15 EXPERIMENTS

ERUPTION

INCLUDES UNMIXABLE
OIL AND WATER EXPERIMENTS

INSTRUCTION MANUAL

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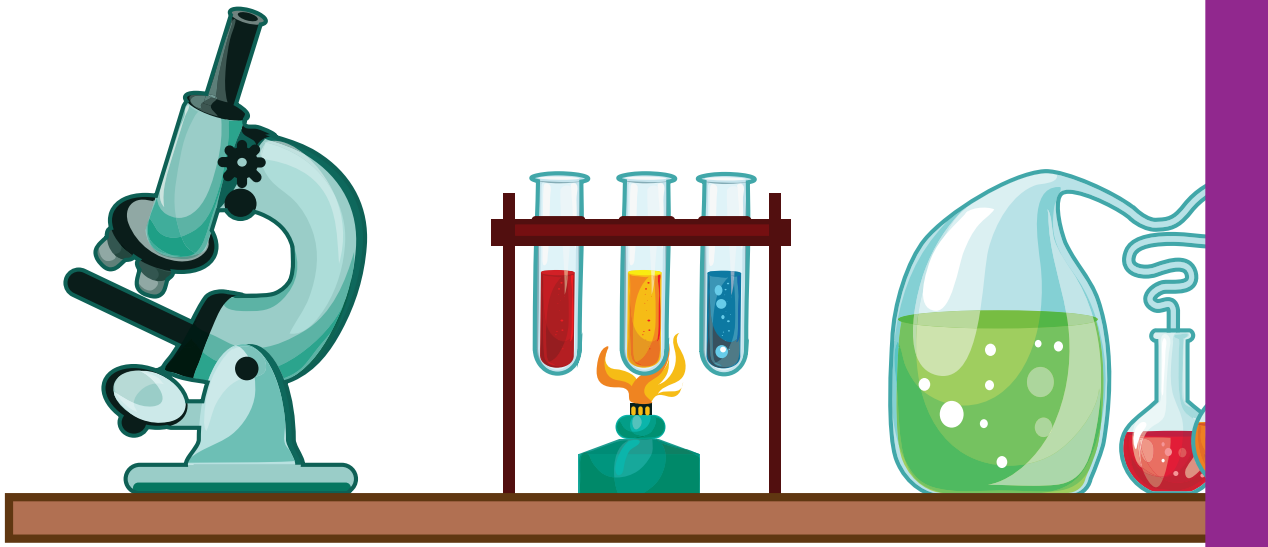
We are here to help!

For any questions, comments or for assistance with the science kit or manual please contact us. We will be happy to assist you!

support@learnandclimb.com



Science Kit Contents

3 Test Tubes
1 Beaker
1 stirring stick
Sweet Potato Powder
Citric Acid
1 Yellow Measuring Spoon
Baking Soda
Volcano Base
Glow-in-the-dark Powder
Coloring Agent (Red and Blue)
Pipette
Funnel
Test Tube Holder
Test Tube Connector
Foaming Agent

Unmixable Water & Oil

MIXOLOGY

Humans have always been interested in how things mix together. In ancient times, before people knew a lot about science, they would try to create different things like medicines, dyes, inks, foods, clothes, and just about anything else from mixing. **They discovered mostly through trial and error, and they were constantly improving their process,** kind of like what you will be doing in this guide!

Have you ever mixed anything together? What happened? Did the thing you were mixing change color? Did it bubble up or start foaming? **Did what you were mixing change or transform into something entirely new?**

PROPERTIES

These ancient people (and then people who came after them, and people who came after them...) discovered that certain materials have special properties. **A property is just a trait or a quality of something.** An example is a bike. Most bikes are metal, shiny, and colorful. Or how about Play-Doh? Play-Doh is colorful, squishy, and soft.

PROPERTIES OF COMMON SUBSTANCES

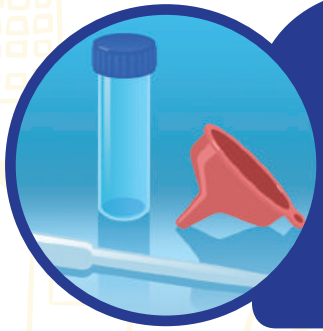
What are some common substances that you know of? In this guide, we will focus on liquids. Gasoline, soda, and milk are some common liquids. Water and oil are two very common substances that are also liquids. Draw three columns on a piece of paper. List some things that you might do with water on the left and some things that you might do with oil on the right. Can you do the same thing with both water and oil? Put that in the middle!

1 You go together like Oil & Water

SUPPLIES FROM HOME

Water

Oil



SUPPLIES FROM KIT

Small test Tube

Funnel

Pipette

*note!

When you are done, spill the mixture outside instead of pouring it down the drain.

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1

Pour 5 ml of water into your test tube.

2

Pour oil into your test tube, until you reach the 10 ml mark.

3

Screw on the cap.

4

Shake.

5

Let it stand for a few seconds.

6

Record your results.

Explanation

Have you ever heard the phrase "They go together like oil and water" ?
Normally, that describes people who have very different personalities.

Likewise, water & oil do not mix because they have different properties. For one, they are "packed" differently. Oil tends to sit on top of water because it is less dense than water, which means that its particles are not as tightly packed.

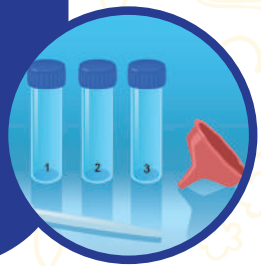
2 Mix it Up

SUPPLIES FROM HOME

Water
Oil
Vinegar
Lemon juice
Dishwashing soap

SUPPLIES FROM KIT

3 small test tubes
Funnel
Pipette



Explanation

What is so special about soap? Soap has special properties that allow it to mix with both water and oil! When it mixes with water and oil, the color changes. It forms a kind of "bridge" between the particles and makes a special mixture called an emulsion. Why might we need oil and water to mix? Hmmm... Think about it some more!

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1

Pour 5 ml of water into test tube 1.

2

Pour oil into test tube 1 till it reaches the 10 ml mark.

3

Pour vinegar into test tube 1 till it reaches almost the top of the test tube.

4

Close the cap and shake well.

Are there any other liquids in your house that can help oil & water mix?!

5

Repeat instructions a and b to test test tube 2. Then add lemon juice till it reaches almost the top of the test tube.

6

Close the cap and shake well.

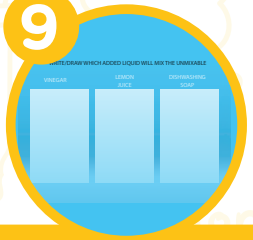
7

Repeat instructions a and b to test tube 3. Then add dishwashing soap till it reaches almost the top of the test tube.

8

Close the cap and shake well.

9



Record which liquid will make the oil and water mix.

Which liquid will make the oil and water mix?

3 Eggy Emulsion

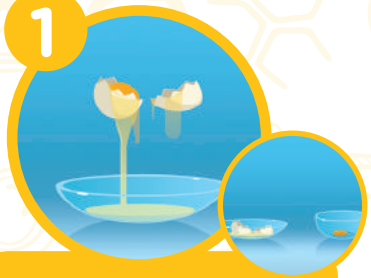
WARNING: Adult supervision and help needed. **DO NOT USE THE WHISK WITHOUT ADULT HELP** AND/OR SUPERVISION.

SUPPLIES FROM HOME

- Electric whisk
- 10–30 ml of oil
- 1/4 cup vinegar
- 1 egg yolk
- Salt
- Pepper
- Medium/large bowl

How to Video - learnandclimb.com/pages/video-library

1



Separate the egg yolk from the egg white. Place the egg yolk into your bowl.

2

Add salt, pepper, and 1/4 cup of vinegar to your bowl.

3

Mix all the ingredients in the bowl with an electric whisk — only with adult supervision.

4

While still mixing the ingredients in the bowl, slowly add 10 to 30 ml of oil till you get an eggy emulsion.

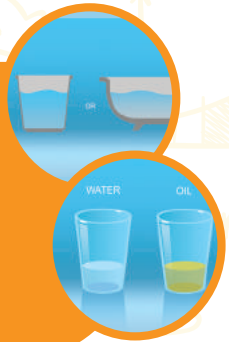
Explanation

You just made another emulsion. You might need to make the emulsion a few times until you learn to get the right thickness. If you were to zoom in on the particles, you would see that they still don't truly mix! Instead, they arrange themselves in a certain pattern, where one particle surrounds another.

Eggs are involved in other emulsions, too. A lot of the things you eat and drink are emulsions, such as different sauces, ice creams, cake, milk, and more! See if you can find other emulsions in your kitchen or refrigerator and write them down.

4 Tick Tock Goes the Oil Clock

SUPPLIES FROM HOME



Bucket or bathtub
Water in a cup
Oil in a cup

SUPPLIES FROM KIT

Test tube holder
2 small test tubes
Coloring agent
Test tube connector

Explanation

You just made an oil clock. This clock uses the properties of oil and water. What properties do you think are at work? Does it have to do with temperature? With weight? Tip the clock upside-down and right side up to see what happens! Does the water always go below the oil? Is there a barrier? Based on your results, answer the following questions.

*note! **This experiment is very messy!** Even if you do it in a bucket, you may want to do it outside. Too much coloring agent may stain hands, clothing, or surfaces.

How to Video - learnandclimb.com/pages/video-library

1

Add 2-4 drops of coloring to test tube 1.

2

Add water to test tube 1 until it is half full.

3

Shake the test tube.

4

Add more water to test tube 1, almost till the top..

5

Shake again.

6

Fill the second test tube with oil.

7

Screw the test tube connector onto test test tube 2.

8

Close the opening of both test tubes with your thumbs.

9

Put both test tubes into a large bucket or your bathtub filled with water, with your thumbs still on them.

10

Quickly screw both test tubes together.

11

Create an oil clock by turning over your test tubes every few seconds.

5 Density Exploration

WARNING: KEEP MARBLE AWAY FROM YOUNG CHILDREN. DO NOT PUT MARBLE IN YOUR MOUTH.

SUPPLIES FROM HOME

Pitcher/cup filled halfway with water

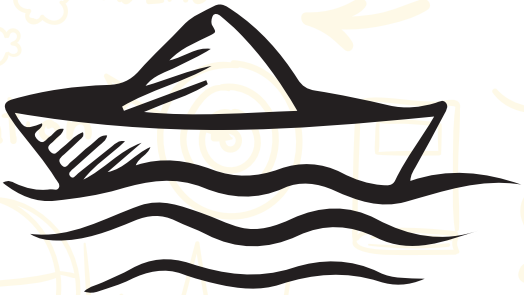
Rubber ball

Marble

How to Video - learnandclimb.com/pages/video-library

Drop both the rubber ball and the marble into the pitcher at the same time.

Watch to see which one sinks first.



Explanation

If you compare a marble and a bouncy rubber ball, which one do you think will be denser? Go ahead and find out!

In this experiment, which one sinks first? Well, the marble, because it is denser! The rubber ball is less dense, so it did not sink as quickly. Density, for our purposes, refers to how compact or "packed in" a substance is. It is normally easy to move or lift less dense objects, while it is harder to move or lift denser objects. So why would we want to change the density of a mixture? There are many reasons, but for us, we want to make things fall slower in our clock. With the next experiment, you will see it in action! Have you ever seen a snow globe before? Well, kind of like that!

6 Changing the Oil Clock

Explanation

The previous oil clock could not "measure time" well. However, dissolving the salt into the water actually increased the water's density. Have you ever been in the ocean? It's easier to float in the ocean than it is in a pool because the ocean water is denser!

SUPPLIES FROM KIT

2 small tubes
Test tube connector
Coloring agent (Packet 11)

SUPPLIES FROM HOME

Rubber gloves
Water
Oil
Salt

How to Video - learnandclimb.com/pages/video-library

1

Fill test tube 1 a quarter full with salt.

2

Fill test tube 1 three-quarters full with water.

3

Close the cap and shake.

4

Add more water to the test tube, until it is almost full.

5

Fill test tube 2 with oil.

6

Put the connector onto test tube 1.

7

Place your thumb over the other side of the connector, and your other thumb over the opening of test tube 2.

8

Fill your bathtub with water.

9

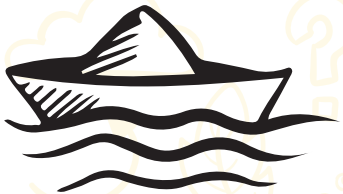
Put your test tubes (with your thumbs still on it) into the bathtub and quickly connect test tube 2 to the connector.

10

11

Turn your connected test tube over every 5 to 10 seconds to watch your oil clock!

7 Floating Egg



SUPPLIES FROM HOME

1 cup of water
Egg
1/4 cup salt
Stirring stick

How to Video - learnandclimb.com/pages/video-library

1

Add the salt to the cup of water.

2

Stir the water and salt until the salt is dissolved.

3

Put the egg in.

4

Watch your egg float!

Expand

Take it even further and try it with two eggs, three eggs, or more! Do you need to add more salt? The more eggs you use the bigger your plate/bowl will need to be.

8 Mix the Unmixable Lava Lamp

note!

Oil may spill and/or shoot out of the bottle, so you might want to spread out a towel just in case.

SUPPLIES FROM HOME

- Water
- Oil
- Empty water bottle, medium or large/ about 20+ ounces

SUPPLIES FROM KIT

- Coloring agent
- Foaming agent
- Glow-in-the-dark potion
- Yellow measuring spoon

Expand

Try to add other ingredients and colors to make your lava lamp even more realistic! Try to make the best lava lamp you can! To buy more foaming agent, contact us through our website,

www.learnandclimb.com

How to Video - learnandclimb.com/pages/video-library

Put a little coloring agent into your bottle.

Pour water into the bottle until it is one-fifth full.

Pour oil into the bottle until it is three-fifths full.

Close cap and shake well.

Add a little of glow-in-the-dark potion to the bottle for some extra magic!

Put all five foaming agents into the bottle Wait a moment.

Put on the cap and watch! If you used some glow-in-the-dark potion, then go into a dark room to watch the magic.

Explanation

The foaming agent reacts, or makes a new substance. The foaming agent also makes the water rise. But we know that the water is more dense than the oil, so it tries (and does) go back down — only to be pushed back up because of the reaction of the foaming agent! Then it goes back down because it is more dense than oil, and so on! This process happens over and over again due to convection, which is just the movement of liquids within other liquids due to different properties. Therefore, lava lamps continuously go up and down!

Volcano Eruptions

FAMOUS VOLCANOES

There are many famous volcanoes scattered throughout the world. There are three main types of volcanoes: Composite (strato) volcanoes, shield volcanoes and dome volcanoes. About 75 percent of the world's volcanoes lie along a special "line" in the Pacific Ocean called the Ring of Fire. Indonesia lies along this line, and it is the most volcanically active country in the entire world. Some famous volcanoes are: Mount Vesuvius, Mount St. Helens, Krakatoa, and Mount Fuji. The largest volcano in the solar system is Olympus Mons. This shield volcano is on not on Earth, but rather on Mars!

Can you name any other famous volcanoes?

STUDYING VOLCANOES

It is important for scientists who study volcanoes, known as volcanologists, to actively study volcanoes. This way, they know when volcanoes are about to erupt and are able to warn people to evacuate or clear the area. They **measure things like temperature of lava, amount of smoke released, rumblings in the ground, and many other factors. They wear heavy suits made from special materials to protect themselves!**

A FORCE OF NATURE

A volcano is a true force of nature out of which gas, lava, rock, dust, and ash erupt. Volcanoes are responsible for some of the most powerful and devastating events in human history. Every day, you walk on the ground. That is the layer of Earth known as the crust. It is made up of huge slabs of rock called plates. These plates are in constant motion across the Earth. They move very slowly, though, about 1 to 4 centimeters per year. The plates move because the mantle, which is the layer of Earth under the crust, is like a giant ocean of magma. Magma is lava before it reaches the surface. Since the magma in the mantle is always moving around, the plates will move on top. Plates may sometimes move under or over one another. Since magma is less dense than solid rock, it is pushed up to the surface. When enough magma builds up and the magma chamber under a volcano gets too full, the volcano will erupt! Under the mantle is the layer of Earth called the core. It is extremely hot, with temperatures as high as 10,000,000° Celsius! It heats the mantle above it and started the process moving. The entire process is part of a theory called plate tectonics.

ERUPTION CONTENTS

Most volcanoes erupt lava. Lava is molten —or melted — rock, so hot that instead of acting like solid rock, it flows like liquid! Volcanoes also eject debris like small rocks and ash, which is made up of volcanic glass, other rocks, and minerals. They can even release gas or smoke like a fire. There are even volcanoes on other planets and moons in our solar system that erupt water and ice!

Why do you think that happens?

9 Load to Explode

SUPPLIES FROM KIT

Volcano base
baking soda
citric acid
Yellow measuring spoon
Beaker

SUPPLIES FROM HOME

Water
Plate

How to Video - learnandclimb.com/pages/video-library

1

Place your Volcano base on a plate.

2

Using your yellow measuring spoon, add 2 large, rounded spoonfuls of baking soda to the “crater hole” found in the top of your volcano.

3

Add 1 large, rounded spoonful of citric acid to the baking soda in the crater hole and mix well.

4

Fill the beaker with 15-20 ml of water.

5

Pour the water into the crater hole with the citric acid and baking soda.

6

Watch your eruption!

Now let’s try some different ingredients for different eruptions!

10 More Eruptions

SUPPLIES FROM HOME

Water

Dish soap

Plate

SUPPLIES FROM KIT

Volcano base

baking soda

citric acid

Yellow measuring spoon

Beaker

Explanation

You just simulated volcanic layering. Some volcanoes do not erupt in one massive explosion. Instead, they have a series of constant, smaller eruptions. When the magma from these eruptions cools, it hardens into a special type of rock known as igneous rock. Igneous rocks are formed from recent volcanic eruptions. You can even sometimes see it in their rocky pores! The layers build up over time and make a special type of volcano called a stratovolcano. Stratovolcanoes are built from layers of lava flow, ash, and igneous rock. An example of a famous stratovolcano is Mt. Etna.

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1

Place your Volcano base on a plate.

2

Using you yellow measuring spoon, add 2 large, rounded spoonfuls of baking soda to the "crater hole" found in the top of your volcano.

3

Add 1 large, rounded spoonful of citric acid to the baking soda in the crater hole and mix well

4

Fill the beaker with 15ml of water.

5

Add 1 large spoonful of dishsoap to the beaker and mix until dissolved.

6

Pour the mixture from the beaker into the crater hole with the citric acid and baking soda.

7

Watch your eruption!

What was different this time?

11 Colorful Flow

SUPPLIES FROM KIT

- Volcano Base
- Yellow measuring spoon
- Baking soda
- Citric acid
- Coloring Agent
- Beaker

SUPPLIES FROM HOME

- Water
- Dish soap
- Plate

How to Video - learnandclimb.com/pages/video-library

1

Place your Volcano base on a plate.

2

Using your yellow measuring spoon, add 2 large, rounded spoonfuls of baking soda to the “crater hole” found in the top of your volcano.

3

Add 1 large, rounded spoonful of citric acid to the baking soda in the crater hole and mix well

4

Pour 15ml water into the beaker

Repeat with other colors.

5

Add 1 large spoonful of dishsoap to the beaker and mix until dissolved.

6

Add a drop or two of coloring agent into the beaker and mix.

7

Pour the mixture from the beaker into the crater hole with the citric acid and baking soda.

8

Watch your colorful eruption!

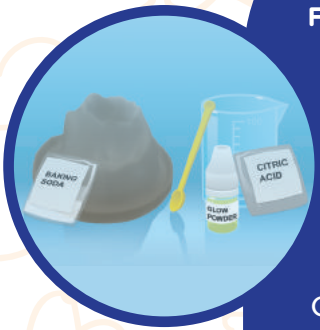
Do you like the color?

12 Glow with the Flow

SUPPLIES FROM HOME

Water
Dish soap
Plate

SUPPLIES FROM KIT



Volcano Base
Yellow measuring spoon
baking soda
citric acid
Glow in the Dark Powder
Beaker

How to Video - learnandclimb.com/pages/video-library

1

Place your Volcano base on a plate

2

Using your yellow measuring spoon, add 2 large, rounded spoonfuls of baking soda to the "crater hole" found in the top of your volcano

3

Add 1 large, rounded spoonful of citric acid to the baking soda in the crater hole and mix

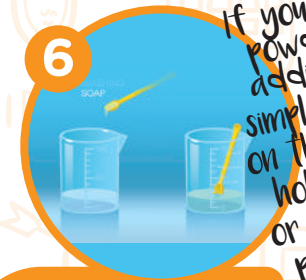
4

Add 4-5 squeezes of Glow in the Dark Powder to crater hole and mix well

5

Fill the beaker with 15m of water

6



Add 1 large spoonful of dishsoap to the beaker and mix until dissolved.

If you added glow powder- before adding the liquid simply shine a light on the filled crater hole for a minute or so to boost the phosphoresence!

7

Pour the mixture from the beaker into the crater hole with the citric acid, baking soda and Glow

8

Turn off the lights & Watch your glowing eruption!

13 The Bubbly Eruption

SUPPLIES FROM KIT

- Volcano Base
- Yellow measuring spoon
- Baking soda
- Citric acid
- Purple Sweet Potato Powder

SUPPLIES FROM HOME

- Water
- Dish soap
- Plate

How to Video - learnandclimb.com/pages/video-library

1

Place your Volcano base on a plate

2

Using your yellow measuring spoon, add 2 large, rounded spoonfuls of baking soda to the "crater hole" found in the top of your volcano.

3

Add 1 large, rounded spoonful of citric acid to the baking soda in the crater hole and mix

4

Add 1 large spoonful of purple sweet potato powder to the crater hole and mix well.

5

Fill the beaker with 15ml of water

6

Add 1 large spoonful of dishsoap to the beaker and mix until dissolved.

7

Pour the mixture from the beaker into the crater hole with the citric acid, baking soda and sweet potato powder

8

Watch your eruption!

14 A Truly Explosive Eruption

notes

You might need adult or another person's assistance for this experiment. Be sure to clean up after you are done so the area doesn't become sticky.

SUPPLIES FROM HOME

Mentos

2 liter bottle of carbonated diet cola

2 liter bottle of carbonated cola

How to Video - learnandclimb.com/pages/video-library

1

Put your 2 liter bottle of diet carbonated cola on a surface outdoors.

2

Open the top of your package of Mentos, keeping all the Mentos in the package.

3

Open the cap of the Diet Cola.

4

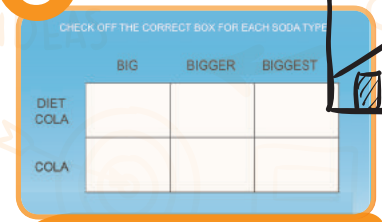
See what happens!

Turn the Mentos package over directly on top of the bottle of soda, but keep the Mentos from falling out of the package by keeping your thumb on the Mentos. When the Mentos are directly on top of the soda, remove your thumb and push the Mentos into the bottle of diet cola.

5

Now try doing the same thing with regular Cola!

6



Use the graph to record which soda type caused what type of eruption.

Explanation

The Mentos and Cola experiment works so well mostly because of the roughness and density of Mentos (it can sink quickly to the bottom, unlike other candies). This way, the cola permeates almost every pore of the Mentos in what is called an activated-site reaction.

15 Different Reactions

SUPPLIES FROM KIT

Beaker

SUPPLIES FROM HOME

Salt

Coke

Big container

How to Video - learnandclimb.com/pages/video-library

1

Fill the beaker halfway with Coke.

2

Get a handful of salt.

3

Pour the salt into the beaker with Coke.

4

See what happens!

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