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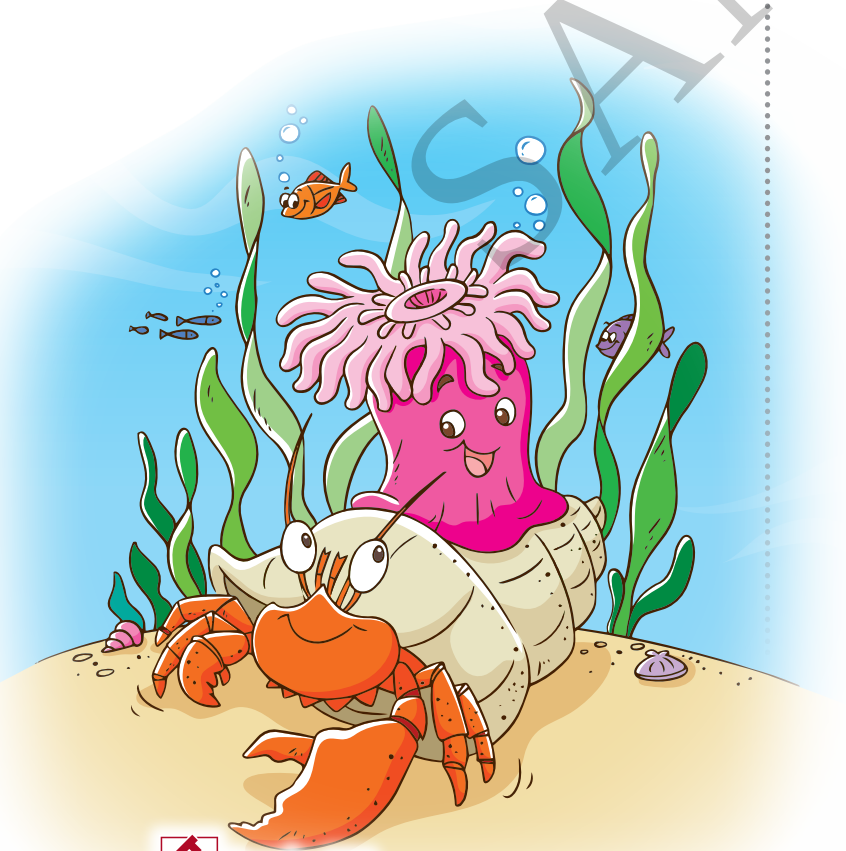

STEM Experiments

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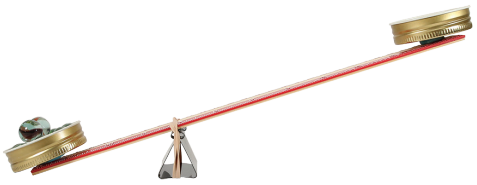
Basic Science Concepts

STEM Experiments



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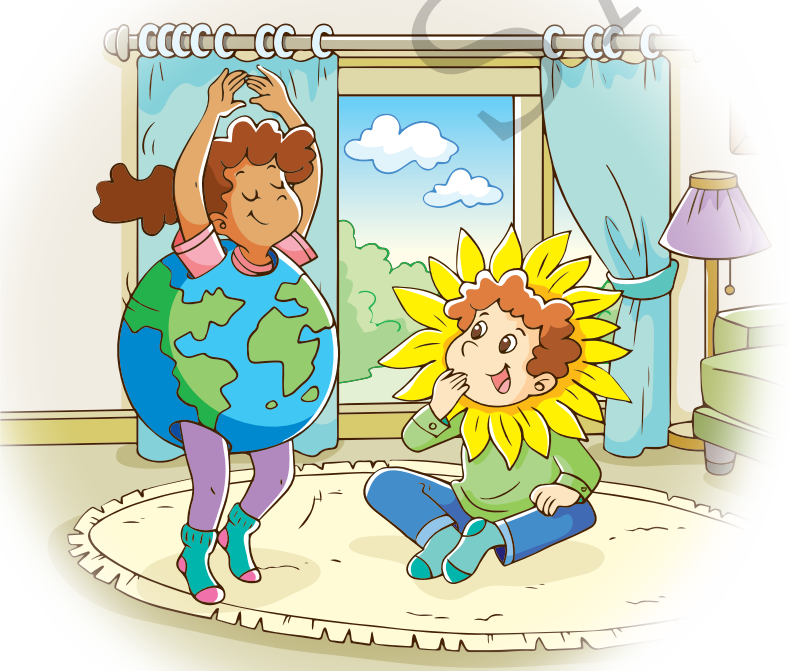
Basic Science Concepts



STEM Experiments

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3 Simple Machines (1)

There are six basic types of simple machines. In this unit, you will explore three of them: a lever, an inclined plane, and a wedge. You will see how they make objects move and how they make work easier.

It is much easier to open this can with a pry, which is a lever – a type of simple machine.

After completing this unit, you will

- know what a lever, an inclined plane, and a wedge are.
- understand that using simple machines is part of our daily lives.
- understand that simple machines make our lives easier.

Vocabulary

simple machine: a device that makes work easier

work: the force needed to move an object

load: something to be carried

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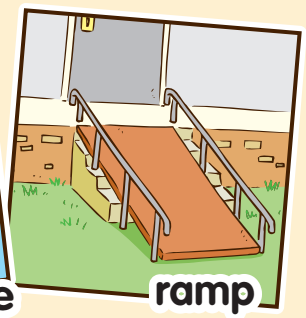
Extension

We often think of simple machines as something made by us, but they are found in nature, too!

Think of an alligator's jaws closing on its prey. They work exactly like a tool we use for cracking nuts – the nutcracker! Both the alligator's jaws and the nutcracker are levers.

mountain slope

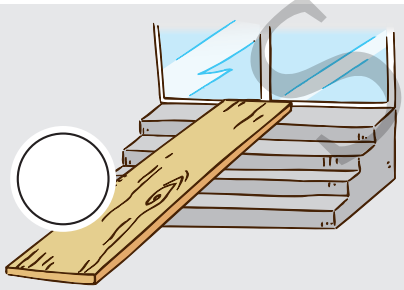


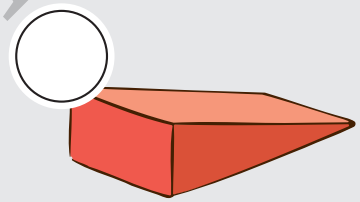
ramp

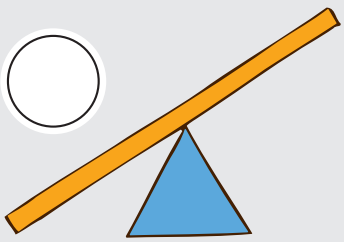
Compare other things in nature to simple machines. You will find that there are many simple machines around us.

A. Identify and name each simple machine. Then match it with the correct description. Write the letter in the circle.

wedge **inclined plane** **lever**







_____ _____ _____

A a slanted edge that pushes something apart

B a sloped surface that helps move a load up or down

C a stick or board that uses a resting point to move a load

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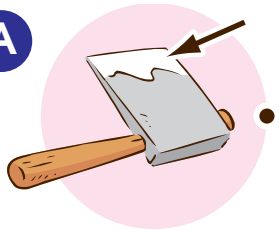
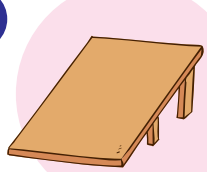
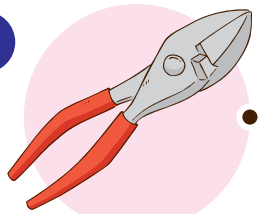
B. Draw a line to match each tool with its purpose. Then identify the type of simple machine each tool is.

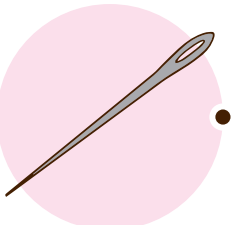
A 

B 

C 

D 

E 

F 

- to lift a piano onto the back of a truck
- to pry a piece of wood into smaller pieces
- to hold wires and bend them
- to allow water to run off
- to pierce a piece of fabric
- to compare objects' weights

Lever:

_____ , _____

Inclined Plane:

_____ , _____

Wedge:

_____ , _____

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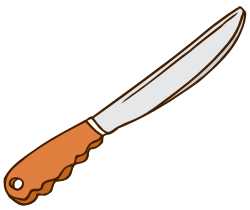
C. Name the simple machine shown in each picture. Then give one more example of that type of simple machine.

A



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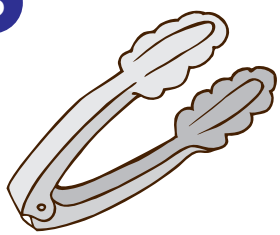
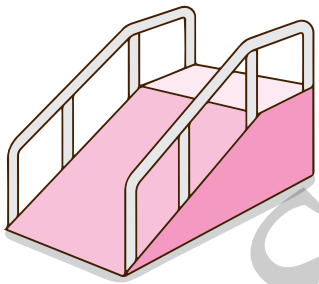


C



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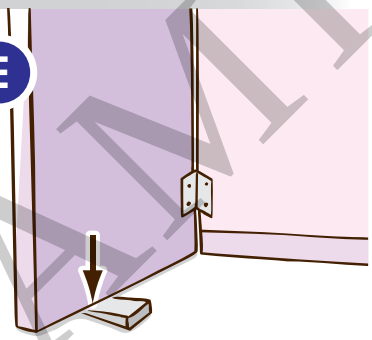

F

A _____

e.g. _____

B _____

e.g. _____

C _____

e.g. _____

D _____

e.g. _____

E _____

e.g. _____

F _____

e.g. _____

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WATER IN LAYERS

understanding how the density of water and temperature are related

Building layer cakes is fun and simple. All you have to do is start with a layer of cake and add a layer of frosting alternately. It is easy to layer solids, but how about liquids? Is it possible to create layers with liquid water? Try the experiment to see.

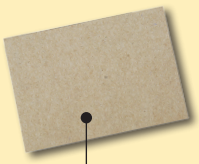
What you need:


red and blue food coloring


2 small identical jars


water


a baking sheet


a thin piece of cardboard

The cardboard must be larger than the openings of the jars.

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STEM Note

Density is a measure of how tightly packed something is, which helps us find out if something feels heavy or light for its size.

CAUTION!
Ask an adult for help with hot water.

Difficulty:

Time needed:
1 hour

In this experiment, you will learn that temperature affects the density of water.

What to do:

1. Fill one jar with cold water and add a few drops of the blue food coloring.
2. With the help of an adult, fill the other jar with hot tap water and add a few drops of the red food coloring.
3. Put both jars of water on the baking sheet.
4. Cover the opening of the red jar with the cardboard.
5. While holding the red jar and cardboard in place, carefully turn the red jar upside down and rest it onto the blue jar to avoid spilling any water as shown in Setup 1.
6. Have someone hold onto both jars while you slowly and carefully pull out the cardboard. Then observe.
7. Repeat Steps 1 to 6 but place the blue jar onto the red jar instead as shown in Setup 2.

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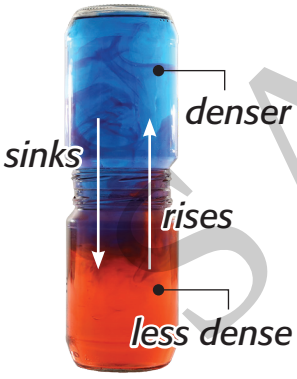
WHAT *just* happened?

When water is heated, it expands and becomes less dense. Therefore, hotter water tends to rise while colder, denser water sinks.

Setup 1

For Setup 1, you should have noticed that no mixing happened – both layers of colored water stayed where they were with hot red water floating over the cold blue water. This is because the hot water was less dense, so it stayed on top.

Setup 2



Conversely, mixing happened instantly and created purple water in Setup 2. This is because the hot red water was less dense and rose while the cold blue water was denser and sank.

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- What is the purpose of using different colors for each jar?
- If you leave the hot water and cold water from Setup 1 out for longer, do you think they will eventually mix together?
- In Setup 2, do you think the mixing will be more or less obvious if the cold water is colder and the hot water is hotter?

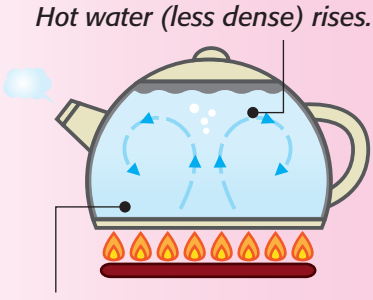
- Are there energy-efficient technologies or systems that can optimize the heating or cooling process?

- How can we change the cardboard to make a better seal between the two jars?

- If the hot water from the tap is at 113˚F (45˚C) and the cold water is at 59˚F (15˚C), what do you think the approximate temperature will be when they are fully mixed together?

Fun to know

How Water Boils



At first glance, you might think that the water in a kettle is sitting idle as it is being heated but, in fact, it is constantly on the move! The water at the bottom of the kettle is closer to the cooktop, so it heats up faster than the water at the top. As the water gets hotter and less dense, it rises to the top, while the now cooler water at the top sinks to the bottom. So rather than sitting idle, water in a kettle is in a cycle of rising and sinking as it reaches its boiling point.

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