

Ziploc™ Bag Chemistry

Three reactions are performed in a sealed Ziploc™ bag so that the reactions can be easily observed.

Materials (per lab group)

- 👉 4 Ziploc™ bags
- 👉 1 tbsp. calcium chloride
- 👉 30 mL water
- 👉 2 tbsp. sodium hydrogencarbonate
- 👉 35mm film canister (top optional)
- 👉 30 mL Indicator solution (phenol red)

Substitutions

- Baking soda*
- Small paper cup*
- 30 mL red cabbage juice*

Procedure

1. Add 2 tbsp. sodium hydrogencarbonate to a Ziploc bag. Gently place a film canister (approximately $\frac{1}{3}$ full of water) inside the bag in the upright position. Squeeze out any excess air and seal the bag. Spill the water into the bag by shaking. Look, listen, and feel. Record your observations in the Data section.
2. Add 1 tbsp. of calcium chloride to a second Ziploc bag. Repeat the remaining steps of step 1 for the calcium chloride and record your observations for this material.
3. Mix 2 tbsp. of sodium bicarbonate and 1 tbsp. of calcium chloride in a third Ziploc bag and mix thoroughly. Gently place a film canister (approximately $\frac{1}{3}$ full of water) inside the bag in the upright position. Again, remove the excess air and seal the bag. Spill the water in the canister by shaking the bag. Look, listen, and feel!! Record your observations in the Data section.
4. Repeat step 3, replacing the water in the film canister with 30 mL of indicator solution.

Data and Observations

1. Sodium hydrogencarbonate in water: _____

2. Calcium chloride in water: _____

3. $\text{NaHCO}_3 + \text{CaCl}_2$ in water: _____

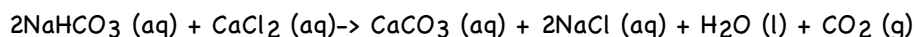
4. $\text{NaHCO}_3 + \text{CaCl}_2$ with indicator solution: _____

Questions

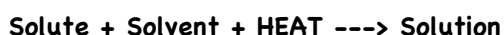
1. Classify each of these changes as chemical or physical. Use your observations to help you make your decisions.
2. In the fourth bag, what did the indicator tell you about the observed reaction?
3. What gas is being produced? How could you test this?
4. Write an equation for any chemical changes that have taken place.
5. Define heat of solution.

Teacher's Notes

- a) There is a physical change in the first bag. See number 5 below for explanation
 - b) A physical change occurs in the second bag.
 - c) In the third and fourth bags a chemical change occurs. See note 4 for the equation.
2. Phenol red can be used to show the presence of an acidic solution. It can be purchased at a swimming pool supply store. Many foods also contain indicators. One of these is red cabbage juice.
3. The indicator should show that the reaction occurring in the third bag is acidic. Cabbage juice will turn from red to blue in color, while phenol red will turn from red to yellow.
4. The gas that is produced is carbon dioxide (CO_2). It is formed from the carbonate ion, HCO_3^- . A burning splint would show that the gas extinguishes the flame. Some fire extinguishers use carbon dioxide for this reason.
5. The chemical changes that occur in bags 3 and 4 can be represented by the following equation:



6. A physical or chemical change may be accompanied by a change of energy. If the change requires heat from the environment, it is said to be *endothermic*.



7. If it releases energy to the environment, it is said to be *exothermic*.



Safety Precautions

As the Ziploc bags expand, care should be used to prevent excessive pressure build-up. The bags may burst. When calcium chloride is dissolved in water heat is given off, so care must be used with these solutions.

Disposal

Solid wastes may be placed in the trash can. All solutions may be poured down the drain, followed by water.