NOTE: This is a computer lab day. Make sure you have signed up for the computer lab in advance.

TITLE OF LESSON

Biology Unit 1 Lesson 18 – Making and Releasing Energy: Lab 5

How does energy move in and out of a cell?

TIME ESTIMATE FOR THIS LESSON

One class period

ALIGNMENT WITH STANDARDS

California – Biol CB 1f, g, & I; IE1

MATERIALS

Web site addresses of the labs you will be using today

LESSON OBJECTIVES

- To demonstrate an understanding of the constituents and functions of chloroplasts or mitochondria
- To demonstrate an understanding of the principles of photosynthesis, and anaerobic and aerobic respiration
- To work successfully on a virtual lab

EXPLANATION OF LESSON

Students will be using the computers to work on a virtual lab today. Have the students work in assigned pairs or groups to complete the labs. Whether they work in pairs or groups should depend on the number of computers available for use. Several options have been listed below for the labs. Make sure you choose a virtual lab for today and an in the science lab for tomorrow. There aren't many experiments for mitochondria so the majority of the labs here are for photosynthesis.

All the lab sites on the Internet are FREE except the http://biologylab.awlonline.com labs.
Below are listed several virtual labs, lab protocols on the Internet, as well as one nonvirtual protocol.

The **Leaf lab** http://biologylab.awlonline.com/LeafLab is provided by Biology labs online. This site has other virtual labs, as well. You must get a site license or the students can pay a small fee per lab used. Teachers can have free access for one week to try them out.

In this laboratory, the students perform simulations of experiments designed to study the reactions of photosynthesis as they occur in the leaves of different plants. Some of these plants perform C3 or C4 photosynthesis; some plants prefer shade to direct sunlight, while some plants in LeafLab have different numbers of chromosomes that will affect photosynthetic rates. By changing experimental parameters such as light intensity, light quality, temperature, gas flow, and carbon dioxide concentration, the student will learn about the importance of each parameter by measuring the amount of carbon dioxide consumed by the plant cells in your experiment as they undergo the reactions of photosynthesis. Data collected from these experiments is calculated to determine photosynthetic rates.

FREE sites and labs:
http://chem.lapeer.org/Bio1Docs/PhotoLab.html – CAM plants
http://www.oxy.edu/departments/tops/Photosynthesis/photosynstudent1.htm – CAM plants
http://www.accessexcellence.org/AE/AEC/AEF/1996/morishita_pictures.html -photosynthetic pictures
http://www.susqu.edu/facstaff/r/richard/photosynthlab.html – leaf disks by alternate method
The teacher should download the information and prepare the materials necessary for the labs in advance.

This lab is NOT FREE, but it is the only lab we've found that works with mitochondria. All the others are really enzyme labs. This is, therefore, an optional lab.
The **Mitochondria Lab** –http://biologylab.awlonline.com/MitochondriaLab is provided by virtual labs.

In this laboratory the students will perform simulations of biochemistry experiments designed to study the reactions of aerobic cellular respiration as it occurs in vitro using isolated preparations of mitochondria. By changing reaction conditions through adding substrates and metabolic inhibitors, you will simulate some of the experiments that were used to determine the metabolic reactions and the sequence of the reactions that occur during the Krebs cycle and the electron transport chain.

*You will need to choose one of these labs in advance. Make sure you have available to all students the web address and how to get there listed on the front board for them as they walk into class so that they can get started right away. Also, be sure to tell them they are responsible for taking their own notes and listing their own protocol today. They will need to finish their virtual lab in one period.

FOCUS AND MOTIVATE STUDENTS – WARM-UP ACTIVITY

1) Homework Check – Collect all homework assignments and hand back all graded notes and handouts, as students will need them to complete today's lab.
2) Agenda – Have students copy the agenda you posted.
3) Computer Protocol – Remind students of appropriate computer lab behavior and the consequences for any misbehavior.

ACTIVITIES – INDIVIDUAL AND GROUP

1. Directions – Have students sit at the computers either in pairs or in their groups. Tell them they will be working on a virtual lab today. It will be their job to take notes on a separate sheet of paper and title it *Making and Releasing Energy: Lab 5*. Explain they will have the whole period to work on and finish this lab. Tell them you will not be returning to the lab, so they must complete this and turn it in today.

2. Lab 5: Making and Releasing Energy – Have them go to the web site you have listed. Ask them to look over the virtual lab they will be conducting today. Ask them to decide what central question should be answered by conducting this lab. Have them write their question at the top of their lab notes for today. Remind them that while they will be working with their groups or a partner to conduct this experiment, they are each responsible for taking their own notes and turning them in at the end of the period. Tell them to begin.

3. Clean Up – Five minutes before the end of the period, have students shut down their computers and clean up their work stations. Collect their notes for Lab 5.

4. Homework Review – Remind them of their homework for tonight. If your science lab is separate from your classroom, have students go directly to the science lab tomorrow.

HOMEWORK

1) Read chapter 22 to chapter 24 pp. 101-113 in *The Double Helix*. List all of the ideas you have learned in this chapter. Compare and contrast these ideas to the ideas given in the book previously.
2) Study vocabulary to date.

GROUP ROLES

Recorder – The Recorder will record all results during the laboratory. All group members are recorders.
Facilitator – The Facilitator will keep group members focused on the activity.
Illustrator – The Illustrator will draw a scheme or illustration of the data discussed.
Manager – The Manager is responsible for getting materials the group needs during the laboratory and making sure they move through the appropriate web pages thoroughly.

DOCUMENTATION FOR PORTFOLIO

Lab Report #1