



DIY Toy Shop Bomb Bags

Toy shop bomb bags illustrate well-known neutralization reactions of acids and bases, forming water, a salt and carbon dioxide gas. They are available for [sale](#) but the student classroom challenge lies in the designing and producing of their own bags.

The bomb bag preparation is a fun and safe classroom activity that introduces chemical reactions and the concept of reagents to students.

Bomb bags have an inner pouch of liquid chemicals surrounded by a white powder. The liquid chemical is **citric acid** solution and the

white powder, **sodium bicarbonate** (aka bicarbonate of soda or baking soda).

Both chemicals are available from the supermarket. Note: Baking powder is not the same as sodium bicarbonate. Citric acid may be replaced with household vinegar.

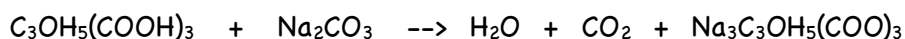
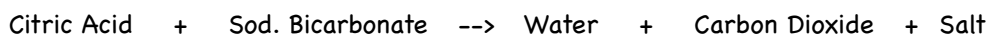


The alkalinity and acidity of sodium bicarbonate and citric acid can easily be demonstrated with our [Goldenrod \(turmeric\) paper](#). Simply dissolve a few crystals in water and smear this solution on the paper. Vivid reds and yellow will appear.

Citric acid is an organic or carboxylic acid and is found in the juice of citrus fruits. Its chemical formula is: $C_6H_8O_7$ Combined with sodium bicarbonate, it is used to make bath fizzes or effervescent tablets.



Here is the chemical reaction:



Safety:

Students should wear **eye protection** due to the irritating nature of the acid. Simply for cleaning-up reasons we recommend you doing the 'reaction' part outdoors. Ear protection may be worn but is not necessary as the plastic bags do not produce the same noise level as the toy shop bags.

Here's how to:

1. You need to source medium size **air tight** plastic food zip seal bags. (Test the tightness before purchasing).
2. Students simply dissolve a quantity of citric acid powder in water. Roughly 2 tablespoons (30 ml) to 250 ml water. Use plastic glasses to do this.
3. All groups may use the same quantity of citric acid solution, but may vary quantities of the sodium bicarbonate powder. Students wrap $\frac{1}{2}$ teaspoon sodium bicarbonate in one toilet tissue sheet, then 1 teaspoon and $1\frac{1}{2}$ and so on . . . (The quantities here will be determined by the size of the zip seal bag and hence the amount of CO_2 gas to be produced.)

- Two tablespoons citric acid solution is added to a bag and the folded tissue wrap inserted and held at the top of the bag. The bag is sealed by a second person and then the tissue is dropped in the acid solution. This is the moment to start the stop watch if you want to record reaction times.
- The bag should puff up and pop if sufficient gas is produced. If it does not, then students have to determine which of the two chemicals is the **restricting chemical**. Add more of that chemical & re-run the experiment.
- Variations to this method are cold and hot solutions, varying quantities of chemicals and different types of acids and bases. It makes for a great exercise if times are graphed against chemical quantities.

Teach: Scientific method, recording, observation, variables, chemical change, chemical reaction rates, graphing, etc.

