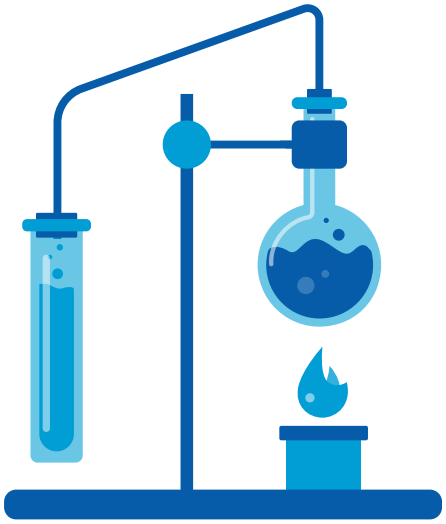
ACTIVITY 5: DISTILLATION OF COLA



The purpose of this activity is for students to separate the components of a complex everyday solution—cola—using a distillation technique.

Materials:

- 100mL of regular cola*
- Heat source (such as a hot plate or burner)
- 250mL Flask
- Glass tubing (or a distillation apparatus)
- Cork with hole for glass rod/tubing
- 250mL Beaker or other container
- Thermometer
- Ice

First ask students what they think is in a can of cola? Without looking at the label, take some responses from them and list them out. After students have shared some ideas, consult the label and read it off to the group to compare. Inform them that most of the ingredients in cola, or most sodas, are added to water in the form of a special syrup. And using a process similar to how syrup is produced from sap, they will be using a process called **distillation** to separate the water and carbon dioxide from cola, leaving the cola syrup behind.

Then, demonstrate and explain the steps of the distillation process before allowing the groups to begin their experiment. Point out during the procedure that throughout this experiment, they can observe that distillation is a process used to separate the components of a mixture based on their boiling points. In the case of any solution being distilled, including cola, the components with the lowest boiling point—in this case carbon dioxide and water—will separate out first. And since we are capturing the steam in the distillation tubing and then cooling it, this experiment will allow us to condense the gaseous water back into its liquid state and collect the water in a separate container to compare the volume of water that was in the volume of cola distilled.

**Note: you could use a diet cola instead, but it has a lot less syrup since it contains no sugar. A variation of this experiment could be to have some groups distill regular cola and others diet cola, then compare the results and discuss them in terms of the syrup and composition of each kind of cola.*

Procedure:

1. Pour the cola into the flask.
2. Insert the glass tubing into the cork and then insert the cork into the mouth of the flask.
3. Place the beaker or container underneath the other end of the glass tubing.
4. Heat the flask gently using the heat source.
5. The cola will begin to boil and the vapor will travel through the glass tubing into the beaker.
6. Place a few ice cubes (or a flexible ice pack) on the glass tubing to cool the vapor.
7. The cooled vapor will condense into a liquid and collect in the beaker.
8. Monitor the production of water vapor as the cola boils further
9. Once water stops traveling through the tube, the distillation process is complete.
10. Measure the volume of water collected and the amount of syrup left in the original flask.

Next, allow student groups time to distill their cola and measure what volume of water they collected and what amount of syrup remained.

Last, have students summarize their findings, observations, and data. They can draw particle diagrams of the before, during, and after phases of the distillation experiment. They can also estimate a percentage of cola that is water by calculating the amount of water collected as compared with the starting volume of cola. They can present their findings to the class to discuss all of the groups' results with everyone; this is especially important if there were different types of soda used by different groups, e.g., diet vs. regular cola.