Lesson 1: Viruses

Introduction

Have you ever gone to the doctor with a cold and been told, “You have a virus.” Maybe somebody once yelled at you, “Stay away from me! I have a virus!”

As children, we were all told that viruses are germs that make people sick. But what exactly are viruses? Where do they come from, and why do they exist?

In this lesson, we will take a look at one of the most interesting and dangerous aspects of biology: The virus.

Note: This lesson requires previous knowledge of nucleic acid (DNA/RNA) replication, transcription, and translation and cell structure. Please refer to those lessons.

Objectives

After completing this lesson you will be able to:

- Differentiate between cellular and non-cellular organisms.
- Recognize the structure of a virus.
- Make conclusions about different viruses based on their structure.
- Comprehend how viruses infect, replicate, and transmit.
- Compare and contrast several different human viruses.
- Outline the steps in a vaccination.

List of Sections

This lesson includes the following sections:

Lesson 2: Bacteria

Introduction

They're all over us. They're inside of us. There are more of them than there are of us!

They're bacteria!

You may be under the impression that bacteria are bad for us. They give us pimples, they cause our underarms to stink, and they can make us sick. But did you know that the vast majority of bacteria are good for us? In our bodies alone, there are over 20 trillion bacteria. They live inside us and help us with things like digestion and the production of vitamins. Throughout the world, in the ground, water, and air, there are countless numbers of bacteria. They live in every type of ecosystem, and help sustain the lifestyle of every single organism.

How do bacteria work? How can something so small – something we can't even see with our own eyes – have such a large influence over the entire world?

Note: This lesson requires previous knowledge of nucleic acid (DNA/RNA) replication and cell structure. Please refer to those lessons/modules.

Objectives

After completing this lesson you will be able to:

- Identify the parts of a bacterium.
- Compare the structure Gram-positive and Gram-negative bacteria and comprehendthe importance of the Gram-staining method.
- Recognize that life on earth cannot exist without bacteria.
- Identify the things that bacteria need to live and how they obtain these things.
- Create a growth medium for bacteria andmake conclusions about the bacteria based on the growth medium.
- Comprehend how antibacterial drugs work.

List of Sections

This lesson includes the following sections:

- Introduction to Bacteria
- Bacterial Structure
- A Bacterium's Life
- Mutualistic, Parasitic, and Commensalistic Bacteria ("The Good, the Bad, and the Ugly")

Lesson 3: Protozoa

Introduction

The first animals to roam our planet were not the powerful lions. Nor were they the majestic eagles or the playful dolphins. The very first animals on earth were the lowly protozoa. Literally meaning first (proto) animals (zoa) in Greek, protozoa are simple, unicellular (single celled) microoorganisms.

But how can something made up of just one cell be called an animal? We know animals as creatures that swim, run, or fly around while eating plants or other animals. So how can a unicellular organism be an animal? What could possibly be so special about this one little cell that scientist point to it and say “This is the first animal!”?

Objectives

After completing this lesson you will be able to:

- Explain what a protozoan is.
- Recognize the economic, medical, and environmental importance of protozoa.
- Classify protozoa based on their structure and movement.
- Compare and contrast protozoa with multicellular animals.
- Identify several diseases caused by protozoa.
- Outline the life cycle of the malaria disease.

List of Sections

This lesson includes the following sections:

- What are protozoa? An Introduction
- Protozoa Particulars
- The Amebas
- The Flagellates
- The Ciliates
- The Sporozoa

Lesson 4: Invertebrates

Introduction

In the previous section, you learned about protozoa, single-celled organisms with “animal-like qualities.” But what exactly is an animal?

As we will soon see, animals come in all shapes and sizes, and occasionally, it is quite difficult to identify what is an animal and what is not.

In this section, we will learn exactly what animals are and how they are classified. We will take a look at the most common of animals, the invertebrates.

Objectives

After completing this lesson you will be able to:

- Identify the characteristics of animals.
- Differentiate between animals and non-animals.
- Identify the advantages and disadvantages of having a backbone.
- Recognize the differences in anatomy and behavior of different invertebrate phyla.
- Comprehend the importance of the role of invertebrates on Earth.

List of Sections

This lesson includes the following sections:

Lesson 5: Vertebrates

Introduction

You've seen them in parks. You've seen them in zoos. Your favorite animal is probably one of them. They're vertebrates. These are the animals that you are familiar with; animals like dogs, frogs, monkeys, eagles, sharks, and snakes.

While these animals seem to be everywhere, the vertebrates, or animals with spinal columns (backbones), make up only about 4% of all known animals.

But despite the fact that vertebrates make up a very small percentage of all animals, vertebrates rule the planet! They have adapted to every lifestyle, and they are found everywhere, almost always at or near the top of the food chain! How is it possible that such a small number of animals can have such an incredible advantage over such a large number of animals? Why are vertebrates in charge?

In this lesson, we will learn all about the different types of vertebrates, what characterizes them, how they live, and why they reign supreme.

Objectives

After completing this lesson you will be able to:

- Explain what a vertebrate is.
- Identify and classify vertebrates.
- Compare and contrast different types of thermoregulation in animals.
- Compare and contrast different types of birthing methods in animals.
- Analyze the steps of the amphibian life cycle.
- Recognize the advantages of being a vertebrate.

List of Sections

This lesson includes the following sections: