

## Tornado in a Jar

### **REMEMBER BEFORE YOU START TO**

1. Label Laboratory Notebook with the title of experiment & date you perform it
2. Gather all your materials
3. Read the CAUTIONS
4. Read ALL Methods
5. Write **predictions** in your Laboratory Notebook
6. Wear your goggles, gloves, and lab coat

**GOAL:** Learn about centripetal force & how tornadoes form

### **Materials**

Glass jar with a lid  
Water  
Dish Soap  
Vinegar  
Blue Food Dye



Be careful to not get dye on your work space.

### **Methods**

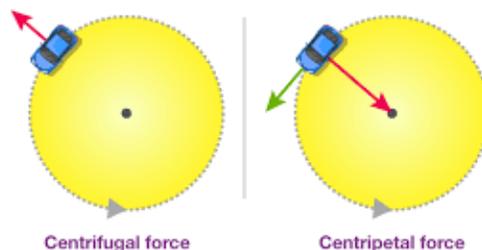
1. Fill your jar about 3/4 full with water and add in 3-5 drops of blue food dye.
2. Add a teaspoon of dish soap and a teaspoon of vinegar to your blue water.
3. Tighten your lid.
4. Simply hold the jar by the lid and rotate it around in a circle in a smooth. **What do you think will happen? Write your predictions in your Laboratory Notebook.**
5. **Observe how the liquid moves in the jar. Write your observations in your Laboratory Notebook.**

### **What's Happening?**

The **tornado** in your **bottle** is caused by "centripetal force" – an inward-facing force that pulls an object or liquid toward the center of its circular path. The twister created in your **bottle** is caused by the water in the **bottle** spinning towards the center of the **bottle**, or vortex.

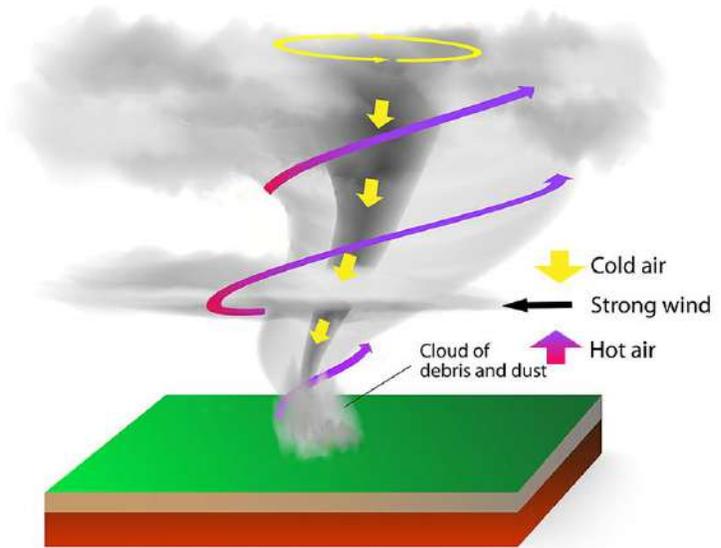
#### CENTRIPETAL AND CENTRIFUGAL FORCE

BYJU'S



## How Do Tornadoes Form in Nature?

- A tornado is a violent rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds of up to 300 mph. They can destroy large buildings, uproot trees and hurl vehicles hundreds of yards. They can also drive straw into trees. Damage paths can be in excess of one mile wide to 50 miles long. In an average year, 1000 tornadoes are reported nationwide.
- Most tornadoes form from thunderstorms. You need warm, moist air from the Gulf of Mexico and cool, dry air from Canada. When these two air masses meet, they create instability in the atmosphere. A change in wind direction and an increase in wind speed with increasing height creates an invisible, horizontal spinning effect in the lower atmosphere. Rising air within the updraft tilts the rotating air from horizontal to vertical. An area of rotation, 2-6 miles wide, now extends through much of the storm. Most strong and violent tornadoes form within this area of strong rotation.



## Who Uses This in Real Life?

**Meteorologists** are scientists that study the atmosphere to predict and understand earth's weather. They help us prepare for each day's temperatures and let us know to expect rain, snow, or sun.



Joanne Simpson (1923-2010) was the first female meteorologist with a Ph.D. Fascinated by clouds as a child, she might well have gone into astrophysics were it not for the intervention of World War II. As a trainee pilot she had to study meteorology and after getting her training from Carl Gustaf Rossby's new World War II meteorology program, spent the war years teaching meteorology to Aviation cadets. Her PhD work focused on clouds, then regarded as not a particularly important part of the subject, but her early research based revealed cloud patterns from maps drawn from films taken on tropical flights. Subsequently she went on to show how tropical "hot tower" clouds actually drive the tropical circulation, and to propose a new process by which hurricanes maintain their "warm core".