Unit # - 3 – Cell Energy: Photosynthesis and Respiration (1 week)

Standards Addressed	Student Learning Objectives For this Unit	Content Skills and Knowledge	Learning Activities and Instructional Strategies
NSES Standards: Life Science Science as Inquiry Science & Technology History & Nature of Science PA STEE Standards: 3.2.10.A (sci. k) 3.2.10.B (app k) 3.2.10 C (meth) 3.3.10.A (liv frms) 3.3.10 B (str/fnc) 3.3.10.C (inherit) 3.3.10.D (evo) 3.6.10.A (biotech) 3.7.10.A (tools) 3.8.10 C (imp) 1.2 read crit 1.4 writing 1.8 presentation 2.2 comp/estimation 2.3 measurement/est 2.5 prob solving 2.6 data analysis	**Students will understand:** That in photosynthesis: ❑ Plants and some other types of organisms are able to use light energy from the sun to produce food. ❑ The characteristics of ATP make it exceptionally useful as the basic energy source of all cells. ❑ The experiments performed by van Helmont, Priestley, and Ingenhousz led scientisits to discover that in the presence of light, plants transform carbon dioxide and water into carbohydrates, and they also release oxygen. ❑ In addition, to water and carbon dioxide, photosynthesis requires light and chlorophyll, a molecule found in plants. That in cellular respiration: ❑ Cellular respiration is the process that releases energy by breaking down glucose in the presence of oxygen. ❑ Glycolysis if the process in which glucose is broken in two molecules of pyruvic acid. ❑ The 2 main types of fermentation are alcoholic and lactic acid. ❑ The products of photosynthesis are similar to the reactants of cellular respiration are the reactants of photosynthesis. **Note: Honors Classes will cover more detail in both…** Photosynthesis: ❑ The process of photosynthesis includes the light dependent reactions as well as the Calvin Cycle. ❑ The light-dependent reactions produce oxygen gas and convert ADP and NADP+ into ATP and NADPH. These reactions occur in the Thylkoid. ❑ The Calvin Cycle uses ATP and NADPH from the light dependent reactions to produce high-energy sugars. Cell respiration: ❑ During the Krebs cycle, pyruvic acid is broken down into carbon dioxide in a series of energy extracting reactions. ❑ The electron transport chain uses the high energy electrons from the Krebs cycle to convert ADP into ATP.	**Knowledge (honors bold)** ▪ Autotroph, heterotroph ▪ Adenosine triphosphate ▪ Photosynthesis ▪ Pigment and chlorophyll ▪ **Thylakoid, photosystem, stroma, NADP+, ATP synthase, Calvin Cycle** ▪ Calorie ▪ Glycolysis ▪ Cellular respiration ▪ NAD+ ▪ Fermentation ▪ Aerobic and anaerobic ▪ **Kreb cycle** ▪ **Electron chain transport** **Skills** ▪ Measure carbon dioxide and oxygen levels using real time data.	**Lab or Demonstration:** Use of oxygen and carbon dioxide probe for labs and demos Examining the Rate of Photosynthesis Observing Cell Respiration **Reading:** Energy: Light to Life (How Life Works pp 35-53) **Worksheet:** Photosynthesis and Cell Respiration **Technology**: Cell Biology Animations http://www.learningscience.org/lsc3acell.htm

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Unit Modifications

- Photosynthesis (Vocabulary review)

Unit Enrichments

- Analyzing Photosynthesis (Demonstration)
- Measuring the Rate of Photosynthesis (Exploration lab)
- Comparing CO_2 Production (Demonstration)

Suggested Assessment Techniques for Unit

Core 1: Protein Synthesis: Replication, Transcription, and Translation
Core 2: The Origin of Eukaryotic Cells
Core 3: Core Concepts Assessment: Final Exam

Materials/Technology for Unit

- The Cell: Web Interactives from learningscience.org