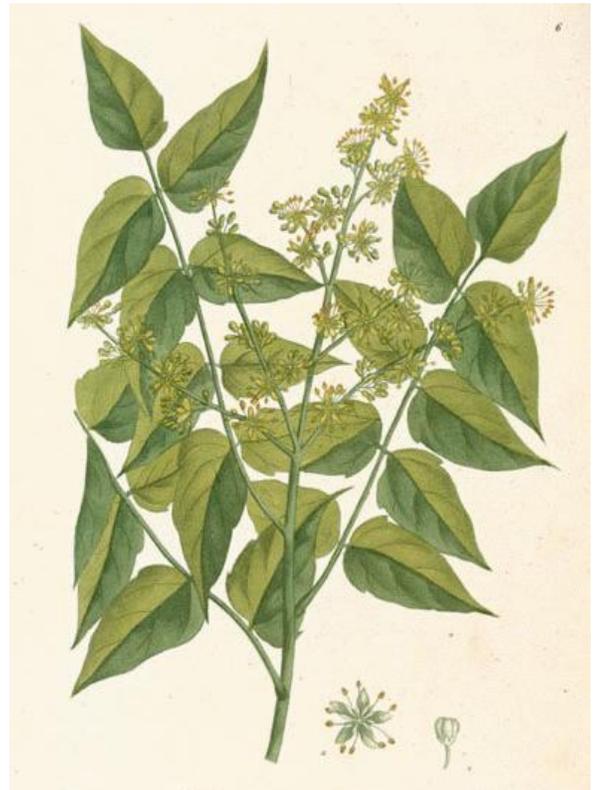


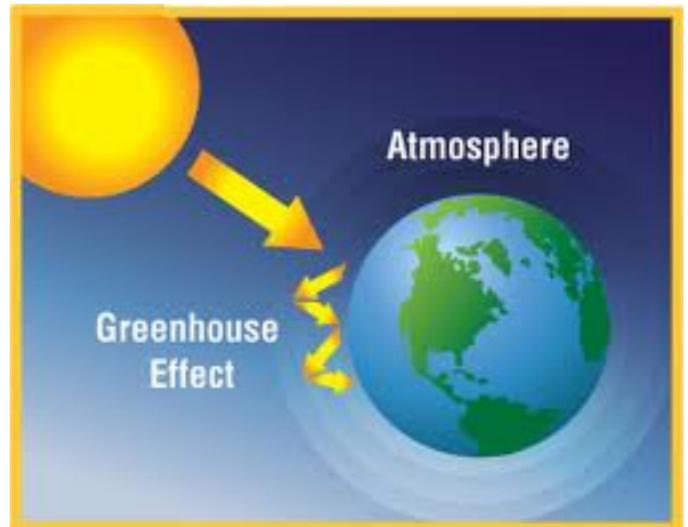
## Ailanthus Plant and Allelopathy

The Ailanthus plant is a common weed that produces an allelopathic chemical. This chemical suppresses or inhibits germination (sprouting) of neighboring plants. This chemical is found in different concentrations throughout the Ailanthus plant – the roots, leaves, and stems. A “tea” or a type of solution can be made from each part of the plant to show the amount of allelopathic chemical present. If a seed in one of the teas grows less than fresh water, then it can be concluded that that part of the plant produces allelopathic chemicals.



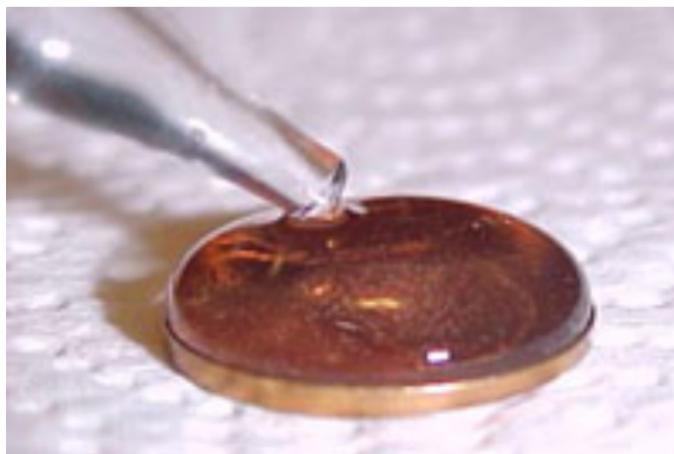
## Greenhouse Effect

Greenhouse gases such as carbon dioxide,  $\text{CO}_2$ , water vapor,  $\text{H}_2\text{O}_{(g)}$ , and methane are gases in the atmosphere that trap heat. As solar energy from the sun passes through the atmosphere, it reflects off the surface of the earth and goes back out to space. However, the greenhouse gases in the atmosphere trap the solar energy and reflect it back to earth. This causes an overall warming of the environment.



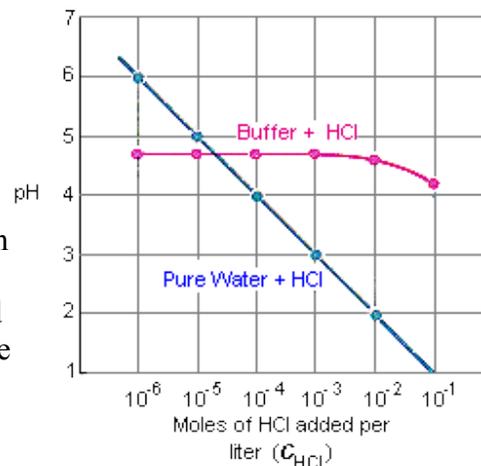
## Water Polarity

One of the special properties of water is polarity, meaning it has an unequal distribution of charge. This polarity causes different water molecules to be attracted to each other, causing properties like high surface tension. These special properties of water can cause an incredible amount of drops to fit on a penny, forming a large bubble on top, without spilling over. Other substances like alcohol or even water mixed with soap do not have the same properties as pure water.



## Potato Buffer

Living things have buffering capabilities, meaning they resist changes in pH so that they can maintain a stable, internal environment. When a strong acid, like hydrochloric acid (HCl) is added to two separate solutions, a potato homogenate (mixture) and water, the pH drops dramatically in water, but much more slowly in the potato homogenate. When a strong base, like sodium hydroxide (NaOH) is added to the potato homogenate and water, the pH of the water increases significantly but the pH of the potato homogenate only rises slightly.



## Enzyme Lab

Jell-O is made of a protein called gelatin. When making Jell-O with fruit, it is essential to avoid using fresh pineapple because pineapple contains an enzyme called bromelain. Bromelain digests proteins, so when it is added to Jell-O, it prevents Jell-O from solidifying and thus, it remains as a liquid. However, if the enzyme in pineapple is denatured through heat, such that it does not function anymore, the Jell-O will solidify.



## Cellular Transport 1

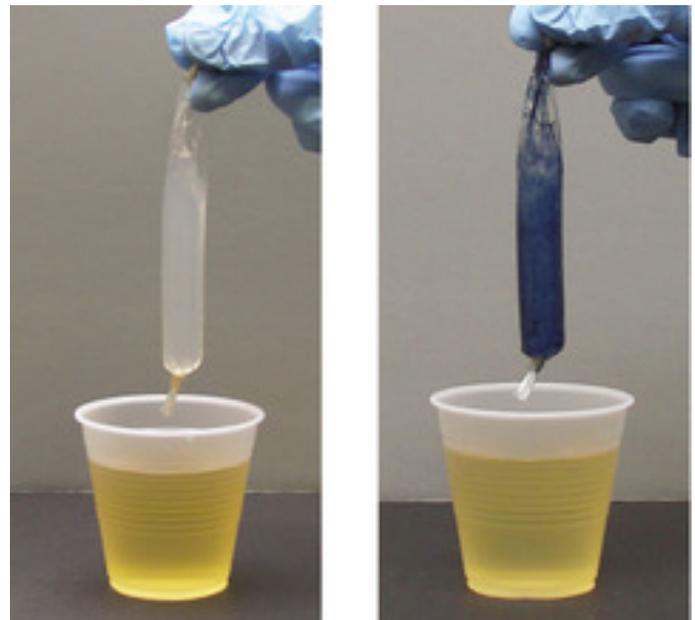
After an eggshell is removed, what remains is the egg surrounded by a semi-permeable membrane. This membrane allows small molecules like water to pass through, but not larger molecules like sugar or other solutes to pass. When an egg is soaked in an isotonic solution, which has the same concentrations of solutes both inside the egg and outside the egg,



water passes through the membrane at equal rates, so the egg stays the same size. When an egg is soaked in honey, a hypertonic solution, the water moves out of the egg, causing the egg to shrink. However, when the egg is soaked in water, a hypotonic solution, the water moves into the egg since there is more solute inside the egg, causing the egg to gain mass.

## Cellular Transport 2

Another way to show this principle is through the use of dialysis tubing. Dialysis tubing, like the egg membrane, is a semi-permeable membrane that only allows small molecules to pass through. If a solution of starch is placed inside the dialysis tubing, creating a hypertonic environment, and this is placed inside a beaker of iodine (a small molecule), iodine will enter the tubing, causing a black color in the tubing. If iodine is placed in the dialysis tubing, causing a hypertonic solution, and starch is placed in the beaker, iodine will pass through the membrane and into the beaker, causing the beaker solution to turn black.



Before

After

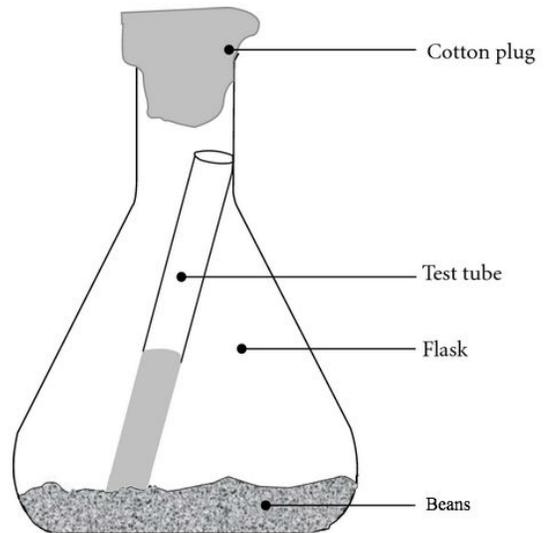
## Locked in a Box

Ian Stewart, a scientist, wondered if he could survive just on the oxygen produced by 150 houseplants, so he locked himself in an airtight box for 48 hours. Plants use carbon dioxide to make glucose (food) in photosynthesis. As a waste product of this process, plants produce oxygen. Animals, such as humans, use oxygen to gain energy in cellular respiration, and produce carbon dioxide as a waste product. Dr. Stewart set up the airtight box with a specific temperature and humidity to ensure maximum rate of photosynthesis.



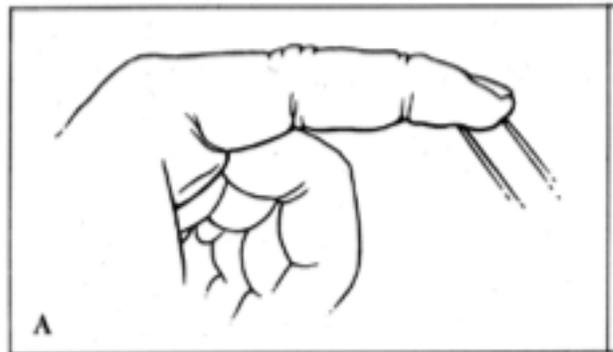
## Cellular Respiration

All living things do cellular respiration because all living things need to obtain energy from their food. In order to see evidence of the process, an indicator can be used. BTB is an indicator that changes from blue to green when carbon dioxide, a waste product of cellular respiration is produced. Three sealed flasks were set up, each with a test tube of BTB. The first flask was empty, except for the BTB test tube, which was blue. The second flask contained dry, or dormant, peas with a test tube of BTB that was blue. Finally the third flask contained germinated peas, with a test tube of BTB, which was green. This indicates that only the germinated peas were doing cellular respiration.



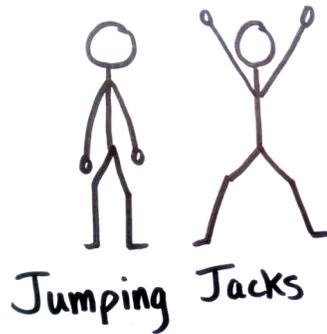
## Two-point Discrimination Test

The peripheral nervous system is responsible for collecting information about the body's external environment. One way it collects this information, is through mechanoreceptors that responds to pressure. There are different densities of mechanoreceptors throughout your body, and one way to test the sensitivity and thus density of these mechanoreceptors is through the two-point discrimination test. This test assesses a person's ability to determine if one, two, or three toothpicks held closely together, are being gently pressed on different parts of the body – the fingertip, palm, back of hand, forearm, and back of arm. If a person can accurately determine the number of toothpicks, then there are more mechanoreceptors in that area of his/her body.



## Respiration Lab

As we exercise, a number of changes occur in the body, namely our respiration. Since our muscles are working, our cells need to obtain more energy, and thus need to go through cellular respiration at a faster rate. Our bodies need oxygen for this process and thus we have to breathe more. However, do our bodies breathe at a faster rate or do we take bigger breaths to get more oxygen? Using a balloon, a ruler, a timer, and of course, a willing test subject, we determined that our lung capacity did not increase, we just took more breaths of the same size.



## Strawberry DNA Extraction

DNA is a fundamental part of all living things. But depending on the organism, there is a different amount of DNA in every cell. A strawberry's cells are known to be octoploid, meaning they each have eight sets of chromosomes. Based on this, the strawberry is an ideal organism from which to extract DNA and make observations. The process is simple and requires basic ingredients: salt, soap, and cold alcohol.

