement of water across the membrane from low solute concentration to high solute concentration

- Active Transport: movement of molecules from low concentration to high concentration
REQUIRES ENERGY

En =
In

1) Endocytosis: the process by which a large molecule or liquid is transported into the cell

Exo = ?) Exocytosis: the process by which large molecules or liquids leave the cell by the creation of a vesicle.

Exploration I - Matter and Energy in Photosynthesis January 21

- Producers: capture light energy and convert it into chemical energy to carry out cell processes.
- Photosynthesis: the process that captures light energy and converts it into chemical energy.
- How is energy transferred from the plant to the very cute panda?
The plant creates glucose through the process of photosynthesis. Glucose is a sugar used for energy by the very cute panda.

Name _____

Exploration I - Matter & Energy in Cellular Respiration February 4

DO NOW

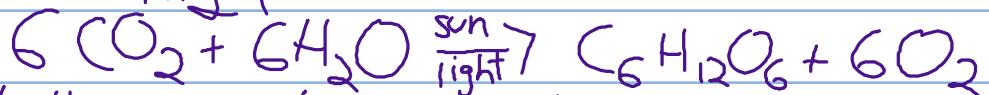
- 1) What are the inputs & outputs of photosynthesis?

Inputs

Carbon dioxide (CO_2)

Water (H_2O)

Sunlight



Outputs

Oxygen (O_2)

Glucose ($\text{C}_6\text{H}_{12}\text{O}_6$)

- 2) Where does photosynthesis take place?

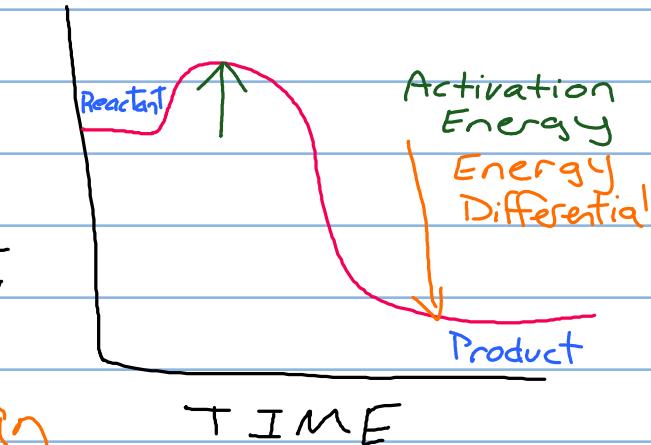
Photosynthesis happens in the chloroplast.

Name _____

Exploration 2 - Using Chemical Energy February 11

DO NOW

- Justify the following claim using evidence & supporting reason OR create a counter claim using evidence & supporting reason.

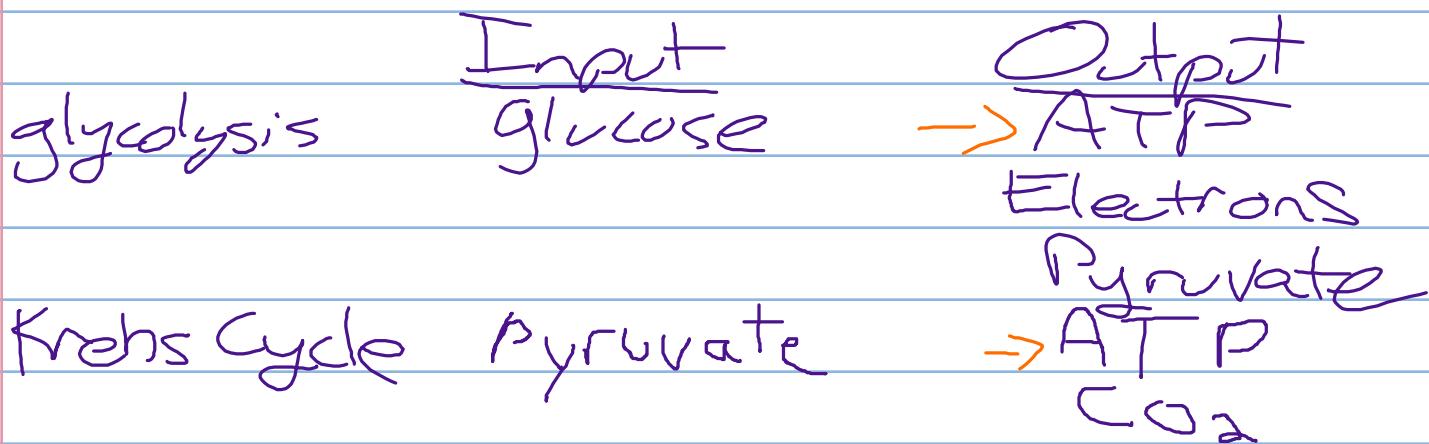


Claim: Cellular respiration is an endothermic reaction.

Counter: Cellular respiration is an exothermic reaction.

Evidence: The energy differential decreases over time.

Reason: Exothermic reactions release energy over the course of the reaction. In this case, the energy differential was negative indicating a release of energy from the reaction, therefore exothermic.



electron Trans Chain electrons \rightarrow ATP
oxygen water

- Making chemical bonds stores energy.
- Breaking chemical bonds releases energy.
- Cellular respiration produces ATP.
ATP is energy for cell.

Exploration I: Introduction to Ecosystems Feb 13

- What are living & non living components of an ecosystem where a very cute gray fox lives?

Living-Biotic
Squirrel Trees
Brown Bear grass

Nonliving-Abiotic
water temperature
rocks/minerals precipitation

