**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Swimming Gummy Bears**

Record the class’s data of color and mass of each gummy bear. Then calculate the average mass.



|  |  |
| --- | --- |
| **Color** | **Mass** |
|  |  |
|  |  |
|  |  |
|  |  |

Average Mass: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Each gummy bear will ‘swim” in a different solution overnight. Record which color went into which solution. Then record the new mass and observations about the gummy bear in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
| **Color** | **Solution** | **Final Mass** | **Observations** |
|  | Water |  |  |
|  | 20% sugar |  |  |
|  | 20% corn syrup |  |  |
|  | 20% salt |  |  |

In the boxes below, draw models to describe how the gummy bears interacted with their solution. Use one color dot to represent sugar molecules, another color for corn syrup, a third color for salt, and a fourth color for water. Fill in the key.

**Key:** Sugar Molecules: Corn Syrup Particles:

Salt Particles: Water Molecules:

Water Solution:

After:

Before:

Sugar Solution:

After:

Before:

Corn Syrup Solution:

After:

Before:

Salt Solution:

After:

Before:

**Osmosis:** a process by which molecules of a solvent tend to pass through a semipermeable membrane from a less concentrated solution into a more concentrated one, thus equalizing the concentrations on each side of the membrane.

What Is Osmosis? You just need three ingredients for osmosis to happen: a semipermeable membrane with two solvents of different concentrations on either side. A solvent is a substance capable of dissolving solutes (a term for different liquids, solids or gases) to form a solution. It might sound complicated, but water is the most common example of a solvent. Osmosis refers to the movement of one, less concentrated solvent through a semipermeable membrane to another, more concentrated solvent. The objective is an equalized solution, which can make osmosis sound confusing. Why would something that is less concentrated flow into something that is more concentrated? Wouldn’t that be the opposite of what we want to happen?

1. Animal Cells: This is by far the most popular example of osmosis, probably appearing in every chemistry textbook in the country. As you will see with many examples of osmosis, this animal cell example involves salt and water. Our cells have semipermeable membranes that do not allow salt particles to flow in and out. The only way, then, “water down” an over salted cell is to allow water to move back and forth. Therefore, when we are dehydrated and drink a lot of water, we are reaching equilibrium in our cells by filling them back up with water.
2. Water Soak: You can soak a large number of things in water to literally watch osmosis take place before your eyes. Dehydrated fruits and vegetables are great examples. The water isn’t simply flowing into empty spaces inside the fruit. It is literally passing through the cell walls and re-hydrating the fruit or vegetable. Something such as a raisin will have a very, very high concentration of sugars and water (do not confuse concentration with quantity; the raisin has little water, but it is highly concentrated). Thus, the water flows from a point of low concentration (the cup or bowl of water) to one of high concentration (the raisin). In this way equilibrium is achieved.
3. Slug Murder: I would never recommend killing an innocent creature, but the example of salting a slug is too bizarre to resist. Once you understand what happens when you salt a slug, you’ll realize that salt is the slug’s kryptonite (and it’s a terrible way to die). Learn more about chemical reactions with this chemistry 101 course with a specific focus on organic and physical chemistry. Unfortunately for the slug, it has no protective barrier between its cell walls and the outside world. This probably seems like a fatal flaw, but surely no slug expects to have pure salt dropped on it. But when such a thing does happen, the high concentration of the salt on the outside of the slug causes the cells to start trying to balance concentrations. In non-scientific terms, the water is “sucked” right out of the slug’s body. The slug will dry up and die if enough salt is applied.
4. Root Pressure: I mentioned animal cells above, but plant cells work in the same fashion and are just as popular for osmosis examples. If you’ve ever wondered how roots generate “pressure” to withdraw water and nutrients from the soil, it’s through osmosis. This is accomplished by attracting the polar nutrients in the soil toward the root’s cells. It’s a very clever trick because the nutrients bring water with them and therefore solve this necessary problem for plants.
5. Cholera: Osmosis allows for terrible things to happen, as well. Cholera would not be possible without osmosis. The choleric bacteria populate in our intestines and begin to reverse the intestinal cells’ ionic orientation. In other words, it changes the way ions and, subsequently, water is transported in our intestines. So what does this mean, exactly? It means that the cholera performs a perfect coup. First of all, when our ions’ orientations are switched, the intestinal cells are no longer able to absorb water into the body. Just the opposite, in fact. Now osmosis happens in the other direction and water moves from our intestinal cells into our intestines. This is what causes cholera’s infamously deadly watery diarrhea. Second, this compounds the rate at which you get dehydrated. Not only can you not absorb water, you are literally being drained dry. This is why cholera can kill you so quickly, because it does not rely on how much water you consume.
6. Pruned Fingers: If you’ve ever been a bath or pool too long, then you’ve seen your fingers and toes get pruned. I only include this example because it is often misunderstood. Your fingers are not shrinking; in fact, they are expanding. They are bloated. Most people assume that you are “pruning” up by losing water, but this is not the case. This makes it easier to understand the original idea of osmosis: moving from a less concentrated substance to a more concentrated substance. In this scenario, the water is the bathtub is less concentrated and it is trying to cause equilibrium by using osmosis to get into your body. If you don’t believe me, think about what happens when an animal (or person) drowns and then soaks in the water. Their bodies become extremely bloated, as osmosis will continue to happen until equilibrium is achieved. Before you go jump in a hot bath to see if you’re shrinking or bloating, take a look at this blog post on fun hands-on chemistry experiments you can do at home.

Now, describe how a cucumber transforms into a pickle when added to a brine solution (a very concentrated solution of salt and vinegar). Draw a before and after picture and then describe what you think happens in words.

After:

Before:

Key:

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