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WELCOME TO

GOD'S DESIGN[®] FOR LIFE

You are about to start an exciting series of lessons on life science. *God's Design[®] for Life* consists of three books: *The World of Plants*, *The World of Animals*, and *The Human Body*. Each of these books will give you insight into how God designed and created our world and the things that live in it.

No matter what grade you are in, first through eighth grade, you can use this book.

1st–2nd grade

Read only the “Beginner” section of each lesson, answer the questions at the end of that section, and then do the activity in the  box (the worksheets will be provided by your teacher).

3rd–5th grade

Skip the “Beginner” section and read the regular part of the lesson. After you read the lesson, do the activity in the  box and test your understanding by answering the questions in the  box.

6th–8th grade

Skip the “Beginner” section and read the regular part of the lesson. After you read the lesson, do the activity in the  box and test your understanding by answering the questions in the  box. Also do the “Challenge” section in the  box. This part of the lesson will challenge you to go beyond just elementary knowledge and do more advanced activities and learn additional interesting information.

Everyone should read the Special Features and do the final project. There are also unit quizzes and a final test to take.

Throughout this book you will see special icons like the one to the right. These icons tell you how the information in the lessons fit into the Seven C's of History: Creation, Corruption, Catastrophe, Confusion, Christ, Cross, Consummation. Your teacher will explain these to you.

Let's get started learning about God's design of the world of plants!



UNIT

1

INTRODUCTION TO LIFE SCIENCE

- ◇ **Identify** the six characteristics of living things.
- ◇ **Identify** the five kingdoms of living things.
- ◇ **Identify** the method of classification of living things.
- ◇ **Describe** the need for scientific names.
- ◇ **Describe** basic parts of a cell using models.

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KEY CONCEPTS | UNIT LESSONS



IS IT ALIVE?

Biology is the study of living things.

LESSON

1



How do we know if something is alive?

Words to know:

respiration

Challenge words:

spontaneous

generation

law of biogenesis

abiogenesis

chemical evolution

BEGINNERS

Plants are living things. Animals are alive, too. But how do we know that a computer is not alive? This may seem like a silly question, but what if you had never seen a gummy worm before and someone gave one to you. Would you think it might be alive? What if you dug up something in the ground and didn't know what it was, how could you tell if it was alive or not?

Scientists have studied many things that are alive and many things that are not alive and have found out that things that are alive have six things in common. First, for something to be alive it must eat. Plants eat by taking things out of the soil through their roots. Second, for something to be alive it must breathe. Plants breathe through their leaves.

Third, living things grow and then eventually die. Fourth, all living things have babies or reproduce. Fifth, living things can also move. How do animals move? Some walk or run, some fly, and others swim. But you may think that plants do not move. If you plant a tree in your yard it stays where you plant it. Plants may not move from place to place, but parts of the plants move even when the wind is not blowing. Some flowers open when the sun is shining and close at night. The leaves on most plants grow so that they are facing the sun.



We will learn more about how plants move in a later lesson.

Finally, all living things have cells. Cells are tiny building blocks that make up the plant or animal. Cells are so tiny that you have to use a microscope to see them. But if a scientist finds something in the ground and is not sure if it is alive, she can look at it under a microscope to see if it has cells. This will help decide if it is alive or not. If a scientist looks at a gummy worm with a microscope he will find that it does not have any cells so it is not alive. You will learn much more about living plants in the rest of the lessons in this book.

- **If something is alive, what are some things that it will do?**
- **What are the building blocks for plants and animals?**

How can we tell if something is alive? Look at the things around you. Is an animal alive? Is a plant alive? Is the table alive? How about your computer? Some things are obviously alive while other things are obviously not alive. Still other things might be a little more confusing. We are getting ready to study plants and the study of plants is part of the study of life science. Before we can study life science, we need to know what is alive and what is not. It will help you to identify living things if you realize that all living things have six common characteristics:

1. Living things eat or absorb nutrients. All living things need food and water. Most animals take in food and water through their mouths. Plants absorb nutrients from the soil through their roots.
2. Living things perform **respiration**—they breathe or exchange oxygen and carbon dioxide. Both plants and animals need oxygen to survive. Animals get oxygen from their surroundings in many different ways. We are most familiar with animals that breathe with lungs. But some animals, such as fish, breathe with gills, and others, such as earthworms, can absorb oxygen through their skin. Plants also breathe and take in oxygen through their leaves. During the day, when sunlight is abundant, plants use carbon dioxide to produce food through photosynthesis; however, at night, plants use oxygen to break down some of that food for energy to grow.
3. Living things grow. All plants and animals have a life cycle in which they are born, develop and grow, and then die.
4. Living things reproduce. Animals and plants reproduce in many different ways, but God designed each living thing to be able to produce more of its own kind. Most animals have babies and most plants produce seeds, but there are other ways of reproducing such as dividing or producing spores.
5. Living things move and respond to their environment. Animals can move in many different ways: some run,





IS IT ALIVE? SCAVENGER HUNT

Use a copy of the “Is it Alive? Scavenger Hunt” worksheet to determine whether items inside and outside of your house are alive or not.

some fly, some slither, some swim. Plants can’t move around like animals but they do respond to their environment. Plants turn their leaves to face the sun. Their roots grow down and their stems grow up. Many flowers close at night and open in the morning. This is their way of moving and responding.

- Living things have cells. Even though we can’t see plant and animal cells without the aid of a microscope, we know that all living things are made up of living cells. ■

WHAT DID WE LEARN?

- What are the six questions you should ask to determine if something is alive?

TAKING IT FURTHER

- Is a piece of wood that has been cut off of a tree living? (Hint: Is it growing? Can it respond?)
- Is paper alive?
- Is a seed alive?



LAW OF BIOGENESIS

Now that you know how to determine if something is alive, you understand that living things come from living things. An apple tree produces seeds that grow into new apple trees; a dog gives birth to puppies that grow up to be dogs. This observation is completely consistent with the Bible when it says in Genesis that plants and animals were created after their own kind. Also, in Matthew chapter 7, Jesus said

that people could tell a plant by its fruit—a thorn bush does not produce grapes and a thistle plant does not produce figs. Today, scientists better understand plant and animal reproduction and realize that DNA in the cells determines what kind of plant or animal will be produced.

However, people did not always understand that living things must come from living things. At one

time, people thought that rats were produced by garbage because they observed that rats were more abundant when there was more garbage. People also thought that rotting meat produced maggots, which grow into flies, because they observed that when meat was left to rot, maggots often appeared within a few days. This idea is called **spontaneous generation**. People believed that these animals were somehow suddenly produced

by their surroundings. It took the work of some very persistent scientists to dispel this idea.

In about 1665 an Italian scientist named Francesco Redi did several experiments to show that spontaneous generation did not occur. He believed that maggots came from flies, not from rotting meat. To prove this he put some meat into three different jars. The first jar was left open to the air. The second jar was covered with a layer of gauze which allowed air to pass through. The third jar was covered with a thick parchment that prevented anything from passing into or out of the jar. What do you think happened in each of the three jars?

In the first jar maggots appeared in a few days, just as people had seen before. In the second jar, eggs and later maggots were found on top of the gauze, but no maggots were found inside the jar. There were no eggs, maggots, or flies in or around the third jar. This experiment showed that the maggots came from eggs that were laid by flies which were attracted by the smell of the decomposing meat. When the jar was sealed the flies did not smell the meat and did not lay their eggs, so there were no maggots. This experiment did much to dispel the idea of spontaneous generation; however, many people still believed that simple organisms such as bacteria might still be produced without parents.



In the 1800s Louis Pasteur worked to show that even simple organisms such as bacteria only come from other bacteria. Pasteur experimented with different samples of broth. He showed that bacteria freely reproduced in an open container of broth. He then boiled the broth to kill all of the bacteria. Some of this broth was exposed to the air and other broth was kept in a sealed container. The broth exposed to the air developed new bacteria but the sealed jar did not. Pasteur believed that bacteria were entering the jar on dust particles in the air. To show that this was true, he created a bottle with a zigzag neck that allowed air to enter but prevented dust and other particles from entering the jar. The broth in this jar did not develop any bacteria even after four years. In fact, even after 100 years, no bacteria were found in this jar, which is now on display in the Pasteur Institute in Paris. Pasteur's

experiments laid to rest the idea of spontaneous generation.

These experiments proved that life only comes from other life. This is such an important idea that it is called the **law of biogenesis**. Every experiment has shown that in order to get something that is alive, you must start with one or more living things and that you always get what you started with. Bacteria produce bacteria, flies produce flies, and people produce people. This is exactly how God designed the world to work.

Despite the fact that biogenesis is what we always observe, many scientists today believe that at one time life came from nonlife. They refer to this occurrence as **abiogenesis** or **chemical evolution**. These scientists believe that many millions of years ago under just the right circumstances, chemicals accidentally combined to form proteins, which are the building blocks of living cells, and that these proteins combined to form simple living creatures. Scientists have even tried to reproduce this event in the laboratory; however, even with a very controlled environment, no one has ever built living cells from just chemicals.

God's Word is true, and as you learn more about living things, you will be amazed at how beautifully God designed each living thing to reproduce to continue the cycle of life.

