



LIFEBOAT TO MARS

TEACHER'S GUIDE - MICROWORLD



ACTIVITY BOX

Subject/Objectives:

Life science: To describe the function and purpose of the chloroplast

Materials:

Worksheet: The Role of Chloroplasts
Internet access

Grade Range:

Grades 5-8

Time:

Approx: 45 mins – 1 class period

KEY TERMS:

Organelle: A specialized part of a cell having some specific function; a cell organ.

Chloroplasts: An organelle found in plants, some bacteria, fungi, and protists, that processes the sun's light into food energy.

Photosynthesis: The process in green plants and certain other organisms by which carbohydrates are synthesized from carbon dioxide and water using light as an energy source.

INTRODUCTION:

Unlike animals, which need to eat, there are many organisms that can produce their own food. This is made possible with a special organelle called the chloroplast. Chloroplasts create food by enlisting the use of two components; the sun's energy and the carbon dioxide found in air. These two components, when chemically combined, form glucose (a simple food). Organisms that have chloroplasts are not the only ones who benefit from this organelle. Animals rely on energy producing foods like glucose to survive, making the chloroplast a vital component in the survival of all species.

LESSON OVERVIEW:

This lesson can be used to introduce or reinforce the concept of chloroplasts. In this lesson, students will attempt to navigate their microbe through a course before losing all of their energy. Students will need to find a way to eat or make food so that they can keep up their energy and make it to the finish line. Before each level, each student will create a hypothesis of what he/she believes will happen. Once the level is completed, students will write about what did happen and why. A class discussion about their findings is performed before moving on to the next level. By the end of this lesson students will be able to explain the purpose of the chloroplast and how it functions.





LIFEBOAT TO MARS

TEACHER'S GUIDE - MICROWORLD



STANDARDS:

National Content Standard C Life Science:

Cells carry on the many functions needed to sustain life. They grow and divide, thereby producing more cells. This requires that they take in nutrients, which they use to provide energy for the work that cells do and to make the materials that a cell or an organism needs.

California Standards:

Students know that mitochondria liberate energy for the work that cells do and that chloroplasts capture sunlight energy for photosynthesis.

Students know plants use carbon dioxide (CO₂) and energy from sunlight to build molecules of sugar and release oxygen.

Texas Standards:

(iii) All living organisms are made up of smaller units called cells. All cells use energy, get rid of wastes, and contain genetic material. Students will compare plant and animal cells and understand the internal structures within them that allow them to obtain energy, get rid of wastes, grow, and reproduce in different ways. Cells can organize into tissues, tissues into organs, and organs into organ systems. Students will learn the major functions of human body systems such as the ability of the integumentary system to protect against infection, injury, and ultraviolet (UV) radiation; regulate body temperature; and remove waste.

Florida Standards:

Compare and contrast the structure and function of major organelles of plant and animal cells, including cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, and vacuoles.

TEACHING ACTIVITY:

1. Begin by introducing or reviewing the concept of chloroplasts. If this is used as an introduction to chloroplasts, do not go into too much detail about them, just a basic definition is needed before students begin to explore how chloroplasts work.

2. Pass out student worksheets and guide students to the following link:

(we will add the url to the Microbe Modding guide here)





LIFEBOAT TO MARS

TEACHER'S GUIDE - MICROWORLD



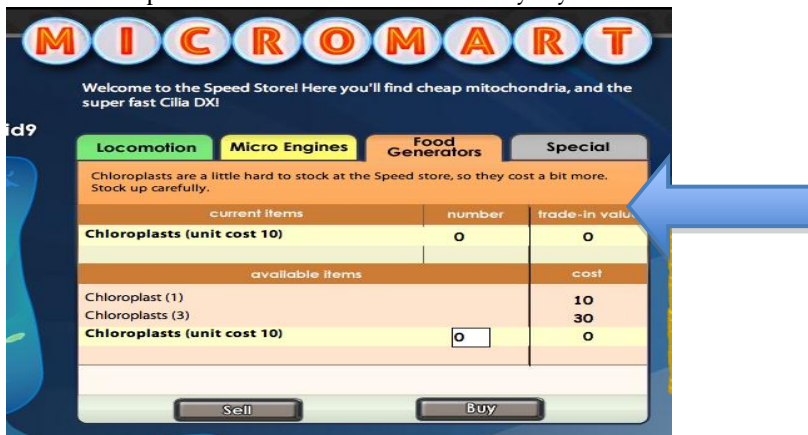
3. In this level the microbes have no chloroplasts. Have students answer the first question on their worksheet before they begin the level. Remind them that their goal is to try to make it to the finish.



*Note: students will not be able to succeed in this first level because there is no food and their microbes do not have any chloroplasts. They should only try 3 times before answering the reflection question for level one on their worksheet.

4. Begin a discussion by asking students: *What happened as you tried to complete the level? Why do you think that happened? What are some observations you made as you traveled around? Guide students to the observation that as they move, they are losing energy. Ask: what do you think the microbes would need in order to get more energy?* Answers will vary, but they should realize that the microbe is going to need to get food somehow.

5. In level 2, students will see an option to buy supplies at the Micromart. They will need to click on food generators and buy 2 chloroplasts before they start the next level. They will need to answer the question for level two before they try it.



6. After students have completed the level successfully, they will need to answer the reflection part on their student worksheet for session 2.

7. Begin a discussion by asking students: *What happened this time as you tried to complete the level? What are some observations you made as you traveled around? Was it easier to make it through this time? Why or why not?*

8. For the final level of the game, have students experiment with light exposure by either darting in and out of the light versus staying in the light for a while before moving on to the finish line. If





LIFEBOAT TO MARS



TEACHER'S GUIDE - MICROWORLD

there is time have students practice both ways, recording their observations as they go. If time is running short, have $\frac{1}{2}$ the class dart in and out while the other half stays in the light for a while.

9. Begin a discussion by asking students: *What did you notice when your microbe darted in and out of the light? What did you notice when your microbe stayed in the light for a while? Why did staying in the light provide more food?*

10. Students will review what they learned as they answer the analysis questions on the student worksheet.

WRAP-UP:

At the end of the lesson, have students present their findings about chloroplasts. If needed, guide them to the following fact/conclusions:

- ◆ Chloroplasts are special organelles, found in certain organisms, which use the sun's light to create food.
- ◆ Organisms with chloroplasts do not need to hunt for food because they make their own.
- ◆ The longer the organism stays in sunlight, the more food they can make.
- ◆ Chloroplasts cannot make food without sunlight.

Read-life microbes like some bacteria and algae contain chloroplasts, which enable these organisms to create their own food. Have students use what they have learned to come up with theories that answer the following scenario: *Algae is an organism that generates its own food; it plays a vital role in water ecosystems. What would happen if algae no longer had access to light? Who would be affected and how?*

EXTENSION:

If there is time, students can compare the rate of energy burn as they move about the levels. Students can spend time at the Micromart comparing the modes of locomotion to how much energy they burn. This can lead them into a discussion about energy costs and rate of food production. Or students can go to levels where there are predators and begin to discover the relationship between predator and prey. What does the predator need? Why are their microbes being eaten?

** Definitions from dictionary.com**





LIFEBOAT TO MARS

TEACHER'S GUIDE - MICROWORLD



MICROBES: The Role of Chloroplasts

Name: _____

Class Period: _____

Objective: Describe the function and purpose of the chloroplast

Level 1:

In this level you have to beat the clock to get to the finish using only what you started with. Do you think you will survive? Why or why not?

Hypothesis: _____

Observations: (describe what happened, what you saw, and why you think it happened)

Level 2:

In this level you will be able to buy some chloroplasts at the *micromart* before you try level 1 again. Do you think you will survive? Why or why not?

Hypothesis: _____

Observations: (describe what happened, what you saw, and why you think it happened)





LIFEBOAT TO MARS



TEACHER'S GUIDE - MICROWORLD

Level 3:

In this level your teacher will assign a specific task for you. Either you will dart in and out of the light before getting to the finish, or you will stay in the sun for a while before heading off to the finish. Depending on which task is assigned to you, describe what you think will happen as you dart or stay.

Hypothesis: _____

Observations: (describe what happened, what you saw, and why you think it happened)

Analysis:

1. What changed from level 1 to level 2? How did that help you reach the finish?
2. How does the chloroplast help you get through the level?
3. What is the difference between staying in the sun versus darting in and out? Why?
4. What is the benefit of being able to make your own food?
5. What do chloroplasts need to be able to make food?

