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Language Culture Knowledge Science

Do Fish Drink Water?

LaCuKnoS Language Booster

DESCRIPTION

Do fish drink water? They do, but how they do it depends on whether they live in fresh water or salt water. Water gets into a fish's body through a process in the cells called ***osmosis***. In this process, water ***diffuses*** (moves) from where there is a higher ***concentration*** of water to where there is a lower concentration. Cells are surrounded by a ***cell membrane*** that only lets small molecules, like water and oxygen pass through. So, if there is more water outside of a cell than inside, water will flow into the cell until the concentration of water on either side of the cell membrane is equal.

The cells in the body of a fish work in the same way, either absorbing water or losing water depending on the surroundings. All fish (and people) must maintain a certain amount of salt in their bodies to stay healthy. Fish that live in freshwater have a higher concentration of salt in their bodies than the salt concentration in the surrounding water. Therefore, water continuously flows into the freshwater fish's body through its skin and gills to dilute the amount of salt in the fish's cells to make it equal to the amount of salt in the surrounding water. Since freshwater fish need to maintain their salt content, their kidneys work constantly to remove excess water as urine.

Ocean fish have the opposite situation. They are surrounded by salt water and their bodies contain a lower concentration of salt than the salty ocean water they swim in. In this case, osmosis causes the fish's cells to lose water in order to equalize salt concentrations inside and outside the cells. To resist the water loss, ocean fish need to drink water through their mouths as their gills process the water and take out the extra salt.

The salmon is an interesting example of a fish that lives in both fresh and salt water, and thus, they have the characteristics of both types of fish. Salmon are born in fresh water, and migrate to the ocean. While living in the ocean, they drink saltwater by opening their mouths; their gills then rid their bodies of the salt and minerals. When the salmon enters freshwater streams to lay eggs, they stop drinking the water and instead absorb it through osmosis where the water passes through the cells of the fish's skin into its body.

Talk with your partner about these questions, then write your answers...

1
Why do saltwater fish need to drink a lot of water, but freshwater fish don't?

2
If a person gets dehydrated on a hot day, what do you think happens to the salt levels in their cells? Why?

Gummy Bear Osmosis

LaCuKnoS Science Investigation

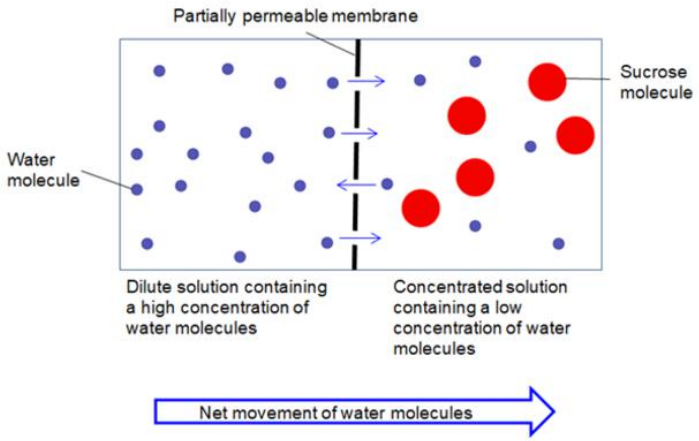
Materials

- 10 gummy bears (2 each of 5 different colors)
- 5 small plastic containers with lids
- Vinegar
- Salt
- Baking soda
- Corn syrup
- Permanent marker
- 5 plastic spoons
- Access to electronic scale
- Paper towels
- Piece of masking tape
- 5 small paper plates
- Ruler or tape measure

DESCRIPTION

Gummy Bears do some interesting things when they are put in different liquids. In this experiment, we will find out what will happen when we put Gummy Bears into distilled water and into solutions of water containing: salt, vinegar, corn syrup and baking soda. These gummy bears can show us how osmosis works and can help us understand what happens in a fish's cells, and in our own.

Molecules are in constant motion and tend to move from areas of higher ***concentration*** to areas of lower concentration by ***diffusion***. Water also moves in and out of cells and this particular movement is called ***osmosis***. Osmosis occurs to regulate the concentration of molecules, like salts and minerals, balancing the concentration in and out of the cell. During osmosis, water moves through the cell membrane. A cell membrane is an example of a ***selectively permeable membrane***. This allows some molecules, like water, to move through the membrane while other molecules, like salt, cannot. In this investigation, the gummy bears will act as the semipermeable membrane and you will study how water moves in and out depending on the ingredients of the solutions that the gummy bears are "swimming" in. Water will move by osmosis either in or out of the gummy bear (which will act as the semipermeable membrane) to balance the concentration of water molecules inside and outside the gummy bear.



PROCEDURE

1. Choose 5 different colored Gummy Bears (a different color for each test solution).
2. Take a ruler and measure your bears (in **cm**) from head to toe (Length), from side to side (Width), and from front to back (Depth). Record your measurements in the pre-experiment Table 1.
3. Weigh each bear (in **grams**) and record weights in the pre-experiment Table 1. Be careful to make accurate measurements.

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PROCEDURE CONTINUED...

4. Prepare and label the five containers with the solutions as follows:
   Container 1: Water – add 2 ounces (60 mL) of water
   Container 2: Salt Water – add 1 tablespoon (8 grams) of salt to 2 ounces (60 mL) of water
   Container 3: Vinegar - add 2 ounces (60 mL) of vinegar
   Container 4: Corn Syrup – add 1 tablespoon (8 grams) corn syrup to 2 ounces (60 mL) water
   Container 5: Baking Soda - add 1 tablespoon (8 grams) baking soda to 2 ounces (60 mL) water
5. Place one Bear in each container. Make sure the bear is completely covered by the solution. Replace the lid on each container. The other bear of each color is for comparison.
6. Store the solution containers with the bears away from direct sunlight and let them sit for between 24-48 hours.

Day 2

7. After the 24-48 hours, use a spoon to gently remove each gummy bear from its solution onto a paper plate. Label the paper plate with the name of the test solution for that bear.
8. Describe the effects of each solution on the bears. Record your descriptions in Table 2.
9. Measure the length, width, depth and weight of each bear and record measurements in the post-experiment Table 3.
10. Using what you are learning about osmosis, discuss the causes that you think led to the changes you saw for each bear. Write your ideas in Table 4.

Table 1: Measurements before soaking bears

	Bear 1	Bear 2	Bear 3	Bear 4	Bear 5
Color					
Length					
Width					
Depth					
Weight					
Solution					

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Table 2: Description of effects of each solution on bears

Treatment	Effect After Soaking in Solution Overnight
Distilled water	
Salt water	
Vinegar	
Corn syrup	
Baking soda solution	

Table 3: Measurements after soaking bears

	Bear 1	Bear 2	Bear 3	Bear 4	Bear 5
Color					
Length					
Width					
Depth					
Weight					
Solution					

Table 4: Reflecting on Causes of the Effects of each solution on Bears

Treatment	Based on what you are learning about osmosis, what caused the effect you observed for each gummy bear?
Distilled water	
Salt water	
Vinegar	
Corn syrup	
Baking soda solution	

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Gummy Bear Osmosis

LaCuKnoS Investigation Summary

NGSS SEP: Constructing an Explanation (or what happened to the gummy bears)

How does the Gummy Bear investigation demonstrate the concept of osmosis?

How does the Gummy Bear investigation help you think about the question: Do fish drink water?

How would you explain to a family member something you learned about osmosis from the gummy bear investigation?

How would you explain to your science teacher something you learned about osmosis from the gummy bear investigation?

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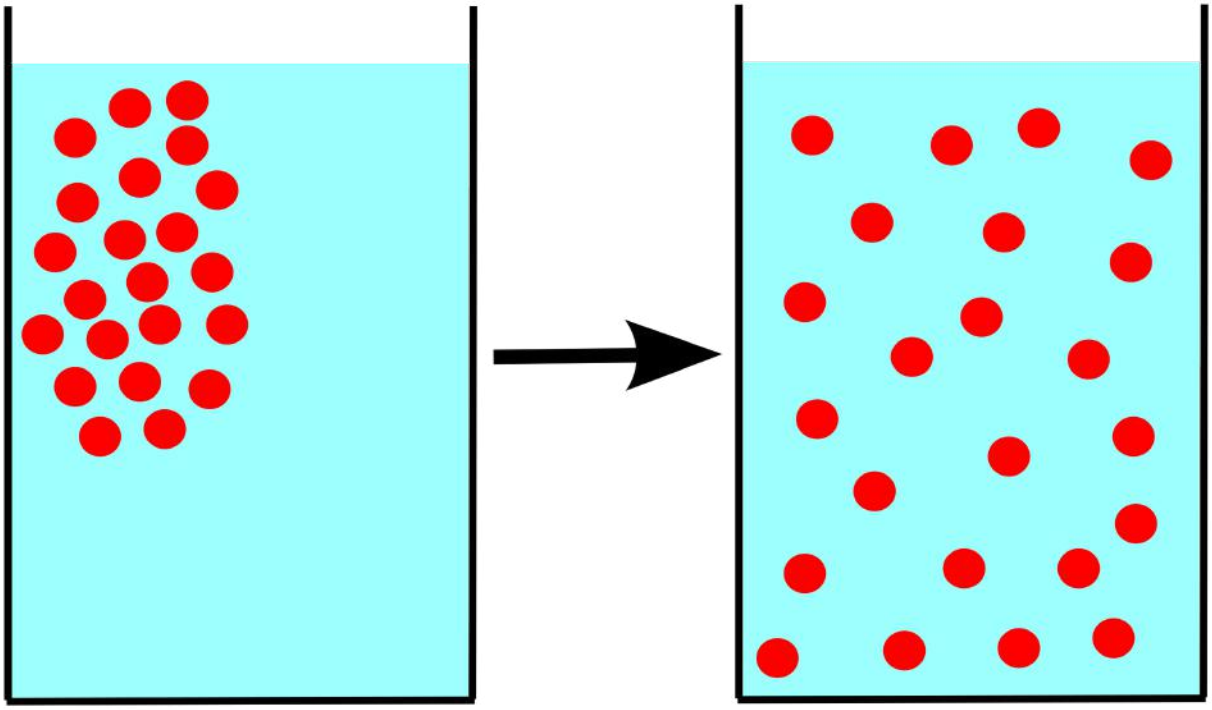
Gummy Bear Osmosis

LaCuKnoS Concept Cards

Diffusion/Difusión

The spreading of something more widely

La separación de algo provocando más espacio



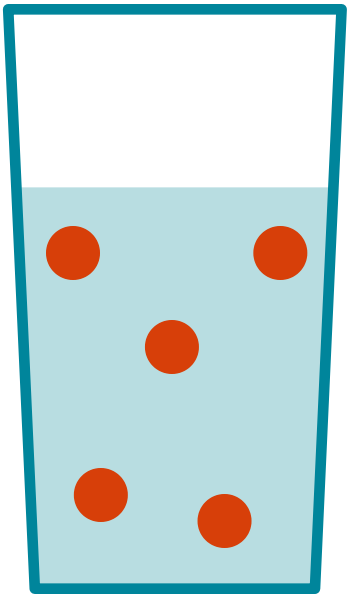
Gummy Bear Osmosis

LaCuKnoS Concept Cards

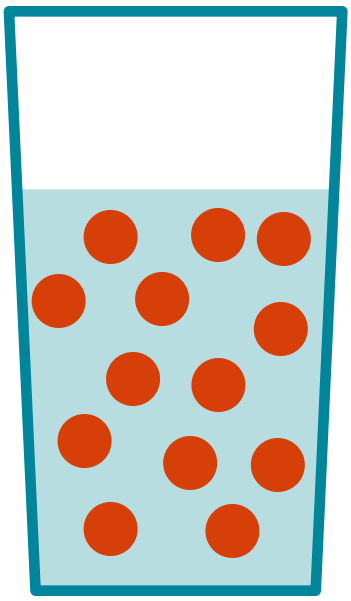
Concentration/Concentración

The amount of a particular substance in a given amount of another substance, especially a solution or mixture

La cantidad de una sustancia particular en una cantidad de otra sustancia, especialmente una solución o mezcla



Low Concentration



High Concentration

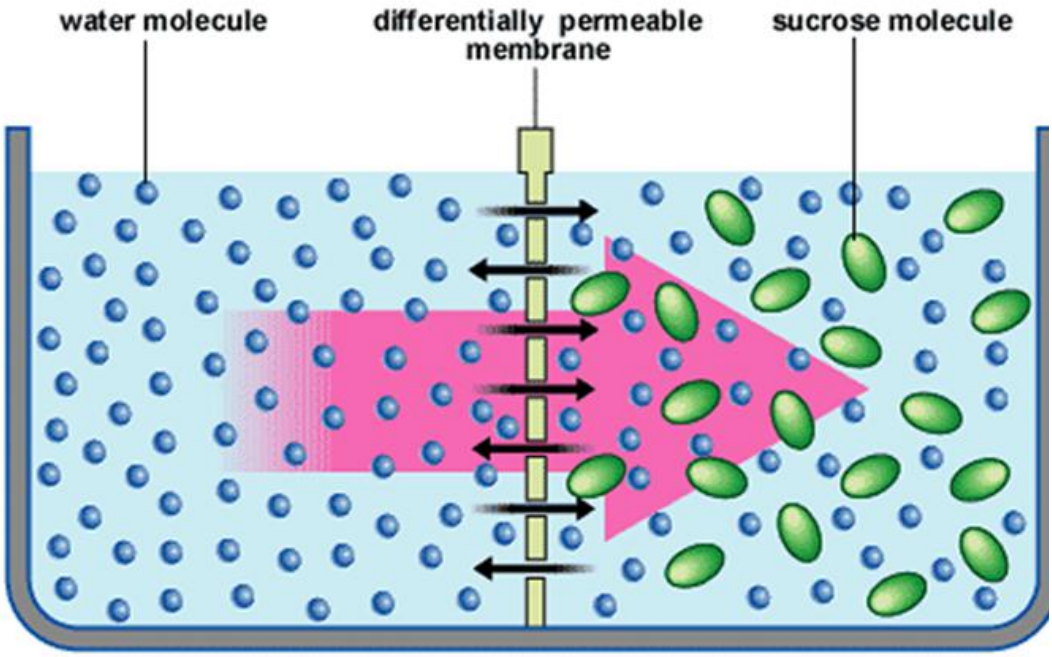
Gummy Bear Osmosis

LaCuKnoS Concept Cards

Osmosis/Ósmosis

Osmosis is the spontaneous movement of solvent molecules through a semi-permeable membrane into a region of higher solute concentration, in the direction that tends to equalize the solute concentrations on the two sides.

La ósmosis es el movimiento espontáneo de moléculas disolventes a través de una membrana semipermeable en una región de mayor concentración de soluto, en la dirección que tiende a igualar las concentraciones de soluto en los dos lados.



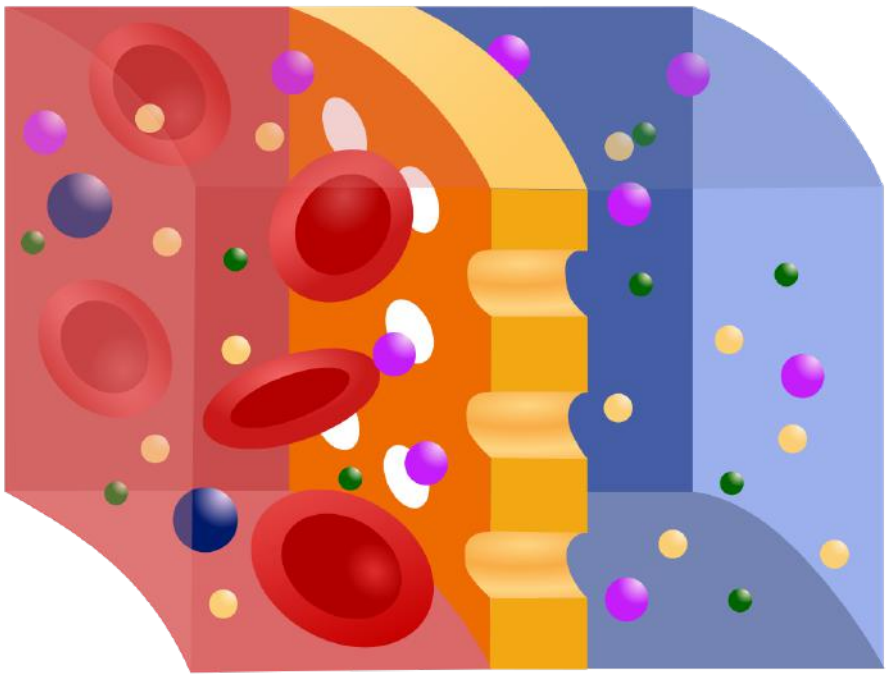
Gummy Bear Osmosis

LaCuKnoS Concept Cards

Selectively Permeable Membrane/ Membrana Selectivamente Permeable

A membrane that will allow certain molecules to pass through it by diffusion

Una membrana que permitirá que ciertas moléculas atraviesan por medio de difusión



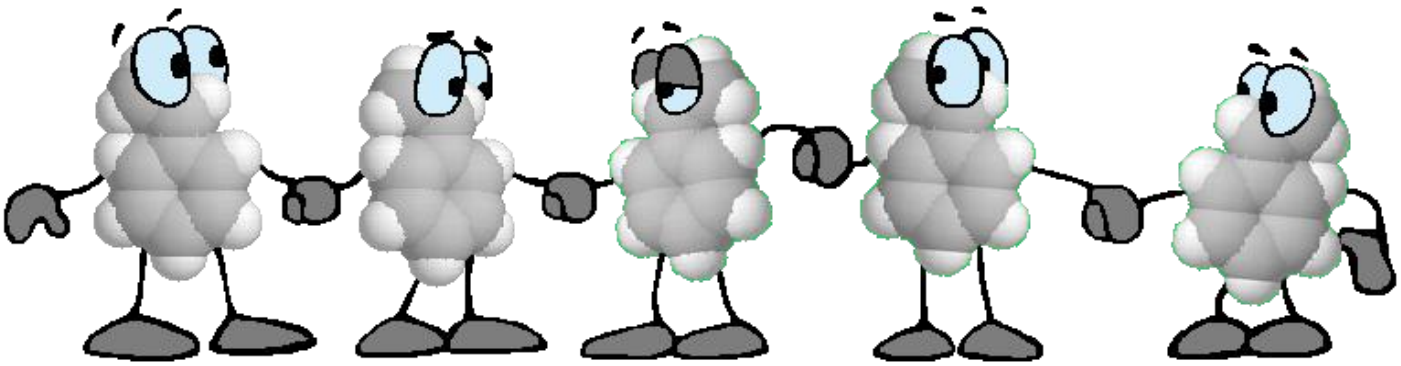
Gummy Bear Osmosis

LaCuKnoS Concept Cards

Polymer/Polímero

A large molecule composed of many repeated units

Una molécula grande compuesta de muchas unidades repetidas



Gummy Bear Osmosis

LaCuKnoS Concept Cards

Solvent/Solvente

A liquid capable of dissolving another substance to form a solution

Un líquido capaz de disolverse en otra sustancia para formar una solución