# Alka-Seltzer® reaction




Alka-Seltzer ingredients:
- aspirin
- citric acid
- sodium bicarbonate

When an Alka-Seltzer tablet is dissolved in water, the bicarbonate ($HCO_3^-$) reacts with hydrogen ions ($H^+$) of the citric acid, which results in carbon dioxide gas and water. The reaction equation can be summarized as:

$$3\ HCO_3^-{}_{(l)} + 3\ H^+{}_{(l)} \rightarrow 3\ H_2O_{(l)} + 3\ CO_{2\ (g)}$$

from sodium bicarbonate ($NaHCO_3$)

from citric acid ($C_6H_8O_7$)

creates bubbles

# Materials you need




Teacher

- Masking tape
- Measuring cup
- Scale

Students

- Alka-Seltzer tablets
- 250 mL beaker (or 8 oz. cup)
- Water
- Metal spoon or hammer
- Sheet of paper
- Stopwatch

# Preparing the experiment



- Fill the beaker/cup with water up to the top of the masking tape
- Make sure the water is always the same temperature!

# Experiment 1: whole tablet






- Take one whole Alka-Seltzer tablet and drop it into the water
- Start the stopwatch immediately
- Watch the tablet disintegrate
- Stop timing as soon as reaction is done

# Experiment 2: tablet 16 pieces (1)




Break one whole tablet into 16 pieces

of approximately the same size

# Experiment 2: tablet 16 pieces (2)

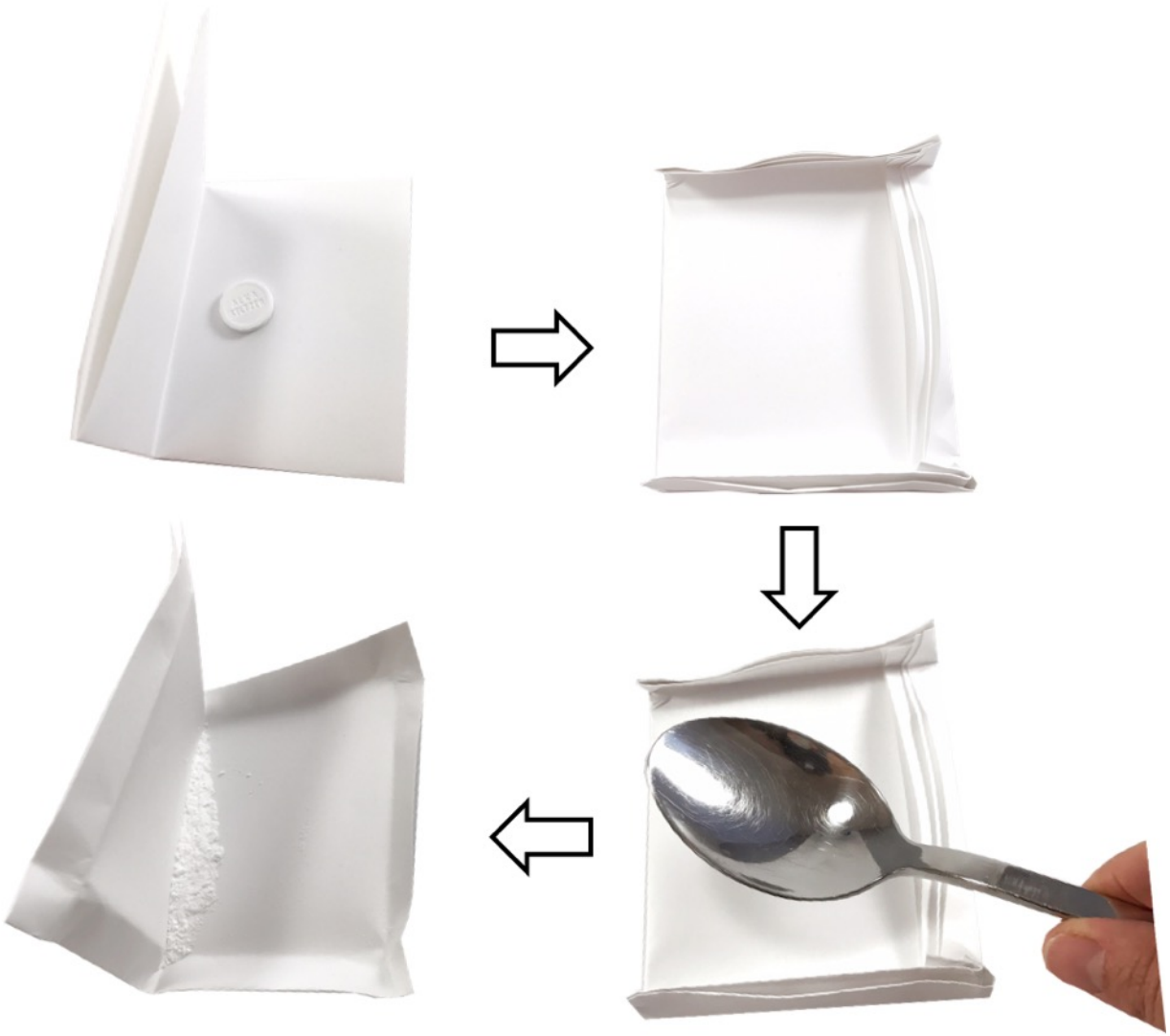







- Drop all pieces into the water at the same time
- Start the stopwatch immediately
- Stop the stopwatch as soon as the reaction is done

# Experiment 3: tablet powder (1)



- Wrap a whole tablet into a sheet of paper
- Fold over the open sides
- Carefully crush it with a metal spoon

# Experiment 3: tablet powder (2)








- Slide the powder from the paper into the water
- Start the stopwatch immediately
- Stop the stopwatch as soon as the reaction is done

# Data analysis

| Tablet size | Reaction Time [s] | | | | Reaction Rate [g/s] |
|---|---|---|---|---|---|
| | Group 1 | Group 2 | ... | Average | Average |
| Whole | | | | | |
| 16 pieces | | | | | |
| Powder | | | | | |

From all your results, calculate the average

- reaction times
- reaction rates

# Calculate the reaction rate

$$\textbf{Reaction rate} = -\frac{\text{Change in tablet mass [g]}}{\text{Change in time [s]}}$$

**Change in tablet mass [g]** = Final tablet mass [g] – Initial tablet mass [g]

Final tablet mass [g] = 0 grams
Initial tablet mass [g] = ask your teacher for this value

**Change in time [s]** = Final time [s] – Initial time [s]

Final time [s] = Time at end of reaction [s]
Initial time [s] = 0 seconds