Photosynthesis and Cellular Respiration Rates in Plants Using Vernier Probes

Time: 55 minutes
Grade level: 9-12

Objectives:
- Students will be able to use CO_2 Gas Sensors to measure the amount of carbon dioxide consumed or produced by a plant during respiration and photosynthesis.
- Students will be able to determine the rate of respiration and photosynthesis of a plant.

Idaho Achievement Standards:
- 649.01c Use technology and mathematics to improve investigations (data collection and analysis) and communication.
- 652.02a Know that atoms and molecules cycle among the living and nonliving components of the biosphere.
- 652.02b Trace energy flows through ecosystems in one direction, from photosynthetic organisms to herbivores to carnivores and decomposers.
- 653.01b Know that living systems require a continuous input of energy to maintain their chemical and physical organization.
- 653.01c Know that the energy for life is primarily derived from the sun through photosynthesis.
- 653.01d Understand cellular respiration and the synthesis of macromolecules.
- 653.01e Know that chemical bonds of food molecules contain food energy, which is released when the bonds are broken.
- 653.01h Trace how matter cycles and energy flows through different levels of organization of living systems – cells, organs, organisms, communities – and between living systems and the physical environment.

Materials:
- Living leaf samples from different types of plants
- Computers loaded with Logger Pro software
- Vernier computer interface
- Vernier CO_2 Gas Sensors
- 250-mL conical flasks
- Lamps
- Colored cellophane
- Ice bath
- Aluminum foil
- Forceps
- Tape
- Scissors
- Paper towels
- Colored chalk
- 500 mL beaker with water

Procedure:
- I will engage the students through quickly explaining that they will be conducting experiments on plant leaves to determine the rate of consumption or production of CO_2 using gas sensors. (Time 3 min.)
- I will have the students get into groups of 2-3, come to the materials table and pick up the "Procedures Paper", "Data Collection/Answer Sheet", their "Take Home Assignment", leaf sample (of choice), and 250 mL flask. and let them choose the plant material they wish to work with. (Time 2-3 min.)