

BOUNCING EGGS

Eggs are fragile. If you drop them, the shells break easily, whether they are raw or hard-boiled. But with this very simple activity, you can *make an egg bounce!* Have fun and learn a little bit about **chemistry** and **chemical reactions**.



Chemistry is the branch of science that studies substances, what they are made of, and how they interact. A **chemical reaction** takes place when two or more different substances are mixed together, and a **chemical change** occurs. The chemical change creates a completely different substance.

One chemical reaction that you might be familiar with is rust forming on things that are made of iron, a nail for example, or maybe even your bicycle. The process of rust formation is one example of a chemical reaction called an **oxidation reaction**.

When cooking, heat can cause chemical changes in food. You may have noticed a grayish ring around an egg yolk that forms when it is hard-boiled. When the egg white is heated, a chemical called **hydrogen sulfide** is produced, which reacts with iron in the yolk. This creates the grayish colored ring.

To create a bouncing egg, you will need just a few things:

- A hard-boiled egg with an unbroken shell still attached
 - A raw egg with an unbroken shell still attached
 - Two jars or cups
 - White vinegar (just enough to cover each egg in its respective jar or cup)
 - Food coloring, optional
 - Paper towel
 - Cookie sheet
 - Flashlight
1. Gently place each egg in a jar or cup, with just enough vinegar to cover the egg.
 2. Add a few drops of a different color of food coloring to each cup to help you remember which egg is raw and which is cooked.



- Carefully inspect the eggs and note your observations when you place them into the vinegar, a few minutes later, in 24 hours, and in 48 hours. You will leave the eggs in the vinegar for a total of 48 hours (two days).

What do you observe?

- Shortly after placing the eggs in the vinegar, bubbles should start to form on the shell.
- The following day, you will see a scum start to form on the surface of the eggs.
- Two days later, take the eggs out of the vinegar, one at a time. Rinse them with water and rub gently using a paper towel. The shell will rub off.
- Give the egg a poke and gently squeeze it.
- How did it change?
- With a flashlight, shine a light through the raw egg. What do you see?
- Hold the raw egg a few inches above the surface of a cookie sheet, and drop the egg. Does it bounce? How high can you hold it and drop it before it breaks?
- Try the same thing with the hard-boiled egg.

Which egg bounced best? What happened, and why?

Vinegar is an **acid** called **acetic acid**. Acetic acid reacts with the **calcium carbonate** in the egg shell, softens it, and breaks it up. As acetic acid and calcium carbonate interact, a chemical reaction occurs and produces a **gas, carbon dioxide**. The bubbles that you saw forming on the shells are carbon dioxide bubbles.

After the shell is dissolved, all that is left is the skin of the egg, a membrane, holding it together. The vinegar-soaked eggs feel soft and squishy.

More interesting facts:

 Calcium carbonate is found in other materials such as seashells, limestone, and chalk.

 Acid rain can react with substances in the environment containing calcium carbonate and cause reactions similar to the one in this experiment.

 An "acid test", placing an acid on a rock, is one test that a **geologist** uses to identify a rock sample.

 A **geologist** is a scientist that studies the Earth and what it is made of. They are known for studying rocks, but they actually do much more than just that. **Geology** is a branch of science that studies the Earth, the materials it is made of, the structure of those materials, and the processes acting upon them.



ADDITIONAL RESOURCES

Websites

<https://www.stevespanglerscience.com/lab/experiments/amazing-egg/>

<https://www.incredibleegg.org/professionals/k-12-schools/eggs-in-the-classroom/?site=a>

<https://eggs.ab.ca/community/kids/science/>

https://www.teachengineering.org/activities/view/duk_consenergy_rde_act

Videos

Smithsonian Science Education Center, Chemical reactions in action

<https://www.youtube.com/watch?v=5iowJs6MryI>

<https://knpb.pbslearningmedia.org/resource/ket-earlychild-sci5/what-comes-from-an-egg/>

Books available from the Washoe County Library System

Chemical Changes by Lynnette Brent

Chemical Engineering and Chain Reactions by Robert Snedden

Chemical Reactions by Carol Baldwin

Eggs by Claire Llewellyn

Eggs by Kim Etingoff

