

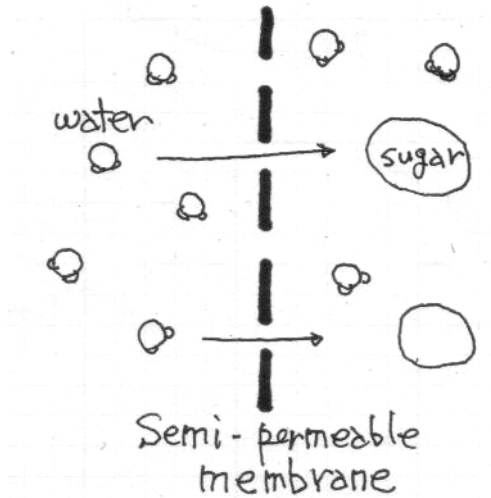
Semi-permeable membrane and osmotic pressure

Level Elementary

Concept

Cells that make the body of the living thing are covered with semi-permeable membrane. There are so many tiny holes in semi-permeable membrane. A big particle like sugar is not passed though semi-permeable membrane, but a small particle like water can be passed. Only water moves to the salt solution when water and the salt solution are partitioned with semi-permeable membrane. This phenomenon is called osmosis. Moreover, the pressure takes at this time is called an osmotic pressure.

The phenomenon of osmosis is confirmed by using familiar foods.



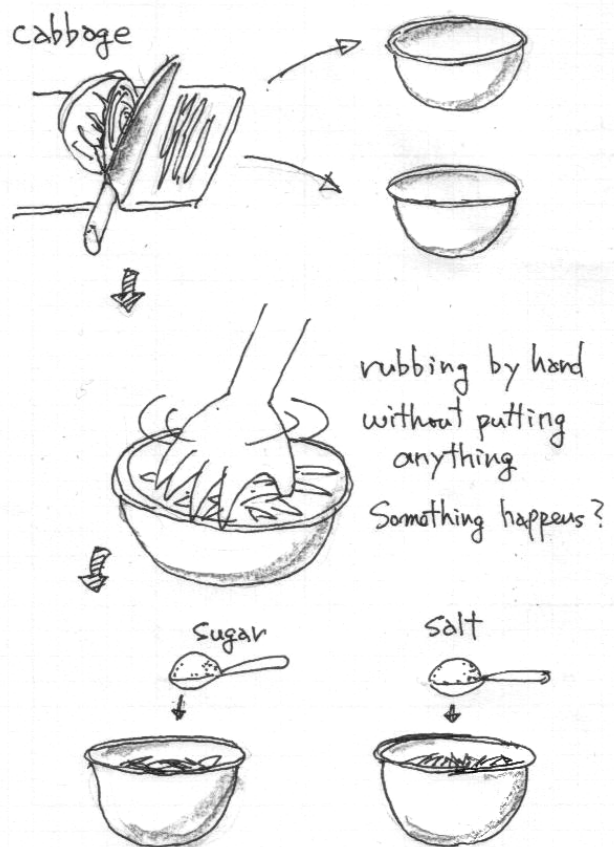
Experiment 1

Materials

sugar, salt, cabbage, and kitchen bowl (2)

Procedure

- (1) The cabbage is shredded. Put it in two kitchen bowls dividing into the half.
- (2) Rub it by the hand without putting anything. It is confirmed whether there is a change or not.
- (3) The salt is put to the cabbage and the sugar is put in another cabbage. They are often rubbed by the hand.
- (4) Either confirms whether a lot of water has come out. A lot of water comes out when the osmotic pressure is high.



Science

The osmotic pressure of the salt is higher than that of sugar.

The osmotic pressure rises when a lot of solutes are dissolved.

The osmotic pressure becomes about 7times of atmospheric pressure by the salt solution of 1%.



sugar

salt

Experiment 2

Materials

glass (2), plate, vinegar, water, and raw egg (2)

Procedure

(1) One egg is put in the glass.

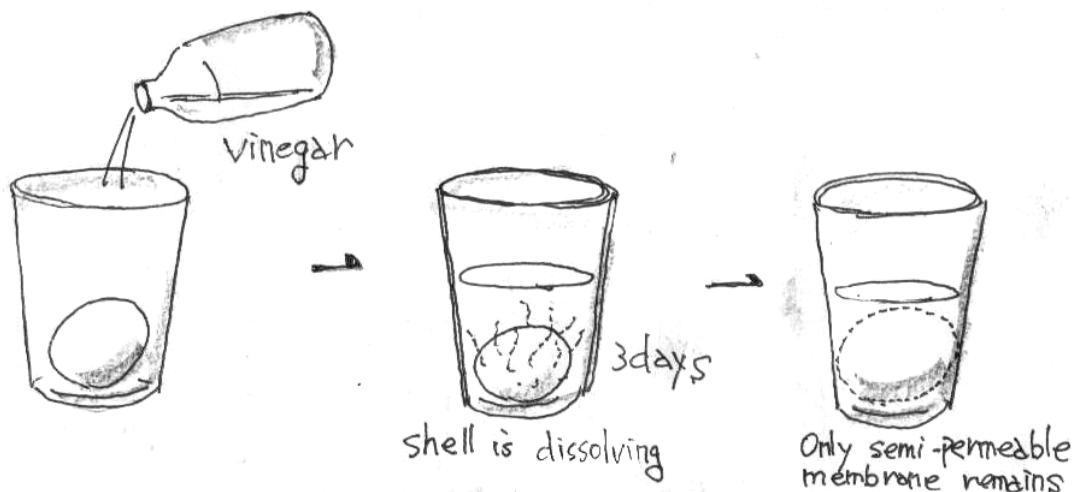
The vinegar is poured in the glass till all of the egg is soaked.

(2) The bubble occurs from the shell and it begins to dissolve.

It is put for about three days.

(3) All shell dissolve and it becomes the egg only of a semi-permeable membrane.

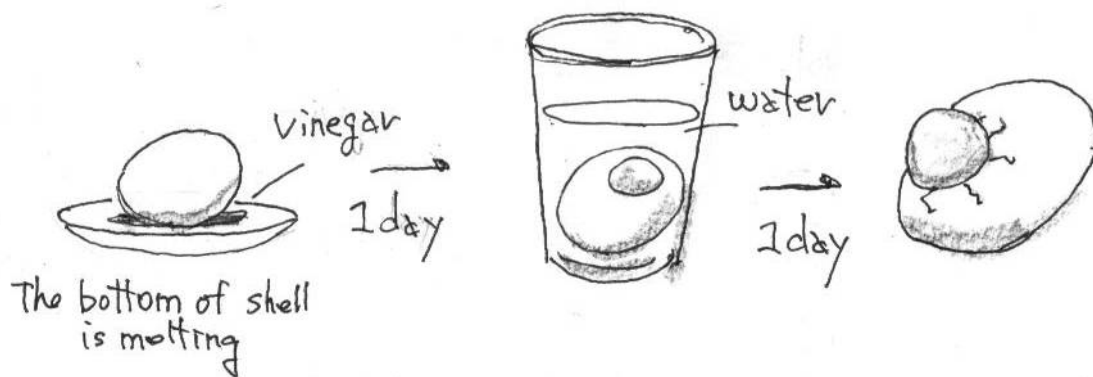
How is the difference from the egg before?





The egg expanded.

- (4) The vinegar is put in a plate.
 Another raw egg is put.
 The shell will dissolve only to the bottom in a day.
- (5) The egg is put in the glass.
 Water is put in till all of the egg is soaked.
 It is put all day long.
 How does the egg become?



Science

The shell of the egg is made of calcium carbonate. Carbon dioxide reacts with vinegar and dissolves. There is semi-permeable membrane of protein inside the shell of the egg. The water in the vinegar moves into the egg through the semi-permeable membrane. The size of the egg increases 1.5 times as original size. In the second experiment, water enters it only from tiny holes. It pushes out to the outside through the hole.



Extension

Order of seasoning

When you cook using sugar and salt, it is necessary to put either first.

Water is put in the pan, and the potato is boiled.

The sugar is put in previously and then the salt is put.

In another pan, the salt is put in previously and then the sugar is put.

The taste changes only the order is different though the same seasoning was used.

The salt can enter the potato boiled by the sugar water.

However, sugar cannot enter the potato boiled with the salt solution. The taste changes because the salt comes out from the potato oppositely.

This happens because of the difference of the osmotic pressure.

The sugar should be first and then the salt in order of cooking.

