

Physical Science



Course Overview

K¹²'s Middle School Physical Science course presents the fundamentals of physics and chemistry. Students explore the amazing universe we live in, including motion, energy, the nature of matter and atoms, how chemicals mix and react, and the forces that hold the universe together.

The course begins with a study of chemistry. After discussing physical and measurement systems, students then explore the properties and characteristics of matter, changes in matter, and the structure of the atom. In addition they examine the Periodic Table, different types of

compounds, chemical formulas, and chemical reactions. After becoming familiar with chemistry, students begin a study of physics, starting with motion and forces. Newton's laws of motion are studied and applied to motion, acceleration, periodic motion, and gravity. Next, students examine motion and work, which includes the study of potential and kinetic energy, heat, momentum, collisions, and simple machines. Students continue their studies investigating waves, light, electricity, and magnetism. They finish the year by completing a research project.

Course Outline

Introduction to Physical Science

What does physical science cover? Everything physical, which covers quite a lot. Begin your journey into physical science by learning about measurements and how to do proper lab procedures. You will also be introduced to lessons that will prepare you for standardized tests in science.

- Introduction to Physical Science
- Physical Systems
- Measurement and the International System
- Laboratory: Measured Steps
- Laboratory: Density
- Working with Model Problems
- Model Problems

Matter

Have you ever played solitaire, where you arrange cards horizontally and vertically looking for connections? Russian scientist Dmitri Mendeleev did, and he was inspired to create the pattern of the Periodic Table. This pattern displayed in the periodic table helps us understand atoms, chemical reactions, chemical formulas, chemical compounds, atomic mass, and other concepts covered in this unit.

- Atoms
- Atomic and Mass Numbers
- Elements and the Periodic Table
- Design of the Periodic Table
- Molecules
- Properties of Matter
- States of Matter
- Physical and Chemical Changes

Chemistry

When you see the word *chemistry*, you may have an

image of someone in a lab wearing goggles pouring liquids from one beaker to another. But chemistry surrounds you every day. Cars are built with chemicals and run on chemical fuel. Chemicals make up the clothes you wear and the food you eat. You breathe chemicals, your computer and radio are composed of chemicals, and our world today is dependent on chemicals.

- Chemical Bonding
- Chemical Reactions
- Chemical Formulas
- Laboratory: Testing and Producing Gases
- Rates of Chemical Reactions
- Chemical Equations
- Laboratory: Dissolving Metals
- Mixtures
- Separating Mixtures
- Solutions
- Substances
- Laboratory: Separating Ingredients
- Acids and Bases
- Model Problems

Force and Motion

When you roll a marble across a room, you open the door to understanding the same rules of motion that keep airplanes flying and pendulums swinging. What are these forces? What are the "laws" of motion? Come learn about displacement, speed, acceleration, Newton's laws of motion, and gravitation.

- Force
- Gravitational Force
- Motion
- Laboratory: Calculating Speed
- Speed and Velocity
- Measuring Speed and Velocity



- Acceleration
- Newton's First Law of Motion
- Mass and Weight
- Newton's Second Law of Motion
- Newton's Third Law of Motion
- Buoyant Forces
- Laboratory: Precious Cargo
- Model Problems

Energy

Nothing stays the same, at least not in our universe. Energy is constantly changing from one form to another, whether it's the light in your house or the sound of a horn. The good thing is you can use this changing energy to do all sorts of work. Scientists can use mass to create energy, use explosions for transportation, and use electricity to make our work easier. Learn about the different energy that constantly surrounds you, and how you use this energy in your everyday life.

- Energy
- Work
- Kinetic Energy
- Potential Energy
- Laboratory: The Pendulum
- Laboratory: Using a Lever
- Simple Machines
- Compound Machines
- Laboratory: Heat Flow
- Thermal Energy
- Temperature
- Model Problems

Waves, Sound, and Light

At this very moment, you have a lot of waves traveling to your body. You have sound waves you can hear and light waves you can see, but there's even more that you cannot see. There are radio waves, radiation, magnetism, and other invisible waves that you use to cook with, navigate by, and communicate. Explore the different waves you're being exposed to every second of every day.

- Waves
- Electromagnetic Waves
- Light Waves
- Laboratory: Path of Light
- Reflection and Refraction
- Lenses
- Model Problems

Electricity and Magnetism

You've investigated forces, learned about energy, and examined waves; now look at electricity and magnetism,

two particular forms of energy that are quite important to you. Yes, electricity keeps your computer on and your MP3 player going. But do you know why electricity is so useful? Do you wonder how to build your own circuits and currents? Do you know how to build a basic motor?

- Electric Charge
- Electric Currents
- Electric Circuits
- Laboratory: Series and Electric Circuits
- Magnetism
- Electricity and Magnetism
- Laboratory: Motoring On!
- Motors and Generators
- Model Problems

Scientific Investigation

Scientists conduct experiments and form conclusions. Now you can do the same thing. Be a scientist as you design and carry out your own experiment. Discover how the scientific process works, what makes it different from just guessing, and why it's the most powerful and successful way of figuring out how the forces of nature work.

- Scientific Methods
- Design and Set-Up Your Experiment
- Data Collection
- Data Analysis
- Reporting Conclusions
- Create a Display
- Oral Presentation

Lesson Time and Scheduling

Total lessons: 96 lessons in ten units of study; 7 laboratory lessons

Lesson time: 60 minutes per reading lesson; 90 minutes per lab. You might choose to split the lessons into smaller segments and take breaks as needed. The K¹² online lesson tracking system allows you to pick up wherever you left off in any given lesson.

Standard Curriculum Items

Graduated cylinder, 250 mL
Stopwatch
10 Newton Spring Scale
Digital scale
Double pulley
Lye
Metallic rod
Metallic spring
Muratic acid
Phenolphthalein

Physical Science



Protective gloves (2 pair)
D cell battery holder
Cork stoppers
Lead weight (500 g)
Enamel coated heavy gage copper wire
Non-insulated copper wire
Insulated copper wire strips (set of 5)
Directional compass
Bar magnet (pair)
Plastic pipette
Safety glasses
Iron filings
Lamp bulbs (set of 4)
Lamp bulb receptacle (set of 2)
Advanced thermometer

NOTE: List subject to change.