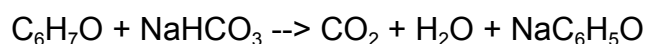


Solubility of Gases

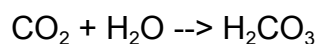
This addresses the following standard:

HS-PSC-3.3 Students who demonstrate understanding can: Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).

Alka Seltzer tablets contain citric acid, which is a dry powdery acid and baking soda. When you put the tablet in water, the following reaction occurs:



The bubbles you see are CO_2 . As the bubbles travel through the water, some CO_2 reacts with water, making carbonic acid.



Other bubbles dissolve in the water.

If you weigh the tablet and the water at the same time, then add the tablet to the water, the mass of the system should decrease because the CO_2 is going into the air.

The table contains 1 gram of acetic acid. This means we can figure out how much CO_2 is made.

$$2 \text{ gram C}_6\text{H}_7\text{O} \times \frac{1 \text{ mole C}_6\text{H}_7\text{O}}{95 \text{ grams C}_6\text{H}_7\text{O}} \times \frac{1 \text{ mole CO}_2}{1 \text{ mole C}_6\text{H}_7\text{O}} \times \frac{44 \text{ grams}}{1 \text{ mole CO}_2} = 0.92 \text{ grams of CO}_2$$

If the tablet and water get lighter by 0.2 grams, that means that 0.72 grams of CO_2 have remained dissolved in the water.

We are going to demonstrate this using ice water, room temperature water, and warm water.

Procedure:

1. Put 50 mL of water into a small beaker.
2. Add about 5-10 drops of Universal indicator. Universal indicator is red/orange in an acid and green in a neutral solution.
3. Using a balance, determine the mass of the beaker, water, and alka seltzer tablet. Record the mass.

4. Add the alka seltzer table to the water.
5. When the tablet is done fizzing, record the new mass and the temperature of the water.

Open Vizeey on your phone or Chromebook

Attach a temperature probe to a databot and turn it on

Choose temperature

Touch the record button when you are ready to record the temperature.

6. Rinse the beaker. The mixture can go down the drain.
7. Repeat these steps using ice water and water heated in the microwave.
8. Calculate the mass of CO₂ dissolved in each by subtracting the CO₂ that went into the atmosphere from 1.0 grams of CO₂ created.

Temperature	Initial Mass	Final Mass	Mass of CO ₂ released	Mass of CO ₂ dissolved

Analysis Questions

1. As temperature increases, what happened to the amount of carbon dioxide dissolved in the water?
2. What happens to the pH of the solution as temperature increases?