



High School Science Virtual Learning

Applied Biological Science

Microbial Ecology

May 18, 2020



High School Applied Biological Science

Lesson: May 18, 2020

Objective/Learning Target:

Recognize the role microbes play in maintaining the health of ecosystems including the major biogeochemical cycles.



Let's Get Started:

How do microbes interact with each other in the environment?

1. Define the following:
 - a. Organism:
 - b. Population:
 - c. Community:
 - d. Ecosystem:
2. Describe the relationship between the terms in #1.

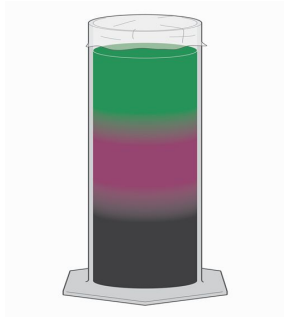


Let's Get Started: Answers

1. Define the following:
 - a. Organism: An individual living thing that shows all the characteristics of life
 - b. Population: A group of organisms of one species that interbreed and live in the same place at the same time
 - c. Community: All populations living in the same space and time
 - d. Ecosystem: A system that includes all the living and non-living things in an area acting as a unit
2. Describe the relationship between the terms in #1.
 - An ecosystem contains communities consisting of different populations of organisms.

Lesson Activity:

One way to learn about how microbes interact with each other is through a Winogradsky column. Watch the video and read the information underneath to learn about the [Winogradsky Column](#). Then answer the following questions:



1. Where is oxygen highest and lowest in the column? Why?
2. If you were to mix up everything in the Winogradsky column and leave it in the same setting, what might you see after several weeks? Explain.
3. Is this a self-sustained closed system (all the inputs needed by the different organisms are also produced within the system)? What is the one thing that is needed to keep this system going? Explain.
4. Do you consider the Winogradsky column to be an organism, population, community, or ecosystem? Explain your answer.

Lesson Activity: - Answers

1. More oxygen is available at the top of the column and the availability decreases as you go deeper down into the column. This is due to the fact that the oxygen produced at the top of the column is consumed before it can reach the bottom.
2. After several weeks you would probably see the layers reform as the microbes would grow best in the niches where optimum oxygen and nutrient levels are.
3. This is a self-sustained system as all inputs that are needed for each species are provided but light is still needed for it to work.
4. It is a snapshot of the ecosystem that existed in the collected sample of sediment



Practice Questions

Using the [Microbial Field Guide](#), identify 4 types of microbes that might be in a Winogradsky column. Describe the field marks that indicate the presence of these microbes. Complete the table below with this information:

Microbe Group	Location in Column	Field marks (i.e. How can you tell?)

Practice Questions - Potential Answer

Microbe Group	Location in Column	Field marks (i.e. How can you tell?)
Cyanobacteria	Very top	Photosynthetic, float on water, appear army-green
Purple nonsulfur	Near the top	Metabolically flexible, still photosynthetic
Purple sulfur	Near the bottom	Thrive with sulfide compounds, purple-pink layer beneath cyano.
Sulfate reducers	Very bottom	eat hydrogen and sugars and breathe sulfate.

Additional Practice

1. View the [HHMI biointeractive](#) on Winogradsky Column: Microbial Ecology in a Bottle for more practice.
2. Consider making your own column by following the Winogradsky Column instructions [here](#) or [here](#).
3. Check your understanding by creating a model of how the microbes in the column make up a web of nutrient cycling.