X: What Is Physical Science?

Standard: Standalone introduction: matter, energy, and Earth systems; scientific inquiry and problem-solving. Supports the IPC scientific-and-engineering-practices strand §112.44(c)(1)–(4).

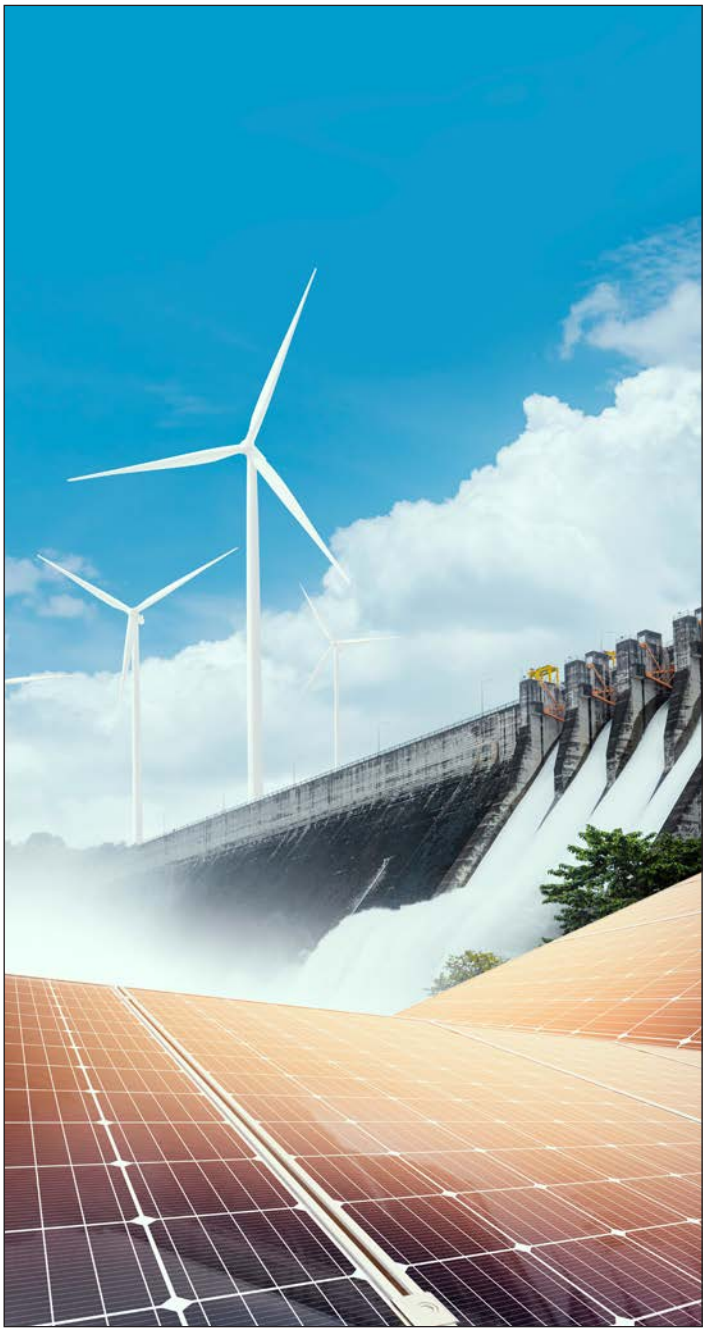
Lesson Objective: You will explain how matter, energy, and scientific inquiry connect, and compare how chemistry, physics, and Earth science show up in everyday life.

What Is Physical Science?
Three Key Topics

1. **Matter and Energy** - Matter is anything with mass that takes up space, and energy is the ability to do work or cause change. These two ideas explain nearly everything you notice in the physical world.

2. **Scientific Inquiry** - This is the process of asking a question, testing an idea, and adjusting your thinking based on evidence. It is the habit of thinking behind every discovery in physical science.

3. **Three Connected Domains** - Chemistry, physics, and Earth science each explain a different part of the physical world, from tiny particles to planet-sized systems. These domains often work together in real technology.



Why This Topic Matters

Physical science gives you a working vocabulary for the world around you, from a phone screen to the weather outside. Every engineer, technician, and scientist relies on these same ideas to solve real problems, making this foundation useful far beyond the classroom.

Objects fall, circuits spark, and weather shifts every day.
Physical science is the study of why.

A smartphone screen lights up in under a second. Inside that thin sheet of glass, electrical signals travel through microscopic circuits, light reaches your eyes, and heat quietly builds up near the battery. None of that happens by magic. It happens because of **physical science**, the field that explains how **matter** and **energy** behave everywhere from a phone in your pocket to a rocket leaving the atmosphere. Every object, every temperature change, and every motion around you follows patterns that physical science can explain. This course introduces those patterns using ideas you already notice every day, even if you have never had a name for them before.

Every phone, skateboard, and light bulb depends on matter and energy working together.

Matter and Energy Are Everywhere

Physical science starts with two ideas that show up in almost everything around you: matter and energy. **Matter** is anything that has mass and takes up space, which means your desk, the air in this room, and even a single drop of water all count as matter. **Energy** is different. It is not an object you can hold, but the ability to do work or cause change, like heating water, launching a soccer ball, or powering a game console for an entire weekend.

You already notice matter and energy changing around you constantly, even without a science class label attached to it. Ice cubes melt into water because heat energy transfers into them from the warmer air. A skateboard rolls downhill because stored energy converts into motion as gravity pulls it forward.

A microwave heats leftovers because energy moves from the appliance into the food in seconds. Even the food you eat carries stored energy, which your body later breaks down and uses as fuel. Recognizing these small, everyday changes is the first step toward thinking like a scientist.

Matter also shows up in different forms, called states, such as solid, liquid, and gas. Water demonstrates all three states depending on temperature, freezing into ice, flowing as a liquid, or rising into the air as steam. Noticing these changes helps you see energy at work, since it takes energy to shift matter from one state into another.

Scientific Inquiry Connects Ideas to Evidence

Noticing a pattern is only the first step toward understanding it. Physical science relies on **scientific inquiry**, a process where you ask a clear question, form a testable idea, gather evidence, and adjust your thinking based on what that evidence actually shows. This is not a one-time event that happens and finishes.

Matter is anything with mass that takes up space, from a desk to a drop of water.

Instead, scientific inquiry works in a loop. A scientist notices something unexpected, asks why it happens, and forms a possible explanation called a **hypothesis**. Testing that hypothesis produces evidence, and that evidence either supports the idea or points toward a better one.

You already use a version of this loop. If a phone charges more slowly than usual, you might guess the cable is the problem and test it with a different charger. That small habit mirrors the same process scientists use in a laboratory.

This cycle also reveals cause and effect relationships hidden inside familiar systems. Consider a bicycle, which depends on force the entire time it moves. A **force** is simply a push or a pull that can start, stop, or change an object's direction. Pedaling harder applies more force to the wheels, which increases speed, which then requires more energy from your legs to maintain that pace.

Braking works the opposite way, converting **kinetic energy** into **thermal energy** through friction between the brake pads and the wheel. Kinetic energy is the energy of motion, and thermal energy is the energy of heat. Scientific inquiry trains you to trace connections like this instead of accepting outcomes without asking why they happen. That skill matters far beyond this classroom, showing up in engineering, medicine, and nearly every technical career path you might consider.

Three Domains Shape the Physical World

This course organizes physical science into three connected domains: chemistry, physics, and Earth science. **Chemistry** examines how matter is built at a small scale and how substances combine or break apart, like rust slowly forming on metal or dough rising inside a hot oven. **Physics** focuses on motion, forces, and energy, explaining why a seatbelt keeps you safe during a sudden stop or how a rollercoaster gains speed as it drops down a hill.

Earth science applies both of those ideas at a much larger, planetary scale, studying weather patterns, rock formation, and the systems that shape the ground beneath your feet every day. Each domain gives you a different lens for looking at the same physical world.

These domains rarely operate alone in the real world. A wind turbine depends on physics for its spinning motion, chemistry for the materials built into its blades, and Earth science for predicting wind patterns at a chosen location.

A hypothesis is a possible explanation that has not yet been tested with evidence.

A weather forecast blends all three domains as well, combining physics, chemistry, and Earth science data into one prediction. Engineers, technicians, and researchers move between these three domains daily, which is why understanding all of them gives you a much wider set of tools for solving real problems, whether that means designing safer vehicles or developing cleaner sources of energy.

A Real Discovery Built on Inquiry

In the early 1600s, Galileo Galilei questioned a widely accepted idea that heavier objects fall faster than lighter ones. Instead of accepting that claim on authority alone, he rolled balls of different masses down ramps, which slowed their motion just enough for him to measure it accurately by hand.

His results showed that, when air resistance is ignored, objects **accelerate** at the same rate no matter their mass. **Acceleration** describes how quickly an object's speed or direction changes, which is different from simply how fast it is moving at one moment. That discovery reshaped physics and proved the power of testing ideas directly rather than trusting assumption. Galileo's approach still models how scientific inquiry works today: question, test, observe, and conclude based on evidence. Modern scientists still rely on that same basic approach, testing predictions with careful measurements rather than trusting appearances alone.

Bringing It Together

Matter, energy, and scientific inquiry form the foundation for everything covered in physical science, from chemical reactions to forces in motion. Understanding these ideas gives you a clearer way to explain the world already happening around you every day.

Galileo rolled balls down ramps to measure how objects accelerate, rather than guessing based on assumption.

How to Apply This to Your World

- Notice one object around you right now that involves both matter and energy.
- Practice asking a testable question, then think about how you could check it with evidence.
- Identify which domain, chemistry, physics, or Earth science, best explains what you are looking at.
- Remember that objects fall at the same rate when air resistance is ignored, no matter their mass.
- Look for a place where more than one domain works together, such as a car or the weather.

Chemistry, physics, and Earth science each explain a different part of the same physical world.

X: What Is Physical Science? - Guided Notes

Three Most Important Concepts

Use the article to fill in the three most important concepts from this lesson.

Concept 1: _____

Concept 2: _____

Concept 3: _____

Main Concept Overview

Use the word bank below to complete each sentence.

Word Bank: Friction, Matter, Acceleration, Energy, Force

1. _____ is anything that has mass and takes up space.
2. _____ is the ability to do work or cause change.
3. Pedaling a bicycle harder applies more _____ to the wheels.
4. Braking converts kinetic energy into thermal energy through _____ between the brake pads and the wheel.
5. Galileo found that, when air resistance is ignored, objects _____ at the same rate no matter their mass.

Matching Section

Match each term on the left with its correct description on the right.

_____ 1. Physical Science	A. Focuses on motion, forces, and energy
_____ 2. Chemistry	B. Studies weather, rock formation, and other planetary-scale systems
_____ 3. Physics	C. A process of asking questions, testing ideas, and adjusting your thinking based on evidence
_____ 4. Earth Science	D. Studies matter and energy across every part of the physical world
_____ 5. Scientific Inquiry	E. Examines how matter is built and how substances combine or break apart

X: What Is Physical Science? - Guided Notes

True or False

Write T for true or F for false next to each statement.

1. _____ Energy is a force that causes change.
2. _____ Matter is anything that has mass and takes up space.
3. _____ Braking converts kinetic energy directly into more force.
4. _____ Galileo used ramps to slow the motion of rolling balls so he could measure it accurately.
5. _____ This course organizes physical science into three domains: chemistry, physics, and Earth science.

Fill in the Table

Use the article to describe what each domain of physical science focuses on.

Domain	Focus From the Article
Chemistry	
Physics	
Earth Science	

Application Questions

1. Explain why scientific inquiry is described as a repeating cycle rather than a one-time event, using an example from the article.

_____

_____

_____

2. Describe how a wind turbine relies on more than one domain of physical science.

_____

_____

_____

Independent / Dependent Variable Analysis Sheet

Directions: Read each scenario carefully. Identify the independent variable (IV), the dependent variable (DV), and two controlled variables (CVs) for that scenario. Then write one sentence predicting the outcome. Use the Quick Reference Box below if you need help telling the variables apart.

Term	What It Means
Independent Variable (IV)	**The one factor the scientist deliberately changes in an experiment.**
Dependent Variable (DV)	**What the scientist measures — the outcome that results from the change.**
Controlled Variable (CV)	**Everything kept the same throughout the experiment so the test stays fair.**

Scenario 1: The Bouncing Ball

A student drops the same rubber ball from three different heights, 30 centimeters (about 12 inches), 60 centimeters (about 24 inches), and 90 centimeters (about 35 inches), and measures how high it bounces back each time. The student uses the same ball and the same hard floor for every drop, marking the highest point of each bounce with a small piece of tape. Every detail stays the same across all three trials except for the height the ball is dropped from.

IV: _____

DV: _____

CV 1: _____

CV 2: _____

Predicted Outcome (1 sentence): _____

_____

Scenario 2: The Growing LED Circuit

A student builds a simple circuit and adds one battery at a time, up to four batteries, to see how bright a single LED bulb becomes. The same LED bulb and the same length of wire are used for every trial, and only the number of batteries changes between tests. After connecting each new battery, the student records how bright the bulb appears compared to the last trial.

IV: _____

DV: _____

CV 1: _____

CV 2: _____

Predicted Outcome (1 sentence): _____

_____

Design Your Own

Write a physical science question about how sugar dissolves in water at different temperatures. Think about how sugar seems to disappear faster in a warm drink than in a cold one, and use that everyday comparison to guide your thinking. Then complete the following, using the same format as the scenarios above.

Hypothesis — Write your prediction using the format: **If… then… because…**

_____

_____

IV: _____

DV: _____

CV 1: _____

CV 2: _____

How would you measure the DV?
(Write 1 sentence describing what you would observe or record.)

_____

_____

X: What Is Physical Science? - Reflection Questions

01

Which of the three domains, chemistry, physics, or Earth science, connects most to a career you might want?

Think about jobs that interest you, even outside of science class. Where might each domain show up?

02

Why might it matter for engineers to understand energy transfer before designing a device people use every day?

Think about what could happen if a device malfunctioned. Who might be affected?

Skateboard Rolling Down a Ramp: Distance Over Time

Time (seconds)	Distance Traveled That Second (meters/feet)	Total Distance (meters/feet)
0	0 m (0 ft)	0 m (0 ft)
1	1.2 m (3.9 ft)	1.2 m (3.9 ft)
2	2.4 m (7.9 ft)	3.6 m (11.8 ft)
3	3.6 m (11.8 ft)	7.2 m (23.6 ft)
4	4.8 m (15.7 ft)	12.0 m (39.4 ft)
5	6.0 m (19.7 ft)	18.0 m (59.1 ft)
6	7.2 m (23.6 ft)	25.2 m (82.7 ft)

A skateboard is released from the top of a ramp, and its distance is recorded every second as it rolls to the bottom.

Analysis Questions

1. **Basic Interpretation:** What was the skateboard's total distance traveled at 4 seconds?

_____

_____

_____

2. **Pattern Identification:** Describe how the distance traveled during each one second interval changed from 1 second to 6 seconds.

_____

_____

_____

3. **Application:** Based on this data, why do engineers who design ramps and roller coasters need to account for objects speeding up over time rather than moving at a constant speed?

_____

_____

_____

X: What Is Physical Science? - Hypotheticals

Scenario 1: The Skateboard Ramp Test

A group of students builds a skateboard ramp in the school parking lot and lets a board roll down from different heights, timing how far it travels each second.

a) Predict what will happen to the skateboard's speed as the ramp height increases.
b) Analyze why timing the skateboard at each second helps identify a pattern.
c) Evaluate whether this setup is a fair way to test the ramp's effect on speed.

Scenario 2: The Field Day Decision

The school is deciding whether to hold field day outside tomorrow. Staff check the forecasted temperature, wind speed, and ground conditions after recent rain before making a final call.

a) Predict which domains of physical science provide this information.
b) Analyze how physics, chemistry, and Earth science each play a role in the decision.
c) Evaluate why using data from all three domains leads to a better decision than guessing.

X: What Is Physical Science? - Vocabulary

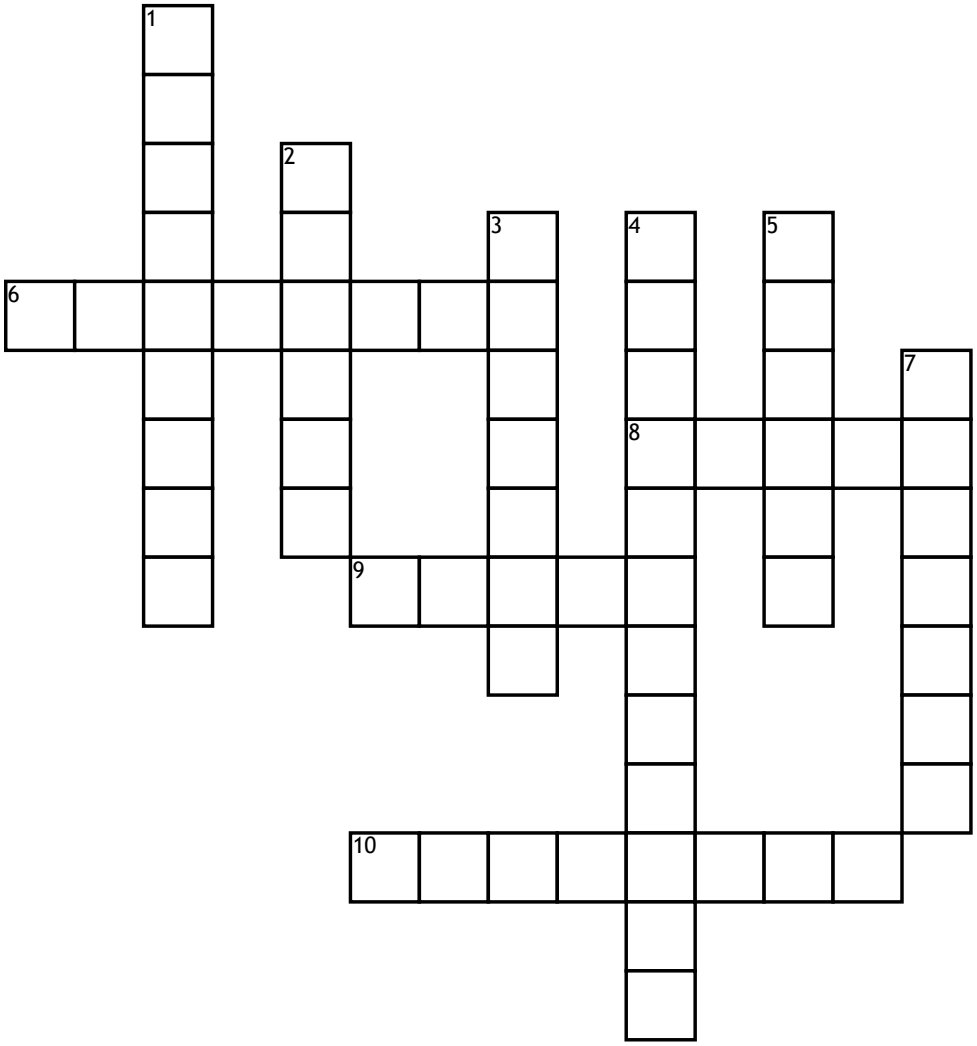
TERM	DEFINITION
Acceleration	
Chemistry	
Earth Science	
Energy	
Force	
Friction	
Matter	
Physical Science	
Physics	
Scientific Inquiry	

What Is Physical Science?

O J G K F Z Y C W S X G G L C G L P G C Q D A L
E W V D R R Z U H L A X J K Y C E P R Y W C W R
S N K Z L V I Z S B M C S F P B L T T Q B B H J
K K E S U Q R C U V M P C W H I D G E H J C L E
C B R R W M G C T N P V R E V U P V N Y B D X P
E M X O G B F V H I K X S I L R S H T R L J T H
G Z R U B Y E F H P O N W R S E D U X G J A S Y
D H A A J G F E K Y L N O D C E R F Q O F C K S
W V I G M O O A D N D E Z I I V N A U N Y B G I
V C O E X X R D P X U B V M E Z C V T I J H H C
J U X M D V C R U G Z J E C N E X B F I A D C A
I Y U X W M E E B I Z E Q V T T E U O N O M K L
U U U Z F G F G N W A M N F I T V P Z K A N Z S
H V F R P P X Q C O N H S Q F Y Z X Q R Y H C C
K K H H O H I M A T T E R C I B J T A A E F Q I
J P P R A H D W W I D G B H C Q G G W X M B F E
M W H V R W X T O J V A H E I G I R A J X U T N
T D N Y O E N V F O Y G R M N V U B T O I T S C
R P O O S D H G K Z J B K I Q Y F Y Q R S A S E
F U X K C I C R K N K H J S U V D A J A L P D Q
E X Z E I V C D L P A Q N T I H W L R D N T Q K
M Z J R U C B S T O G G I R R F A K T T J Y V N
H F A U D P T P R Q G K U Y Y R H F L C A Q U Q
E A R T H S C I E N C E Y I L K U Q S L X K K L

Scientific Inquiry
Physical Science
Earth Science
Physics
Matter
Friction
Force
Energy
Chemistry
Acceleration

What Is Physical Science?



Across

6. A force created when two surfaces rub against each other, often producing heat.

8. The study of weather patterns, rock formation, and other systems that shape the planet. ___ Science

9. A push or pull that can change an object's motion.

10. The study of how matter and energy behave in the world around you. ____ Science

Down

1. The study of how matter is built and how substances combine or break apart.

2. Anything that has mass and takes up space.

3. The process of asking questions, testing ideas, and adjusting conclusions based on evidence. Scientific ____

4. The rate at which an object's speed changes over time.

5. The ability to do work or cause change.

7. The study of motion, forces, and energy.