



## Cloud in a Bottle

### OBJECTIVE:

Weather is all around us. Earth's atmosphere surrounds the planet; it is the mixture of gases we breathe as air. As weather patterns move around, air particles may “bunch up” over a particular area.

More particles mean increased atmospheric pressure. When pressure is high, it prevents clouds from forming and the weather is likely to be fair. When air pressure is low, clouds form more easily and there is a greater chance of rain or snow.

Have you ever wondered how clouds form? Moist air rises in the atmosphere, cools, and water droplets form into clouds. You can imitate this process by creating a cloud in a bottle!

### MATERIALS:

- 1-liter clear plastic bottle with cap
- Foot pump with rubber stopper attached
- Water
- Rubbing alcohol



### PROCEDURE:

1. Start by pouring just enough warm water in the bottle to cover the bottom.

**Even though we don't see them, water molecules are in the air all around us. These airborne water molecules are called water vapor. When the molecules are bouncing around in the atmosphere, they don't normally stick together.**

2. Swirl the water around and then put the rubber stopper in the bottle.
3. Pump the foot pump 15-20 times. You want to put about 9 kg (20 lbs) of pressure in the bottle.

**Pumping the bottle forces the molecules to squeeze together or compress. Releasing the pressure allows the air to expand, and in doing so, the temperature of the air becomes cooler. This cooling process allows the molecules to stick together - or condense - more easily, forming tiny droplets. Clouds are nothing more than groups of tiny water droplets!**

### **PROCEDURE (continued):**

4. When you remove the rubber stopper, you should see a cloud.
5. Place just a few drops of rubbing alcohol in the bottom of the 1-liter bottle. Swirl the alcohol around in the bottle, making sure to coat the sides. Then put the rubber stopper in the bottle. Follow steps 3-4 above to make a more visible cloud.

**The reason the rubbing alcohol forms a more visible cloud is because alcohol evaporates more quickly than water. Alcohol molecules have weaker bonds than water molecules, so they let go of each other more easily. Since there are more evaporated alcohol molecules in the bottle, there are also more molecules able to condense. This is why you can see the alcohol cloud more clearly than the water cloud.**

**Clouds on Earth form when warm air rises and its pressure is reduced. The air expands and cools, and clouds form as the temperature drops below the dew point. Invisible particles in the air in the form of pollution, smoke, dust or even tiny particles of dirt help form a nucleus on which the water molecules can attach.**