

Machines & Motion



God's Design® for the Physical World is a complete physical science curriculum for grades 3–8. The books in this series are designed for use in the Christian school and homeschool, and provide easy-to-use lessons that will encourage children to see God's hand in everything around them.

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Welcome to GOD'S DESIGN®

PHYSICAL WORLD



You are about to start an exciting series of lessons on physical science. *God's Design® for the Physical World* consists of three books: *Heat and Energy*, *Machines and Motion*, and *Inventions and Technology*. Each of these books will give you insight into how God designed and created our world and the universe in which we live.

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

3rd–5th grade

Read the lesson.



Do the activity in the light blue box (worksheets will be provided by your teacher).



Test your knowledge by answering the **What did we learn?** questions.



Assess your understanding by answering the **Taking it further** questions.

Be sure to read the special features and do the final project.

There are also unit quizzes and a final test to take.

6th–8th grade

Read the lesson.



Do the activity in the light blue box (worksheets will be provided by your teacher).



Test your knowledge by answering the **What did we learn?** questions.



Assess your understanding by answering the **Taking it further** questions.



Do the Challenge section in the light green box. This part of the lesson will challenge you to do more advanced activities and learn additional interesting information.

Be sure to read the special features and do the final project.

There are also unit quizzes and a final test to take.

When you truly understand how God has designed everything in our universe to work together, then you will enjoy the world around you even more. So let's get started!

UNIT 1

Mechanical Forces

- 1 Introduction to Mechanical Energy • 8
- 2 Potential & Kinetic Energy • 10
- 3 Conservation of Energy • 13
- 4 Conservation of Momentum • 16
- 5 Force • 21
- 6 Friction • 24
- 7 Work • 26
- 8 Power • 29

- ◇ Distinguish between kinetic and potential energy.
- ◇ Describe how energy and matter are related to one another.
- ◇ Explain how momentum is conserved in collisions.
- ◇ Describe how force, work, power, and friction are related.



1

Introduction to Mechanical Energy

Let's get moving!



What is mechanical energy?

Words to know:

mechanics energy
mechanical energy

Challenge words:

physical laws

Sit very, very still. Try not to move at all.

Try to imagine what the world would be like if nothing moved. It would be a very boring place. Thankfully, God loves motion and created a universe full of movement. There are certainly times to be still. Psalm 46:10 says, "Be still, and know that I am God." However, the world around us is in constant motion.

The scientific study of motion is called **mechanics**, or the study of mechanical energy. In this book, you will learn about the different ways things move, why they move, and many ways to use that motion. Motion can be in a straight line or in an arc. If something is moving around an axis, it is said to have circular motion. Gravity plays a large role in how things move on earth. So we will be studying about gravity in this book.

Mechanical energy is one of the most visible types of energy. Other types of energy include chemical, electrical, light, nuclear, and thermal (heat). Unlike chemical, nuclear, and electrical energy, which all take place on a microscopic and atomic level, mechanical energy is easily seen, measured, and tested. You see things and people move all around you.



Like all forms of **energy**, from a scientific viewpoint mechanical energy is the ability to perform work. You perform work when you move something. You use mechanical energy in countless ways. You use it to brush your teeth and comb your hair. You use mechanical energy to ride a bike or mow the lawn. Mechanical energy swings a bat to hit a home run and allows you to slide down a snowy hill.

People have also learned to build machines that allow them to do much more work than they could

without the machines. Using a machine to increase your ability to do work is called mechanical advantage. Mechanical advantage allows people to build bridges, skyscrapers, aircraft carriers, and airplanes. You will enjoy your study of mechanics—so let's get moving. ⚙️



Experimenting with motion

Let's examine the different ways that objects move. Complete the activities described on the "Types of Motion" worksheet. Record your observations and answer the questions as you do them.



What did we learn?

- What is mechanics?
- What is energy?
- What are some ways that objects move?



Taking it further

- What force greatly affects motion on earth?
- List three or more ways that mechanical advantage is being used around you.



Physical laws

All objects in the universe move according to specific laws. For example, all objects obey the law of gravity. Everything on earth is pulled toward the center of the earth. We will be studying many of the scientific or **physical laws** that govern movements of objects. These physical laws are different from other types of laws.

1. Physical laws were not invented by men—they are only described by men.
2. Physical laws cannot be broken or changed.
3. Physical laws apply throughout the entire universe.
4. Physical laws were set in place by God.

Based on your observations throughout your life, write down what physical laws you think apply to moving objects.

Some of the things you have probably observed include objects always fall toward the earth, objects slow down if nothing is pushing them, objects only move in a circle if something is pulling them toward the center of the circle, when objects collide they change direction and one may slow down as the other speeds up. These are just a few observations that are governed by physical laws. We will learn much more about the laws that cause these things to happen in the lessons to come.