**Cell Physiology (Transport and Energy)**

**Essential Standard:**

**Bio 1.2 Analyze the Cell as a Living System**

**Bio 4.2 Analyze the relationships between biochemical processes and energy use in the cell**

**Clarifying Objectives: Unpacking – What does this standard mean a child will know, understand, and be able to do?**

* **Bio 1.2.1 Explain how homeostasis is maintained in a cell and within an organism in various environments (including temperature and pH)**
* **Bio.4.2.1 Analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems.**
* **Bio 4.2.2 Explain ways that organisms use released energy for maintaining homeostasis (active transport).**

**Bio.1.2.1**

**• Explain how cells use buffers to regulate cell pH and how cells can respond to maintain temperature, glucose levels, and water balance in organisms.**

**• Compare the mechanisms of active vs. passive transport (diffusion and osmosis).**

**• Conclude how the plasma membrane structure functions.**

**• Explain changes in osmotic pressure that occurs when cells are placed in solutions of differing concentrations.**

**Bio.4.2.1**

**• Analyze overall reactions including reactants and products for photosynthesis and cellular respiration and factors which affect their rates (amounts of reactants, temperature, pH, light, etc.).**

**• Compare these processes with regard to efficiency of ATP formation, the types of organisms using these processes, and the organelles involved. (Anaerobic respiration should include lactic acid and alcoholic fermentation.)**

Note: \*\**(1) Instruction should include the comparison of anaerobic and aerobic organisms.*

*\*\*\*(2) Glycolysis, Krebs Cycle, and Electron Transport Chain are not addressed.\*\*\**

**Bio 4.2.2**

**• Conclude that energy production by organisms is vital for maintaining homeostasis and that maintenance of homeostasis is necessary for life.**

*Examples: Active transport of needed molecules or to rid the cell of toxins; movement to avoid danger or to find food, water, and or mates; synthesizing needed molecules.*

**Key Vocabulary:**

**3rd Tier Words: homeostasis, passive transport, diffusion, facilitated diffusion, osmosis, cell (plasma) membrane, selectively permeable, phospholipid bilayer, pores, transport proteins, concentration gradient, osmotic/turgor pressure, equilibrium, active transport, photosynthesis, cellular respiration, reactant, product, ADP/ATP, phosphate group, energy, aerobic, anaerobic, fermentation (lactic acid / alcoholic), chloroplast, mitochondria, cytolysis, plasmolysis, sodium-potassium pump, dynamic equilibrium, fluid mosaic model, polarity, hydrophilic, hydrophobic, tonicity, solute, solvent, ions, protein channel, transport protein, exocytosis, endocytosis, pinocytosis, phagocytosis, distilled water, hypotonic, isotonic, hypertonic, concentration, bond, exothermic, endothermic, digestion, light independent, light dependent reactions**

**2nd Tier Words: pigment, recycled, affect, effect, expand, control, collect, inflate, produce, interact, span, interior, exterior, barrier, submerge, distributed, maintain, net movement, shrivel, turgid, flaccid, wilt, steep, composed**

**Common Misconceptions:**

* **Plants get organic food substances such as starch and sugar or protein from the soil.**
* **Water is food for plants.**
* **Particles move from high to low concentration because they tend to move until the two areas are isotonic and then the
particles stop moving.**
* **There are too many particles crowded into one area, therefore they move to an area with more room.**
* **Exocytosis is the same as active transport.**
* **Light dependent reactions occur in the presence of light while light independent reaction occurs in the dark.**

**Essential Questions:**

**1.2.1**

**How do cells maintain conditions suitable for life in different environments?**

**How do materials get in/out of cells?**

* **I will describe examples of maintaining homeostasis in living cells**
* **I will describe how the structure of the cell membrane allows for the transport of materials**
* **I will explain the mechanisms of passive transport**
* **I will predict what will happen to cells that are placed in different environments when given numerical or descriptive data**
* **I will explain the mechanism of active transport and compare/contrast to passive transport**

**4.2.1**

**How does energy from the sun become energy for life?**

**Are food and energy the same thing?**

* **I will summarize the goal of photosynthesis (to produce food) and the goal of cellular respiration (to use food to produce energy for cells).**
* **I will explain the equation for photosynthesis, identifying reactants and products.**
* **I will discuss the need for organisms to break down the food that they have produced (autotrophs) or have taken in (heterotrophs) in order to produce an energy molecule that cells can use for energy.**
* **I will explain the equation for cellular respiration, identifying the reactants and products.**
* **I will identify the organelles in cells where photosynthesis and cellular respiration occur.**
* **I will differentiate between aerobic and anaerobic respiration (fermentation) and will explain that more energy (ATP) is produced in aerobic respiration.**
* **I will discuss the types of living organisms that are likely to carry out aerobic vs. anaerobic respiration.**
* **I will discuss the types of organisms that produce lactic acid vs. alcohol when using anaerobic respiration.**
* **I will analyze graphs/information about factors that affect the rate of photosynthesis or cellular respiration, including amounts of reactants, temperature, light, and pH.**
* **I will explain that the energy in ATP is stored in a chemical bond, and that ATP can be recycled.**

**4.2.2**

**Why do organisms need energy?**

* **I will evaluate an organism’s need for energy and relate to the STERNGRR life processes (synthesis of molecules, transport of materials, growth, reproduction)**
* **I will explain that in order for an organism to maintain homeostasis, energy is required for the STERNGRR life processes (synthesis, excretion, regulation).**
* **I will provide examples of maintaining homeostasis and relate to STERNGRR and the need for energy.**