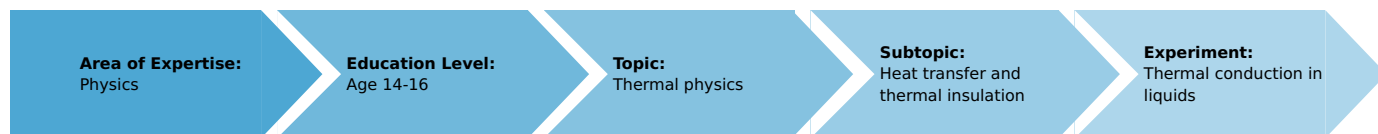


Thermal conduction in liquids (Item No.: P1043400)

Curricular Relevance



Difficulty



Easy

Preparation Time



10 Minutes

Execution Time



10 Minutes

Recommended Group Size



2 Students

Additional Requirements:

- Butane burner, Labogaz 206 type 32178-00
- Butane cartridge C206, without valve 47535-00
- Ice cubes
- Ice, crushed (ice cubes, hammer and cloth)
- Matches
- Scissors

Experiment Variations:

Keywords:

Task and equipment

Information for teachers

Additional Information

This experiment shows vividly that water is a poor conductor of heat: while the water at the top is boiling, the piece of ice normally does not melt quickly.

A heat flow does not occur since the water is heated at the top.

Suggestions

1. The test tube should be heated gently with a small flame
2. When no ice is available, the poor thermal conductivity of water can also be shown by merely measuring the thermal stratification.
3. The thermometer must be slowly inserted so that the thermal stratification is not destroyed.

Remark

This experiment also shows that glass also has only a low thermal conductivity. In a metal container the experiment could not be performed.

Thermal conduction in liquids (Item No.: P1043400)

Task and equipment

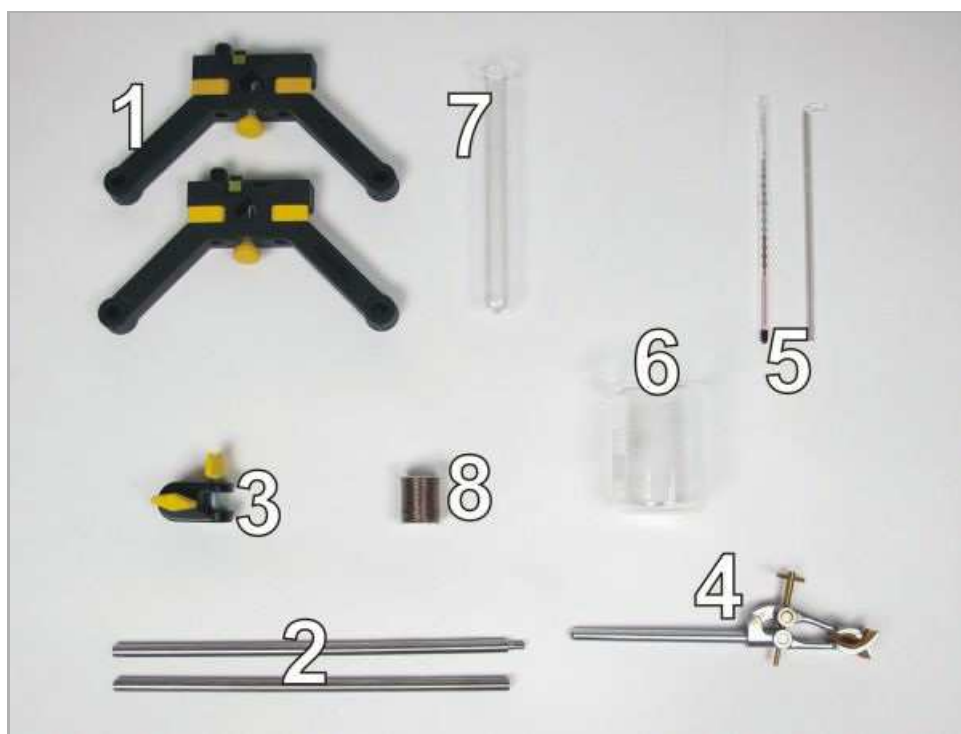
Task

Does water conduct heat?

Heat a test tube containing water so that no convection (= heat) flow occurs and investigate the temperature in it.



Equipment



Position No.	Material	Order No.	Quantity
1	Support base, variable	02001-00	1
2	Support rod, stainless steel, l = 600 mm, d = 10 mm	02037-00	1
3	Boss head	02043-00	1
4	Universal clamp	37715-00	1
5	Agitator rod	04404-10	1
5	Students thermometer, -10...+110°C, l = 230 mm	38005-10	1
6	Glass beaker DURAN®, short, 250 ml	36013-00	1
7	Test tube, 200x30 mm, DURAN	36304-01	1
8	Iron wire, d = 0.5 mm, l = 50 m	06105-00	1
	Butane burner, Labogaz 206 type	32178-00	1
	Butane cartridge C206, without valve	47535-01	1
Additional material			
	Ice cubes		
	Ice, crushed (ice cubes, hammer and cloth)		
	Matches		
	Scissors		1

Set-up and procedure

Set-up

Attention!

1. The test tube must be heated very carefully near its mouth. Do not hold it directly in the flame!
2. During heating, the test tube and the universal clamp get hot!

Setup

- Set up the support stand according to the following pictures.

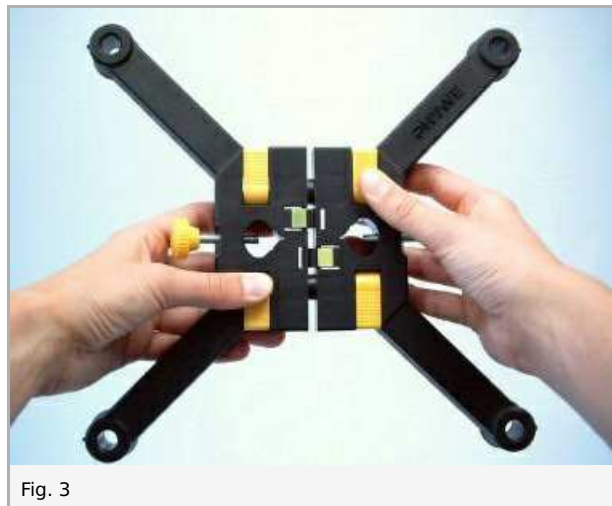




Fig. 4a



Fig. 4b



Fig. 5



Fig. 6



Fig. 7

- Wrap a relatively large piece of ice tightly with wire and place it in the test tube.

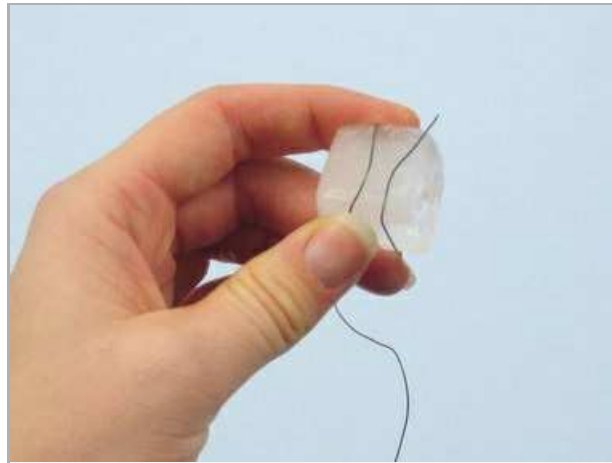


Fig. 8

- Crush the remaining ice with a hammer, but wrap it in the cloth before beginning so that the resulting pieces do not scatter.



Fig. 9



Fig. 10

- Fill the beaker about half-full with ice.



Fig. 11

- Add enough cold water to the beaker to just cover the ice; stir gently.



Fig. 12

- Fill the test tube to within about 3 cm of the rim.



Fig. 13



Fig. 14

- Hold the test tube with the universal clamp so that it is slightly slanted.



Fig. 15

Procedure

- Heat the upper third of the test tube gently with the burner until the water at the top boils.
- Watch the piece of ice and record your observations in the report.
- Turn off the burner.
- With your thermometer measure the temperature carefully (without stirring) in the upper, middle and bottom parts of the test tube.

Report: Thermal conduction in liquids

Result - Observations 1

What happens to the piece of ice during heating?

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Result - Observations 2

Is it still present when the water at the top boils?

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Result - Observations 3

Note down the temperature at the top, the middle and the bottom of the test tube.

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Evaluation - Question 1

Are there heat flows in the test tube?

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Evaluation - Question 2

Does water conduct heat well?

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Evaluation - Question 3

Give other examples which confirm the results of this experiment.

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