

LIFE ON EARTH

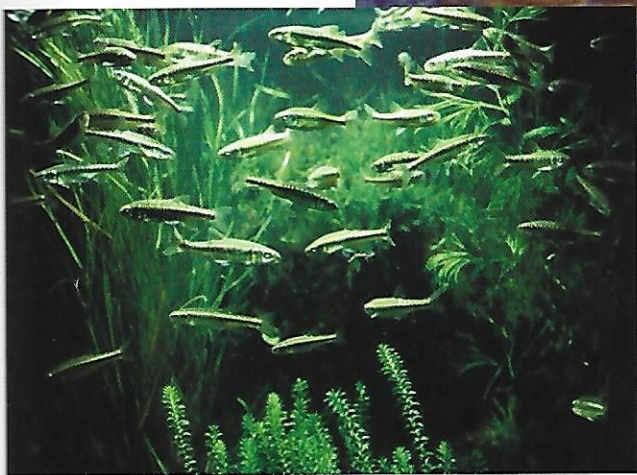
WHAT IS LIFE?

It's not too difficult to tell that some things are alive. Dogs chasing tennis balls are alive. Birds chattering in a hawthorn tree are alive. Minnows swimming around the plants in a pond are alive. In fact, animals are the first things we learn to recognize as living.



It's not always so easy to tell that plants are alive, because they don't do some of the things we usually think about when we think about life. Plants don't move around,

breathe, eat, or make sounds. Even so, they are alive, and there are ways to figure out that they are alive.



Things that are alive, like the animals described above, are called **organisms**. Any living thing is an organism. But not all organisms are animals. Plants are organisms, too. In the scenes above, the berry tree is alive, and the water plants in the pond are alive.

LIVING, DEAD, AND NONLIVING

One way to look at the question What is life? is to think about what makes life come to an end. Every living organism dies after a period of time. An organism is **dead** when it is no longer alive. A fish out of water will die after a short period of time. The fish is still there, it is still made out of the same materials, and it still looks the same as it did when it was living in the water, but it is no longer alive. And this is important—something can only be dead if it once lived. A rock can never be dead because a

rock was never alive. We describe the rock as **nonliving**.

Living organisms can be described in terms of two sets of characteristics. One is the **needs** or **requirements** that all organisms have to satisfy to stay alive. The second is the **functions** that all organisms do.

WHAT DO LIVING ORGANISMS NEED?

What do you need to stay alive? It has been said that a person can live 5 minutes without air, 5 days without water, and 5 weeks without food. People need air, water, and food to stay alive.

You breathe air to stay alive. When you breathe in, you bring oxygen into your lungs, where it dissolves into your blood. When you breathe out, carbon dioxide, carbon monoxide, and other waste gases leave your body and go into the air. The process of moving gases into and out of your body is **gas exchange**. Birds do it, bees do it, lizards, fish, baboons, stink bugs, and trees do it. All living organisms engage in gas exchange, and the most common gases involved are oxygen and carbon dioxide.

You drink **water** to stay alive. Even if you don't actually drink pure water, there is water in the fruit, vegetables, soft drinks, milk, and everything else you eat and drink. Water is essential for life as we know it on Earth. It's just that simple: all living organisms need water.

You eat food to stay alive. Food contains energy. Energy is required to make things happen. You can't move, breathe, see, hear, think, or do anything else without energy. All living organisms **use energy** to live.

The process of living produces by-products that are of no use to the organism. In fact, many

by-products are dangerous to the organism if they are allowed to build up. For this reason it is necessary for organisms to get rid of waste products. These might be gases, liquids, or solids. All living organisms **eliminate waste**.

These four basic needs are common to all living organisms: the need for gas exchange, the need for water, the need for energy, and the need to eliminate waste.

WHAT DO LIVING ORGANISMS DO?

Once an organism's basic needs are met, it gets on with the process of life. One of the universal truths is that everything has to be somewhere. That somewhere for an organism is its environment.

People live in towns and go to stores and schools, ride in vehicles, shop, read, watch TV, eat, and millions of other things. The human environment can be colorful and complex. Fish live in oceanic environments, scorpions live in desert environments, maple trees live in forest environments, and so on. When things happen in the environment, organisms respond. All organisms **respond to the environment**.

The ocean fish swims away when the sea lion comes by, the scorpion scurries under a rock when the Sun heats up the ground, and the maple tree's leaves turn red and fall off in the autumn. These are all responses to the environment.

When organisms start life, they are small. As time passes, they get bigger. Increase in size is called growth. The chemical building blocks for growth come from food and from the environment in the form of minerals. All organisms **grow**.

Organisms don't live forever. Some live a short time and some live a long time, but eventually

every individual will die. To make sure that the species doesn't become extinct, living organisms make new organisms of their kind. Even though the ways that different kinds of organisms do it vary dramatically, all living organisms **reproduce**. That's not to say every individual organism will reproduce, but every population of organisms reproduces to keep the species going.

All organisms do three things: they respond to the environment, they grow, and they reproduce. Anything that does not have the ability to do all three of these things is not an organism.

There is actually one more characteristic common to all living organisms. That characteristic is not discussed in this article, but

will be introduced in the near future. Can you think what that characteristic might be? It's true of you, it's true of turtles and beetles, it's true of elm trees and mosses, and of all the tiny living organisms too small to see with the naked eye.

Sometimes it is difficult to decide if something is alive. A car driving down the road exchanges gases, and a washing machine needs water. A burning candle uses energy, and a fire gives off waste. A smoke alarm responds to the environment, clouds grow, and the Mint reproduces new dollar bills all the time.

One characteristic, or even three or four, does not qualify an object to join the ranks of the living. In order to qualify as a living organism an object must pass all seven tests.



1. *What is an organism?*
2. *What are the basic needs of all living organisms?*
3. *What functions are performed by all living organisms?*
4. *What is the difference between living, nonliving, and dead?*