girl scouts of california's central coast

Oil and Water Firework Experiment

Supply List

An empty jar, or tall clear glass

4 tbsp of cooking oil

Food coloring (red, blue, optional)

Water

A bowl, measuring cup, or small cup

Paper towels

A spoon or fork

Steps:

1. Begin by filling an empty jar, or tall, clear glass 3/4 of the way with water. Set this to the side.

2. In a measuring cup or bowl, combine 4 tablespoons of cooking oil along with several drops of food coloring. You will want to add 3-5 drops of food coloring for each color that you are using.

3. Use a spoon to stir the food coloring into the oil. It will not mix, but stirring will help to break the food coloring into smaller droplets.

4. Now, pour the container of oil into the jar of water. After a moment or two the oil will settle at the top of the jar, but the food coloring will begin to shoot down and mix into the water, creating a "fireworks" effect! This will continue until all of the droplets have fallen from the oil.

So How Does It Work?

To fully explain this, we have to talk a little about density. Density is the amount of mass per unit of volume, so in other words, something that is heavy and compact would have a high density. This makes sense to think of in terms of solids, but it also applies to liquids and gasses as well!

Between water and oil, oil is less dense. That is why the oil floats on top when we pour it in. Liquids with different densities do not mix together. But what about the food coloring? The food coloring we used (and is most common) is water based, which is why it stays in drops in the oil; but when the food coloring sinks and reaches the surface of the water, it mixes with the water and creates a firework effect!

Milk Firework Experiment

Supply List

A plate or baking dish

Milk (any milk will work)

Food coloring

Liquid dish soap

Q-Tip

Steps:

1. Pour enough milk in the dinner plate to completely cover the bottom to the depth of about 1/4 inch. Allow the milk to settle before moving on to the next step.

2. Add one drop of each of the four colors of food coloring—red, yellow, green, and blue—to the milk. Keep the drops close together in the center of the plate of milk.

3. Find a clean cotton swab for the next part of the experiment. Predict what will happen when you touch the tip of the cotton swab to the center of the milk. It's important not to stir the mix—just touch it with the tip of the cotton swab.

4. Now place a drop of liquid dish soap on the other end of the cotton swab. Place the soapy end of the cotton swab back in the middle of the milk and hold it there for 10 to 15 seconds. Watch what happens!

5. Add another drop of soap to the tip of the cotton swab and try it again. Experiment with placing the cotton swab at different places in the milk. Notice that the colors in the milk continue to move even when the cotton swab is removed. What makes the food coloring in the milk move?

6. Milk is mostly water, but it also contains vitamins, minerals, proteins, and tiny droplets of fat suspended in solution. Fats and proteins are sensitive to changes in the surrounding solution (the milk).

So How Does It Work?

Milk is mostly water, but it also contains vitamins, minerals, proteins, and tiny droplets of fat suspended in solution. Fats and proteins are sensitive to changes in the surrounding solution (the milk). The secret of the bursting colors is in the chemistry of that tiny drop of soap. Like other oils, milk fat is a non-polar molecule, and that means it doesn't dissolve in water. When soap is mixed in, however, it breaks up and collects the non-polar fat molecules. The molecules of fat bend, roll, twist, and contort in all directions as the soap molecules race around to join up with the fat molecules.

During all of this fat molecule gymnastics, the food coloring molecules are bumped and shoved everywhere, providing an easy way to observe all the invisible activity. As the soap becomes evenly mixed with the milk, the action slows down and eventually stops. This is why milk with a higher fat content produces a better explosion of color—there's just more fat to combine with all of those soap molecules.

Soda and Mentos Explosion

Supply List

2 liter bottle of Diet soda

5-7 Mentos

Piece of paper or tube

-This activity is probably best done outside in the middle

of a field or on a lawn. Diet soda is recommended because

it is less sticky and easier to clean up later.

Steps:

1. Position the bottle on the ground so that it will not tip over.

2. To get the best reaction, you have to drop all seven Mentos into the bottle of soda at the same time (which is trickier than you might think). One method for doing this is to roll a piece of paper into a tube just big enough to hold the loose Mentos. You can also try using a large plastic test tube to hold the Mentos.

Assuming that you're using the paper tube method, you'll want to load the seven Mentos into the tube, cover the bottom of the tube with your finger, and position the tube directly over the mouth of the bottle. When you pull your finger out of the way, all seven Mentos should fall into the bottle at the same time.

3. After making your tube of Mentos, get ready to drop them into the Diet soda. After dropping the Mentos in, make sure to run away and look back at the eruption!

So How Does It Work?

Soda is made of sugar or artificial sweetener, flavoring, water, and preservatives. The thing that makes soda bubbly is invisible carbon dioxide (CO_2), which is pumped into bottles at the bottling factory using lots of pressure. If you shake a bottle or can of soda, some of the gas comes out of the solution and the bubbles cling to the inside walls of the container. When you open the container, the bubbles quickly rise to the top pushing the liquid out of the way. When this happens, it forces the liquid to spray everywhere.

We use Mentos because they have tiny pits on the surface of the mint, and because of their weight. Each Mentos mint has thousands of tiny pits all over the surface. These tiny pits are the perfect places for CO_2 bubbles to form. As soon as the Mentos hit the soda, bubbles form all over the surfaces of the candies and then quickly rise to the surface of the liquid. Couple this with the fact that the Mentos candies are heavy and sink to the bottom of the bottle and you've got an even more explosive experiment. The gas released by the Mentos literally pushes all of the liquid up and out of the bottle in an incredible soda blast.