AIR PRESSURE/CHEMISTRY

Raisins, Dancing

Theme: Drop several raisins into a bottle of clear carbonated water and watch them dance.

Materials:

Clear carbonated liquid	Two Liter Bottle
Raisins	5-6

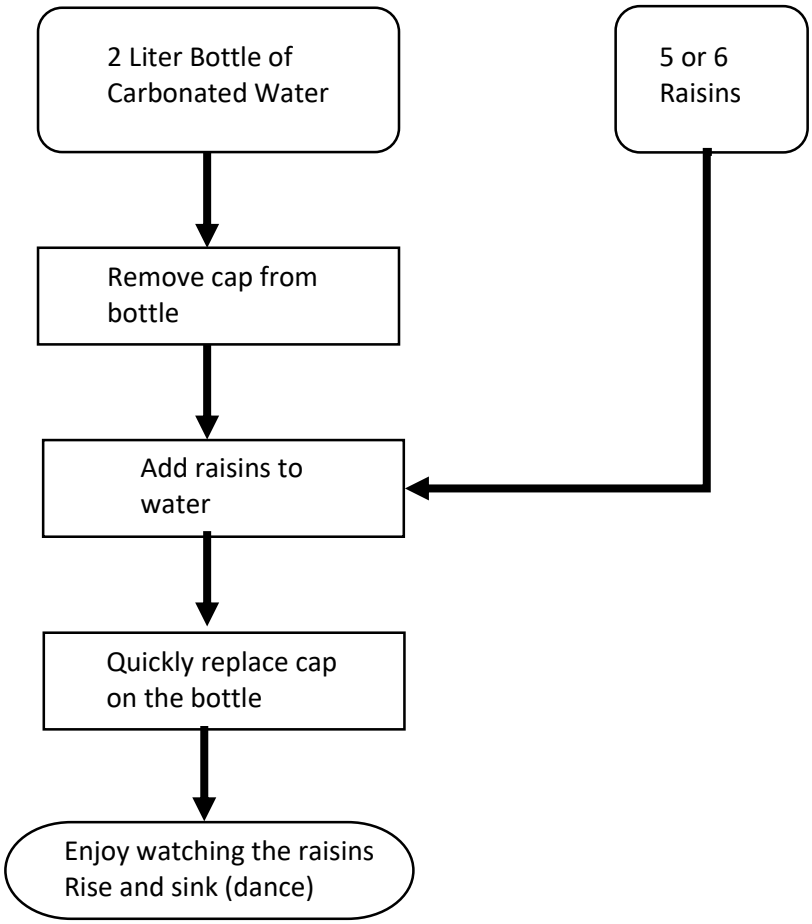
Experiment the easy way:

1) Open a two liter bottle of clear carbonated liquid.

2) Drop five or six raisins into the bottle and quickly place the lid back on the bottle tightly.

3) Watch the raisins rise and fall in the bottle.

The Secret: Initially, the raisins will fall to the bottom of the bottle because they are heavier that the water. The carbonated water contains carbon dioxide (CO_2) which forms bubbles on the creases of the raisins which makes the raisins light enough to float. When the raisin gets to the top of the liquid in the bottle, the CO_2 bubbles leave the raisins and become part of the gas at the top of the sealed bottle. The raisin sinks again where it attracts more CO_2 bubbles and again rises to the top. As long as enough CO_2 gas remains dissolved in the liquid, the process will continue.



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Experiment using Chemistry:

Drop 5 or 6 raisins into a half dull glass of clear water and watch them fall to the bottom of the glass because raisins are heavier than water. Add ¼ glass of vinegar to the water. Then add 2 heaping teaspoons of baking soda to the liquid. What happens.

Materials:

2 Glasses, 8 ounce	
Set of Measuring cups	
Cookie sheet with sides	
Measuring spoon, teaspoon	
Tap Water	½ Cup or 4 ounces
Raisins	5-6
Vinegar, white	¼ cup or 2 ounces
Baking soda	2 heaping teaspoons

Experiment the easy way:

1) Fill a glass of water half full with 4 ounces of water.

2) Put the glass of water on a cookie sheet or school lunch tray.

3) Drop five or six raisins into the glass and watch them sink to the bottom of the glass.

4) Add ¼ glass or 2 ounces of white vinegar to the water.

5) Add 2 heaping teaspoons of baking soda to the water.

6) Watch the raisins rise and fall in the bottle.

The Secrets: Initially, the raisins will fall to the bottom of the bottle because they are heavier that the water.

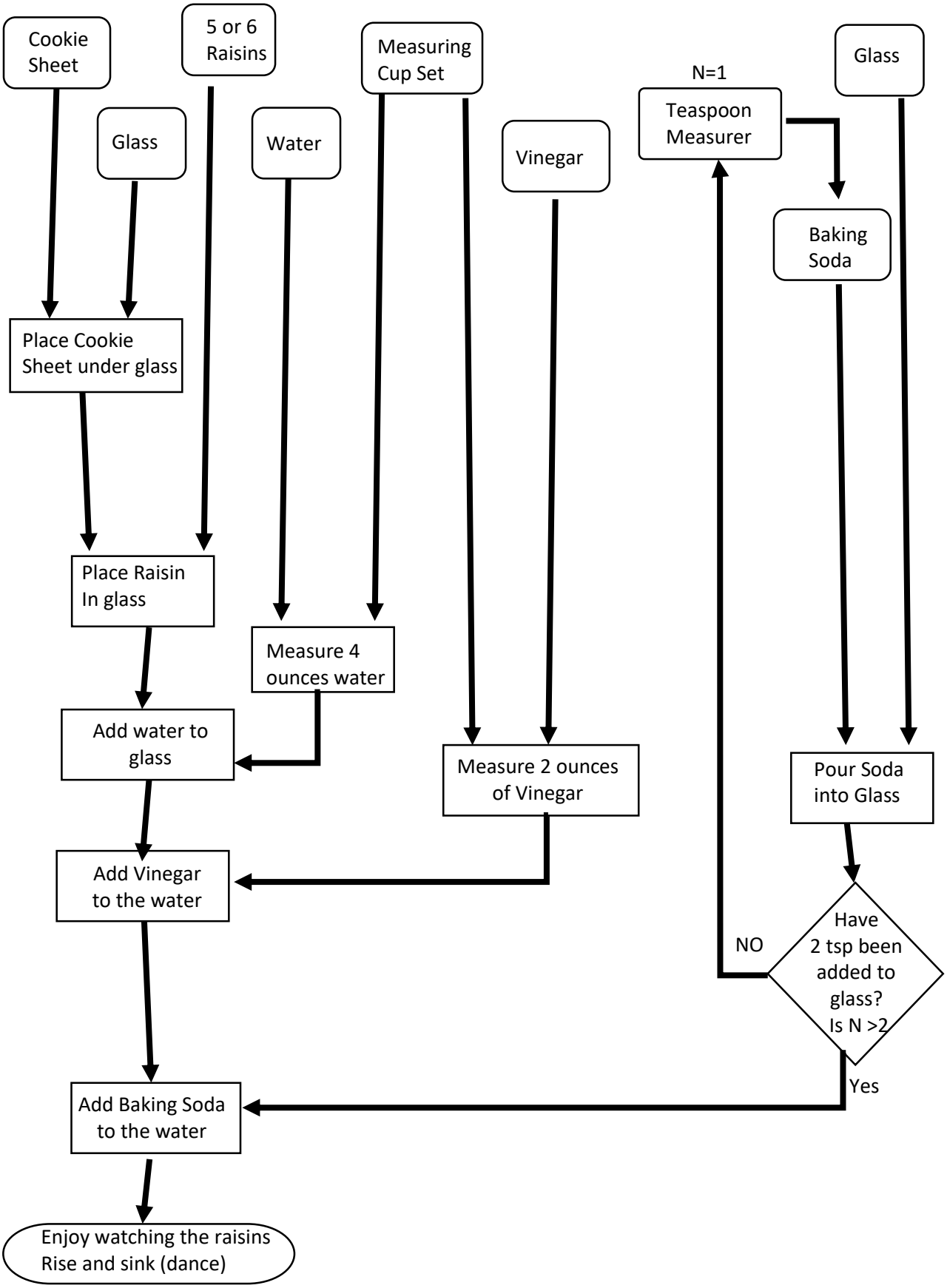
Vinegar is acetic acid (C2H4O2) and water. Baking soda is sodium bicarbonate (NaHCO3). When these two compounds (in chemistry a compound is formed by two or more elements united in fixed proportions) are mixed, a chemical reaction takes place.

Solid Liquid Gas Liquid dissolved in water

$$NaHCO_3 + CH_3COOH \longrightarrow CO_2 + H_2O + Na + CH_3COO$$

This chemical reaction adds the carbonation to the water.

The carbonated water contains carbon dioxide (CO_2) which forms bubbles on the creases of the raisins thus making the raisins light enough to float. When the raisins get to the top of the liquid in the glass, the CO_2 bubbles leave the raisins and become part of the surrounding air. The raisins then sink again where they attract more CO_2 bubbles and again rises to the top. As long as enough CO_2 gas remains dissolved in the liquid, the process will continue.


Cookie Sheet
5 or 6 Raisins
Measuring Cup Set
Glass
N=1
Teaspoon Measurer
Glass
Glass
Water
Vinegar
Baking Soda
Place Cookie Sheet under glass
Place Raisin In glass
Measure 4 ounces water
Add water to glass
Measure 2 ounces of Vinegar
Pour Soda into Glass
Add Vinegar to the water
NO
Have 2 tsp been added to glass? Is N >2
Yes
Add Baking Soda to the water
Enjoy watching the raisins Rise and sink (dance)

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Supplemental:
1) Try this experiment with grapes. Do you get the same result? Why not?
2) Try this experiment with beans. Do you get the same result? Why not?
3) Try this experiment with a dime. What happened?
4) Try this experiment with a small Lego. What happened?

Science Project: Vary the amount of Vinegar and the amount of Baking Soda and observe what how the variations affect the raisins. In this experiment we want the raisins to dance the longest amount of time. Record the time of each run in seconds.

Before running the Confirmation run, complete the calculations shown below:

RUN	White vinegar	Baking Soda	Time Raisins Dance (T)
1	1 ounce vinegar	1 teaspoon baking soda	
2	1 ounce vinegar	2 teaspoons baking soda	
3	1 ounce vinegar	3 teaspoons baking soda	
4	2 ounces vinegar	1 teaspoon baking soda	
5	2 ounces vinegar	2 teaspoons baking soda	
6	2 ounces vinegar	3 teaspoons baking soda	
7	3 ounces vinegar	1 teaspoon baking soda	
8	3 ounces vinegar	2 teaspoons baking soda	
9	3 ounces vinegar	3 teaspoons baking soda	
Confirmation			

We need to determine the average number of seconds for reach variable. Average is defined as the value representing the middle of a group of data. Average is calculated by adding up a series of related valued and then dividing by the number of items. In this experiment, all of our samples come in groups of three so we would add the three response times for each variable and then divide by three.

T1 represents the total time that the raisins in the first run danced. This time is used as one of the three data points for 1 ounce vinegar and also for 1 teaspoon baking soda. T2 represents the total time that the raisins in the second run danced. This time is used as one of the three data points for 1 ounce vinegar and also for 2 teaspoon baking soda.

1 Ounce Vinegar = (T1 + T2 + T3) / 3 =

2 Ounces Vinegar = (T4 + T5 + T6) / 3 =

3 Ounces Vinegar = (T7 + T8 + T9) / 3 =

1 Teaspoon baking soda = (T1 +T4 + T7) / 3 =

2 Teaspoons baking soda = (T2 + T5 + T8) / 3 =

3 Teaspoons baking soda = (T3 + T6 + T9) / 3 =

The confirmation run will use the amount of vinegar that lasted the longest based on the three average times. The confirmation run will also use the amount of baking soda that lasted the longest based on

the three average times for baking soda. This should give a reaction that will result in the longest time (if it is the same values used in one of the nine runs already completed, it should approximate that earlier run). The confirmation run checks our experiments for accuracy and to possibly catch variables that we have not accounted for.

How did your confirmation run compare to the nine original runs?

How would water quality affect this experiment?

Would different brands of vinegar or baking soda affect this experiment?

Other References:

https://www.workman.com/products/pop-bottle-science Pages 51-52
https://www.amazon.com/Awesome-Science-Experiments-Kids-Projects/dp/1939754666 Page 7
http://www.science-sparks.com/raising-raisins/