Heat sensitivity of the skin

P1042100

Physics > Thermodynamics > Temperature & Heat

Difficulty level	Group size	Preparation time	Execution time
easy	2	10 minutes	10 minutes

This content can also be found online at:

http://localhost:1337/c/62c5c889f96d28000318f3df

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Teacher information

Application

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Experimental setup

We are confronted with environments of different temperatures every day. How the respective temperature feels depends not only on its actual amount, but also on how warm or cold the previous environment was in comparison. This is particularly noticeable in a swimming pool when changing between differently heated pools. Another example is a room change between differently warmed rooms in a house. A person who has been in a room for a longer period of time finds the room pleasant, but a person coming from a colder room finds the same room warm.

The students explore this phenomenon in the following experiment using three different warm water baths.

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Other teacher information (1/2)

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Prior knowledge

Students should be familiar with a butane burner.

Principle

With the help of water baths at different temperatures, the students discover that their own perception of warmth is not a useful measuring technique.

To do this, they hold one finger in a hot and a cold water bath at the same time. Then both fingers are held in a third warm water bath at the same time and it is determined that it feels hot to one finger and cold to the other. From this it is to be concluded that one's own perception of warmth is relative between the current and previous ambient temperature.

Other teacher information (2/2)

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Learning objective

In this experiment, the students should learn that the sensation of warmth on the skin does not provide a reliable estimate of the temperature. The estimation depends rather on the temperature that was previously available as a reference value, and whether the person was previously active or at rest.

Task

Warm or cold?

Investigate the heat sensitivity of your skin by touching different warm water baths.

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Safety instructions

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The general instructions for safe experimentation in science lessons apply to this experiment.

When the water heats up, the tripod ring and the wire net become very hot! If the hot water is to be decanted, the beaker may only be touched at the upper rim.

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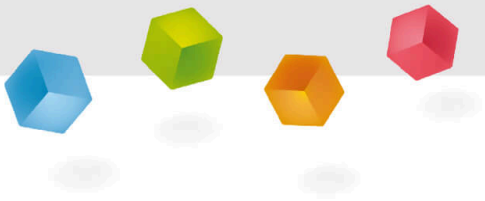

Student information

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Motivation

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Water in the pool

Many swimming pools have several pools that are heated to different temperatures. Sometimes there is a hot whirlpool, a warm paddling pool for children and a colder sports pool where you can swim laps.

Does it make a difference to one's own feelings whether one jumps from the whirlpool or from the sports pool into the children's pool?

You will learn the answer to this question and how the skin feels warmth in general with the help of this experiment.

Tasks

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Experimental setup

Warm or cold?

Investigate the heat sensitivity of your skin by touching water baths of differing temperatures.

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Equipment

Position	Material	Item No.	Quantity
1	Support base, variable	02001-00	1
2	Support rod, stainless steel, l = 600 mm, d = 10 mm	02037-00	1
3	Ring with boss head, i. d. = 10 cm	37701-01	1
4	Wire gauze with ceramic, 160 x 160 mm	33287-01	1
5	Beaker, 100 ml, plastic (PP)	36011-01	1
6	Beaker, Borosilicate, low form, 250 ml	46054-00	1
7	Beaker, Borosilicate, low-form, 400 ml	46055-00	1
8	Students thermometer,-10...+110°C, l = 180 mm	38005-02	1
9	Butane burner, Labogaz 206 type	32178-00	1
10	Butane cartridge C206, without valve, 190 g	47535-01	1

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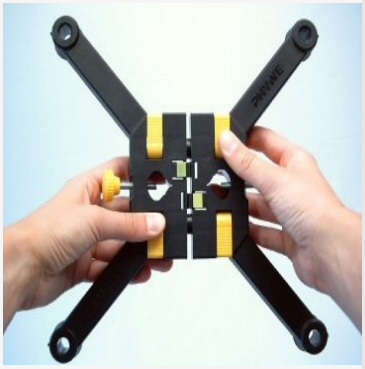
Set-up (1/2)

Set up the experiment according to the illustrations in order from left to right.




Set-up (1/2)

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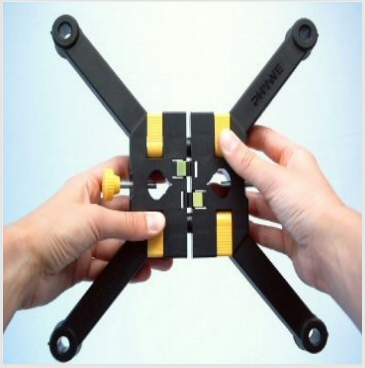
Set up the experiment according to the illustrations in order from left to right.

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Set-up (2/2)

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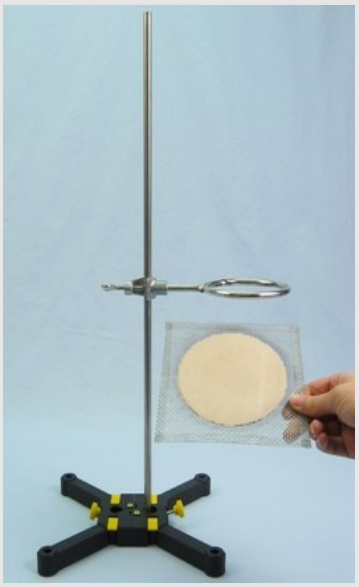

- Fill 300 ml of water into the large beaker.
- Fill 100 ml of cold water into the middle beaker.
- Completely fill the small beaker with cold water.

Procedure (1/2)

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- Heat the large beaker with the butane burner to about 40 °C (left picture).
- Pour 100 ml of the hot water into the middle beaker (picture on the right). Be careful as the tripod ring and the wire net are hot, so only touch the top of the glass.

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Procedure (2/2)

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- Hold a finger in the three beakers one after the other (see picture). How warm does the water feel in each case? Note the order of the cups from hot to cold.
- Hold one finger of the right hand in the hot water and one finger of the left hand in the cold water. Leave the fingers in the respective beakers for about 30 seconds and move them slightly. Take the fingers out of the beakers and then immediately hold both fingers in the middle beaker and move them again.
- Make a note of what you observe in the report.

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Report

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Task 1

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Drag the words into the correct boxes!

The own heat sensitivity perception of the water in the beakers from hot to cold is:

_____ - _____ - _____ .

small glass

medium glass

large glass

Check

Task 2

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What can be observed in the second experimental section?

- [ ] There is no difference.
- [ ] The temperature of the middle beaker is felt differently by the two fingers.
- [ ] With the right finger (previously hot) the water feels warmer than with the left finger (previously cold).
- [ ] With the right finger (previously hot) the water feels colder than with the left finger (previously cold).

Check

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Task 3

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Can you reliably distinguish between hot and cold by feeling with your fingers?

- No
- Yes

On what does your decision of "warm" or "cold" depend?

- The assessment always depends on the temperature of the object touched.
- The assessment depends on what ambient temperature the finger (skin) has felt directly before.

Task 4

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Discuss the following questions with a classmate and write down your thoughts.

- Can you give more examples of the observations from the experiment?
- Have you ever touched a very hot body? What does the heat sensation of your skin report then?
- Have you ever touched a very cold body? What does the heat sensation of your skin report then?

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