Informal Presentation – Cell Respiration

9th Grade Biology

**Preplanning Tasks**

Connection Analysis: TEKS:

* 9A – Compare the structures and functions of different types of bio-molecules, including carbohydrates, lipids, proteins, and nucleic acids
* 9B – compare the reactants and products of photosynthesis and cellular respiration in terms of energy and matter.

Objective: SWBAT🡪 complete the chemical equation for cellular respiration by learning about where the reactants come from, where they go, their purpose, the products of the process, and what happens to them. Students will compare the chemical equation of cell respiration to the chemical equation of photosynthesis and explain the comparison they see.

Objective Rationale: understanding the origins of the compounds in cellular respiration should educate students about what they should eat and how it effects their bodies.

Terms: ATP, cellular respiration, calorie, glycolysis, pyruvic acid, NAD+, NADH

Prerequisites: photosynthesis, biomolecules, energy flow, levels of organization

Critical Management Skills:

* Materials: indicator=Bromethyl blue, Cheetos nutrient label, two medium beakers, two straws, pipette, Cheetos, stand, matches, test tube and stopper, test tube holder, two pairs of goggles, Dixie cups, sprite, graduated cylinders (1000ml, 100ml, 10ml, 1ml), bucket, funnel
* Room setup: whole class instruction set-up (tables facing forward, no groups)

**Lesson Set-up**

Gaining Attention: “Pineapple!”

Behavior Expectations: everyone needs to participate when the teacher asks and keep your eyes and ears on the speaker, listening.

**Lesson Opening**

Bell Ringer🡪On the board write, “Find as many biomolecules as you can in the food label on the SmartBoard. List them and their functions.” Students should find any biomolecules or biomolecule derivatives and write them down in their journal.

* Need nutrient facts label from Cheetos bag
* Call on volunteers, if none then pick the volunteer.
* Note that the label probably wont have nucleic acids because it is a grain
  + Ask what foods would have nucleic acids. *Raw fruits and vegetables*
* Use the function of lipids and carbohydrates as energy sources to transition into cellular respiration

Statement of Objective: Today we will learn about the process of cellular respiration, making sure to notice the reactants and products.

Statement of Objective Purposes: If we understand this process, then we can become aware of what we need for our body to be able to function as they do. If we did not consume these reactants then we would not be able to provide for our bodies so they can work correctly.

Connections to Prior Learning: Notice the biomolecules in play in the process and compare them to the ones found in the process of photosynthesis

**Lesson Body**

Subject matter and Presentation Outline:

* Food serves as a source of raw materials from which the cells of the body can synthesize new molecules
* A calorie is the amount of energy needed to raise the temperature 1g of water by 1 degree Celsius
* Glycolysis begins the process of releasing energy
  + The next step is determined by the presence or absence of oxygen
* If oxygen is present then cellular respiration occurs
  + Consists of Glycolysis, the Krebs Cycle, and the Electronic Transport Chain
  + The release of energy by the breaking down of glucose and other food molecules

AP= unison response (repeat the chemical equation

VS= chem. eq. written on board

* + 6O2 + C6H12O6 --> 6CO2 + 6H2O + Energy (ATP)
  + Releases the chemical energy a-little at a time and not all at once
  + Traps the energy in the form of ATP
* Glycolysis is the process where one molecule of glucose is broken down into two molecules of pyruvic acid, a 3-carbon atom
  + Two molecules of ATP are used but four molecules of ATP are produced, leaving a net gain of two ATPs
  + NAD+ holds a pair of electrons to be transferred to other pathways in the cell, 4 electrons are removed during glycolysis

Interest builder: Liquid color change contest

CFU=call on non-volunteer

VS= change of color

This will show students that when we exhale, that we are actually breathing out carbon dioxide coming for the process of cell respiration.

* In what organelle does cellular respiration (CR) occur? *Mitochondria*
* What is needed for CR to occur? *Glucose and oxygen*
  + CR is an aerobic process because it uses oxygen
* What are the products of cellular respiration? *Carbon dioxide, water, and energy (ATP)*
* How do we get oxygen and how do we get rid of carbon dioxide? *Inhaling and exhaling*
* This demonstration will prove that when we exhale we release carbon dioxide
  + Call on two volunteers and have them exhale into a beaker with water and an indicator (bromethyl blue). Make it a contest for fun.

AP=demo w/ students

* + The color change should go from blue to yellow showing the presence of carbon dioxide

Interest builder: Burning a cheeto

VS= burning cheeto

This will be a real example of how the process occurs in the cell, specifically the mitochondria. The only difference is that the energy here is being lost as heat and light, in our bodies it would get trapped as ATP.

* This demonstration will show what is happening to the glucose in our mitochondria
  + It uses oxygen to convert the glucose into energy (here it is lost as heat) and carbon dioxide
* What is happening to the glucose in the cheeto? Being converted into carbon dioxide
* What is the black smoke? Lipids
* Prove that the gas given off by the burning of the cheeto by capturing the gas in a test tube and then testing it with the indicator.
  + Why is the liquid in the test tube yellow? Carbon dioxide present

Extended Practice:

Interest builder: 10% energy rule with sprite

VS= Sprite and buckets

* This will demonstrate the amount of energy transferred between each trophic level
* Pore 1000ml of sprite into the large beaker
  + What does the sprite represent? energy
  + What does this beaker represent? Producers
* Pore 10% of the sprite in the large beaker into the 100 ml graduated cylinder
  + How much energy was transferred? 10%, 100ml
* Pore 10% of the sprite of the 100ml cylinder into the 10ml cylinder
* Last, pore 10% of the sprite from the 10ml cylinder into the 1ml cylinder
  + How much energy is left in the last trophic level? 1ml
  + What organisms would you find in this trophic level? Top consumers, carnivores
* Get each student a cup of sprite and ask them this question when they drink it; “When you drink this Sprite think about the route it has to take to get to your cells, and when it gets to its destination what happens to the glucose in it?”

AP= Sprite for all students

Closing:

* Review the concept that you need the reactants glucose and oxygen, and that the products are carbon dioxide, water, and energy
* Turn to your desk buddy and tell them something new that you learned today about cellular respiration

AP= pair and share

Evaluation: Students will have to explain what goes into the process of cellular respiration and the products of cellular respiration by writing the equation in their journals the next class period. It is important to note where the process occurs. They will need to know where we get these reactants and what happens to the products. Students should write down a comparison they see between the two processes of photosynthesis and cell respiration.

Example:

* C6H12O6 + 6O2 🡪 6CO2 + 6H2O + 36ATP
* Happens in the mitochondria
* We get C6H12O6 from our food we ingest, we breathe in 6O2 from the air, 6CO2 is exhaled into the air, 6H2O water is exhales as water vapors, and we use the 36ATP in all our biological processes as the energy source
* Cell respiration and photosynthesis use the same chemical compounds in their reactions but their reactants and products are switched