

SUBDISCIPLINE:

# Matter and Energy

UNIT:

## Matter

**Concept:**

### Combining and Separating

Substances like salt and sugar mix physically but not chemically like vinegar and baking soda. This concept will teach you more about the different kinds of mixtures.

### Characteristic Properties of Matter

All objects maintain a certain color, odor, density, and reactivity regardless of their sample size. This concept will show you how an objects physical and chemical properties make up its everyday traits.

### States of Matter

Ice, liquid water, and water vapor are made of water molecules, but they are different forms of water. This concept will teach you more about the different states of matter.

### Molecules

It takes large amounts of different kinds of molecules to make a compound. This concept will show you more about how molecules interact to create a compound.

### Chemical Reactions and Equations

A chemical reaction occurs when two elements are joined with one another. In this concept, you will learn how and why chemical reactions occur when we combine different elements.

### Benefits and Risks of Chemical Use

Chemicals can help us accomplish great things, but they can sometimes be harmful. This concept will help you learn more about the risks and benefits of using chemicals.

UNIT:

## Types of Energy

**Concept:**

## **Kinetic Energy**

Kinetic energy is the energy that a moving object has as a result of its mass and its motion. On the rollercoaster ride, energy changes forms between potential and kinetic every time the cars move up or down.

## **Potential Energy**

All objects have energy. This concept will tell you more about potential and kinetic energy, two of the five forms of energy.

## **Heat and Temperature**

Temperature is a measurement of the kinetic energy in a substance. Heat is energy that can move from a warmer object or location to a cooler one. This concept will further illustrate the difference between heat and temperature.

UNIT:

## **Energy and Waves**

**Concept:**

### **Transmission and Absorption**

Light can move through empty space and clear air easily, but it gets absorbed by translucent and opaque materials. In this concept, you will learn how light is transmitted and absorbed.

### **Beyond Visibility**

We rely on microwaves to cook food, radio waves to hear music and infrared frequencies to feel heat. In this concept, you will learn about gamma rays, ultraviolet rays, and other frequencies.

### **Refraction**

Sunlight usually looks white, but it is actually many colors. A rainbow forms when light refracts; drops of water in the clouds act like tiny prisms. Sunlight passing through them separates white light into all the colors. In this concept, you will learn about refraction.

### **Reflection**

Light bounces off a mirror in a predictable pattern—a reflection—because the surface is very smooth. In this concept, you will learn about reflection.

### **Characteristics and Properties of Waves**

Energy can be transmitted in either transverse or longitudinal waves. This concept will introduce you to the characteristics and properties of both types of waves.

### **Types of Waves**

Energy can be transmitted through sound, radiation, or seismic waves. In this concept, you will learn about the different ways that energy can be transmitted.

## Light as Wave Energy

Scientists often think of light as a wave that can be measured in terms of amplitude, frequency and wavelength, just like waves in the ocean. This concept will guide you through the different methods scientists use to measure light.

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SUBDISCIPLINE:

## Interactions of Matter and Energy

UNIT:

### Force and Motion

Concept:

### Interaction of Force and Mass

A game of tug-of-war illustrates why the rope moves toward the stronger team: The force of pull is stronger on that side. In this concept, you will learn about the interaction of force and mass.

### Newton's Laws

The English mathematician Isaac Newton didn't play baseball in the 17th century, but the laws of motion he developed explain why a ball can move in a straight line at a constant speed. In this concept, you will learn more about Newton's laws.

### Gravity

The force of gravity may be weak, but not on our home planet. The gravitational attraction of the mass of the Earth keeps us grounded. This concept will teach you about the basics of gravity.

### Friction

Friction is the force that can produce heat and keep objects from sliding around. In this concept, you will learn about friction.

### Straight Line Motion

From a moving car, things appear to move at different speeds than they do from a stationary point. Physicists call this relative motion. This concept will teach you about the basics of straight line motion.

UNIT:

## Electricity and Magnetism

**Concept:**

### Static Charges

A static charge can build up until it naturally dissipates or is released in the form of a spark. In this concept, you will learn about the nature of static charges.

### Electricity and Magnetism Relationship

Wrap a wire around a nail and hook its ends to a battery: You will generate a magnetic field that makes the nail a magnet. In this concept, you will learn how electricity and magnetism are related.

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SUBDISCIPLINE:

## Engineering

UNIT:

## Technology and Design

**Concept:**

### Transportation Systems

People use airplanes, highways, and subways to get from their homes to their destination. In this concept, you will learn about the different types of transportation systems.

### Communication Systems

Communication systems have many parts that work together to send and receive messages. In this concept, you will learn about the different types of communication systems and how they work.