

What is the ratio of time to the temperature of water in a microwave?

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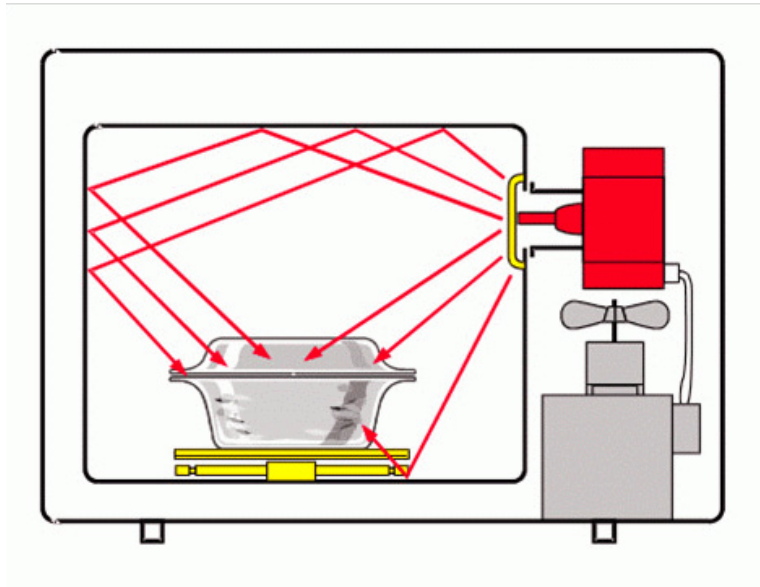
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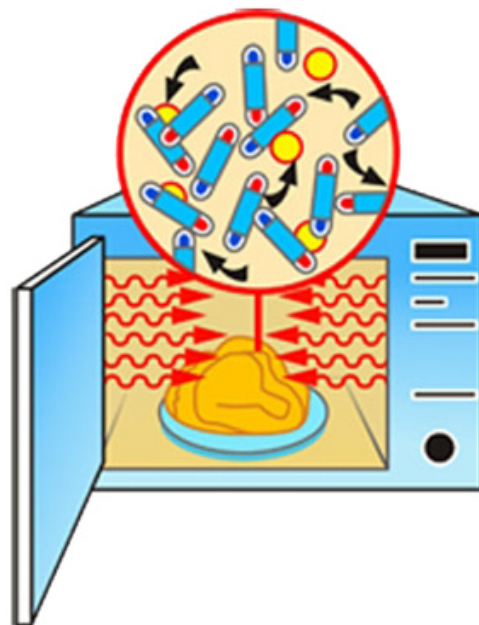
Objective

We live in a high technological age. Technological progress has reached incredible peaks, so nowadays we use microwaves in our daily life. Microwave is a household appliance that is designed for fast food or quick-heating food. It is used as a microwave for defrosting food. Every day I have to warm up my food using the microwave oven, because such a furnace has long been a familiar subject in our kitchen. However, sometimes we still do not know how much specifically we need to heat our food or beverages. That's why I thought of research paper, where I would find the ration of time to the temperature of water in a microwave.

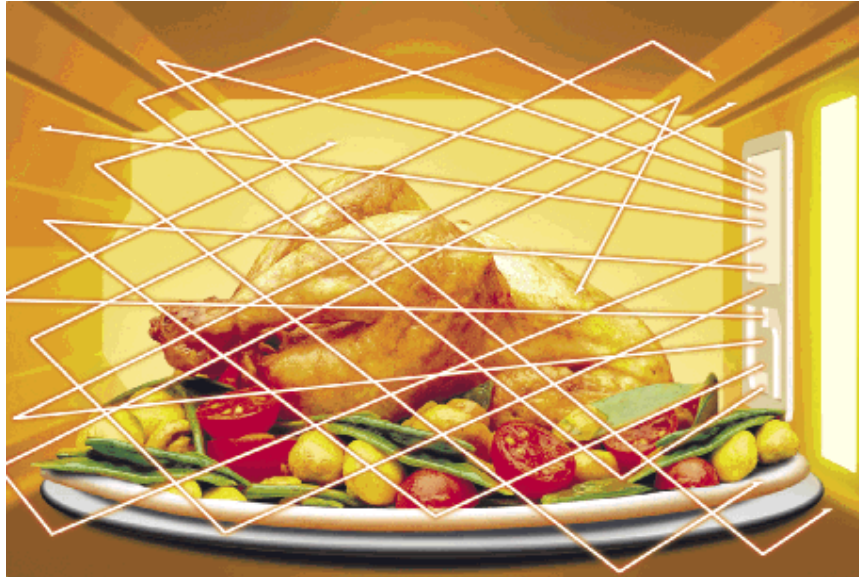
Process of a working microwave



Initially, I found out how the microwave works. It turns out the most important part of any microwave is a magnetron. Thanks to him, the electrical energy from your network is converted to a high-frequency electric field frequency of 2450 megahertz (MHz). Magnetron, creating an electric field that directs it through the waveguide into the cooking chamber, houses the product containing water (water is a dipole, since water molecule consists of positive and negative charges).



Exposure to external electric field on the product leads to the fact that the dipoles are beginning to polarize, dipoles begin to turn. When you turn the dipoles arise friction forces, which are converted, to heat. Since the polarization of the dipoles occurs throughout the volume of the product, causing it to become hot. Microwave's magnetron is very short electromagnetic waves that travel through space at the speed of light (299,792 kilometers per second).



Once the microwaves enter into the furnace chamber begins its reflection from the metallic walls. Thus, microwaves can all sides affect prepared products.

Microwaves are one of great importance for the modern man; they are used for telephone communication, the transmission of television programs in the world of the Internet and via satellite. In this case, the microwaves are used for rapid cooking. Microwave operates at a frequency of 2.45 GHz (a wavelength of 12.24 cm). From a conventional oven or a microwave oven is characterized in that it heating of foods does not occur at the surface but the most part of volume products containing water. This is due to the fact that almost all foods radio waves penetrate to a greater depth, thereby reducing the cooking time.

Materials

6 paper cups
Water
Thermometer
Microwave

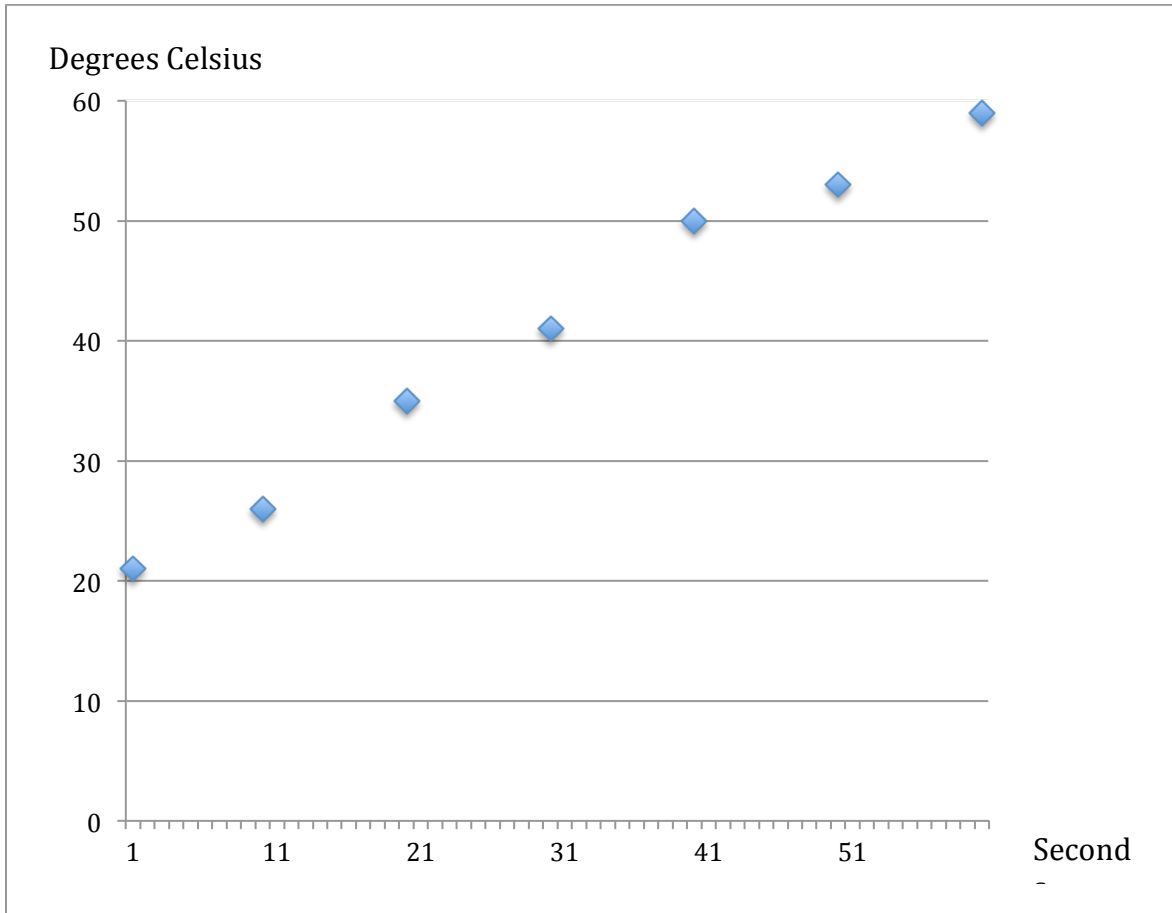
Method

Put water in 6 paper cups.
Measure the mass of water.
Measure initial temperature of water.
Put 1st cup in microwave for 10 seconds.
Put it out and measure the temperature by thermometer.
Put 2nd cup in microwave for 20 seconds.
Put it out and measure the temperature by thermometer.
Put 3rd cup in microwave for 30 seconds.
Put it out and measure the temperature by thermometer.
Put 4th cup in microwave for 40 seconds.
Put it out and measure the temperature by thermometer.
Put 5th cup in microwave for 50 seconds.
Put it out and measure the temperature by thermometer.
Put 6th cup in microwave for 60 seconds.
Put it out and measure the temperature by thermometer.
Write down all the measurements and compare them.

Data

Initial temperature is 21 degrees Celsius.
Mass of water is 100 grams.
Temperature of water after 10 seconds is 26 degrees Celsius.
Temperature of water after 20 seconds is 35 degrees Celsius.
Temperature of water after 30 seconds is 41 degrees Celsius.
Temperature of water after 40 seconds is 50 degrees Celsius.
Temperature of water after 50 seconds is 53 degrees Celsius.
Temperature of water after 60 seconds is 59 degrees Celsius.

Results



(Data from the experiment; the ratio of seconds to degrees Celsius of water)

Discussion of the experiment

I have chosen paper cup, because paper would not keep the heat from the water, so the data would be clear. As we can see from the graph, the ratio of time to the temperature of water in a microwave is linear, which provides people, who use microwave often in their lives, the answer that more time they heat their food or drink, hotter it will be.

Advices for usage of microwave

Now let's talk about the pot in which the food is heated. The fact is that certain types of dishes reflect the microwaves. It is the best to use a clear glass bowl; it is the best to let microwaves go through. However, do not put in the microwave dishes and cups of crystal. Almost all of its types of porcelain are suitable for cooking in the microwave, but you cannot use dishes with gilded or silvered pattern.

Utensils made of plastic can easily be deformed if it is sensitive to heat. Therefore, when using plastic, make sure that it was the inscription on the "thermal stability up to 140 degrees."

Microwaves are reflected from the aluminum foil and cannot penetrate. However, these properties can be made to benefit if the aluminum foil cover those parts of products that can easily burn slightly, for example wings or legs of poultry, fish tail or head, during the thawing process.

Metal utensil absolutely is not suitable for cooking in the oven. This applies to pots, pans made of steel, cast iron, enamel, and utensils made of aluminum and copper. There is a simple test to determine the suitability of utensils used in microwave ovens. If you reheat a bowl and heat only the food, but a piece of plate is not present, such a vessel can be used. Microwaves do not heat up such utensils, but, with time, this tableware is heated by heat, which accumulates in the heated food.

Bibliography

"Microwaves Don't Cook From the Inside Out." *Today I Found Out*. N.p., 22 Oct. 2010. Web. 22 Jan. 2016.

"Microwave Ovens." *Microwave Ovens*. N.p., n.d. Web. 22 Jan. 2016.

"Microwaves." *The Electromagnetic Spectrum*. N.p., n.d. Web. 22 Jan. 2016.

"Producing Microwaves." *Instructables.com*. N.p., n.d. Web. 22 Jan. 2016.

"SCI-TECH ... The Cool Site for Hot Science." *SCI-TECH ... The Cool Site for Hot Science*. N.p., n.d. Web. 22 Jan. 2016.

"Why Are the Microwaves in a Microwave Oven Tuned to Water?" *Science Questions with Surprising Answers*. N.p., n.d. Web. 22 Jan. 2016.