Little balloon, grow big and round!

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Słowa kluczowe:

rozszerzalność,temperatura

DZIEDZINA:

Physics,Thermodynamics

Cel doświadczenia:

How does the water level change when it is heated? How does the gas volume change with temperature? Can temperature changes affect the size of solids? After a series of simple experiments, the club member will be able to explain what temperature expansion is, what it involves and what are its effects.

Spis materiałów:

1. a glass bottle (of any volume)
2. a plastic bottle without a cap (of any volume)
3. a transparent straw/rubber tube
4. plasticine
5. a food colour or paint (anything that will change the colour of the water but will not change its properties)
6. a pot/glass vessel
7. a stove
8. a balloon
9. a coin
10. a board/matchbox
11. nails/pins
12. a candle
13. tweezers

!!!!WARNING!!!! – The experiments use hot water and high temperatures. Take special care! Work only under the supervision of an adult.

Etapy realizacji:

Experiment 1.

1. Pour cold water into the glass bottle. Fill the entire bottle. You can add some food colour (this will make the observation easier).
2. Insert a straw into the bottle and seal it with the plasticine.
3. Fill the pot with water and put the bottle inside. Heat the pot on the stove. Watch the water

level in the straw (**WARNING!** Low-quality glass may crack if exposed to prolonged high temperature!).

Experiment 2.

1. Put the balloon on the neck of the plastic bottle.
2. Pour hot water into one vessel and cold water into another.
3. Put the bottle with the balloon into the hot water vessel. Watch what will happen to the balloon.
4. Next, transfer the bottle with the balloon into the cold water vessel. Watch the balloon.

Experiment 3.

1. Place the coin on the board/matchbox and drive 2 nails/pins at each end, thus marking a section that is equal to the diameter of the coin. You should be able to slide the coin between the nails/pins.
2. Next, heat the coin in a candle flame. Hold the coin with tweezers.

Place the coin on the board and try to slide it between the nails/pins.

Pytania do doświadczenia:

1. Why do temperature fluctuations cause changes in the volume of liquids, gases and solids?
2. Do all coins expand equally when heated (if you have a chance, check also coins from other countries!)?

Opis zjawiska:

Temperature expansion is a body property which consists in increasing the volume of the body with an increase in its temperature. As the temperature increases, the liquid, solid or gas particles gain more kinetic energy and start moving faster. As a result, matter particles move further and further away from each other, causing the volume to increase.

Ciekawostki:

1. Water is characterised by an anomalous temperature expansion – its volume decreases as the temperature rises within the water temperature range from 0 to 4 °C (water has the highest density in 4°C). Above 4°C, though, water acts like most substances and its volume increases with temperature. This means that the lake water of the highest density falls to the bottom in the lake. Thanks to this property, fish can survive the winter on the bottom of the water reservoirs.
2. This phenomenon (of anomalous thermal water expansion) can be damaging, though. If the water temperature falls below 4°C, the volume of water will increase and pipes or radiators that contain water may burst.
3. **The phenomenon of thermal expansion** is often an undesirable effect. Different types of structures exposed to large temperature fluctuations, such as bridges and rails, must be equipped with the so-called **expansion joints**, which protect them against deformation.
4. The mentions of the first thermometer come from 210 AD. Greek writer and engineer Philo of Byzantium is believed to be its inventor. However, the first precision thermometer was created by Gabriel Fahrenheit in the 18th century.