



# RECREATION AT HOME

## Naked Egg STEM Activity

### Materials Needed:

- Vinegar (at least 16 ounces or 2 cups)
- Raw eggs
- A couple of glasses or cups

### How to make a Naked Egg

A “naked egg” is an egg that has no shell. The shell is gone – yet the egg stays intact.

The shell of an egg (typically a chicken egg) is made up of primarily calcium carbonate. If you soak this egg shell in vinegar (which is about 4% acetic acid), you start a chemical reaction that dissolves the calcium carbonate shell. The acetic acid reacts with the calcium carbonate in the egg shell and releases carbon dioxide gas that you see as bubbles on the shell.

The inside of the egg remains intact and is held together by the two fragile membranes that are just inside the shell.

The process is really very simple. Carefully place the egg in a cup and fill the cup with vinegar so that the egg is completely covered. Don't worry if the egg floats a bit. Just get enough vinegar in the cup to mostly cover the egg.

Now the hard part – you will have to wait as the acetic acid in the vinegar begins to react with the calcium in the egg shell. In just a short while, you should see some bubbles appearing on the outside of the egg. These are bubbles of carbon dioxide gas from the reaction. It can take 12-24 hours before a good portion of the shell is removed. A good sign of progress is a white, frothy, scummy layer on the top of the surface of the vinegar.

After a day of soaking you can carefully remove the egg from the vinegar. We suggest pouring the liquid into another cup and catching the egg in your hand. Using a spoon to fish the egg out might seem like a good idea, but the egg may break or get damaged when using a spoon to remove them.

At this point you may be able to literally rub the shell off the egg with your fingers. It will rub off as a white powdery substance. Give it try, just be very careful, you don't want to break the egg as it is getting more fragile as the shell is slowly dissolved. Depending on your particular egg, you may already have a Naked Egg. However, if it isn't naked yet, we suggest you fill a cup with fresh vinegar and soak the egg for at least one more day.

After two days of soaking you should have a pretty cool Naked Egg. Notice that the egg is a bit bigger than when you first started. This is because some of the vinegar (and some of the water in the vinegar) has moved through the membranes to the inside of the egg. The membranes are semi-permeable and allow water to move through them. This is called osmosis.



## **Fun things to do with your Naked Eggs**

Naked eggs are cool, but experimenting with them is even cooler. You have probably already noticed that your naked egg is kind of rubbery. How far above the table can you drop your egg and have it survive by bouncing? Start at one inch, then try two inches, and so on. Keep in mind that eventually this is going to get messy when the membrane breaks. You might want to prepare your table with lots of old newspaper or do this experiment outside.

If you want to see your egg get really big, simply put it in a cup filled with water. The makeup of the inside of the egg is around 90% water. If you put the egg in a cup of (100%) water, the water will begin to move inside the egg through the membrane to equalize the amount of water inside and outside of the egg membrane. This process of water moving through a membrane is called osmosis. Osmosis equalizes – or makes the concentration of water on both sides of the egg membrane the same. This means the egg will swell as the water moves inside and get larger.

You can even color the inside of your egg if you soak it in some water with food coloring. This is a nice way to verify that the water in the cup is really moving through the egg membrane and not just colouring the outside

## **Shrink your Egg**

Now that you know about osmosis, you might ask “can I make my egg shrink or shrivel up?” Of course, you just need a liquid that has only a little bit of water. A common substance you may have at home that fits this requirement is corn syrup.

Slip your Naked Egg into a cup filled with corn syrup and let it sit for a day, or two, or more and you will begin to see your egg begin to shrink and look sort of baggy. Corn syrup has very little water content. Once inside the syrup, the water inside the egg begins to move across the semi-permeable egg membrane to equalize the water concentration. Again, that’s osmosis at work. If you leave your egg in the syrup long enough it will begin to look something like a huge raisin – with of course a yoke inside.

If you get tired of the shriveled egg look, you can reverse the process by just dunking the egg back in a cup of water. The water will once again move across the membrane and fill the egg with water again.

## **Can I eat the Naked Egg?**

We do NOT recommend eating a naked egg prepared this way. Keep in mind you created your egg by soaking a raw egg in vinegar sitting at room temperature for a few days. That is not how to treat eggs you are going to eat! Instead of eating your Naked Egg, just experiment with it.