

Volume change during melting of ice (Item No.: P1044500)

Curricular Relevance



Difficulty



Intermediate

Preparation Time



10 Minutes

Execution Time



10 Minutes

Recommended Group Size



2 Students

Additional Requirements:

- Ice cubes

Experiment Variations:

Keywords:

Task and equipment

Information for teachers

Additional Information

Ice cubes are placed on a measured volume of water and their volume determined by immersing them. After the ice has melted, the total volume is again determined and from the difference the volume change of the ice is calculated.

Remarks

The total volume of the ice cubes should be approx. 30 ml. Thus, the given number of ice cubes is to be corrected according to the size of the ice cubes used.

In this experiment it is not absolutely necessary to measure the temperature of water and to wait until the water has again reached the initial temperature since the density of water in the temperature range from 0 °C to 20 °C only changes by 0.2 %:

Temperature	Density of water
0 °C	0.99984 g/cm ³
20 °C	0.99821 g/cm ³

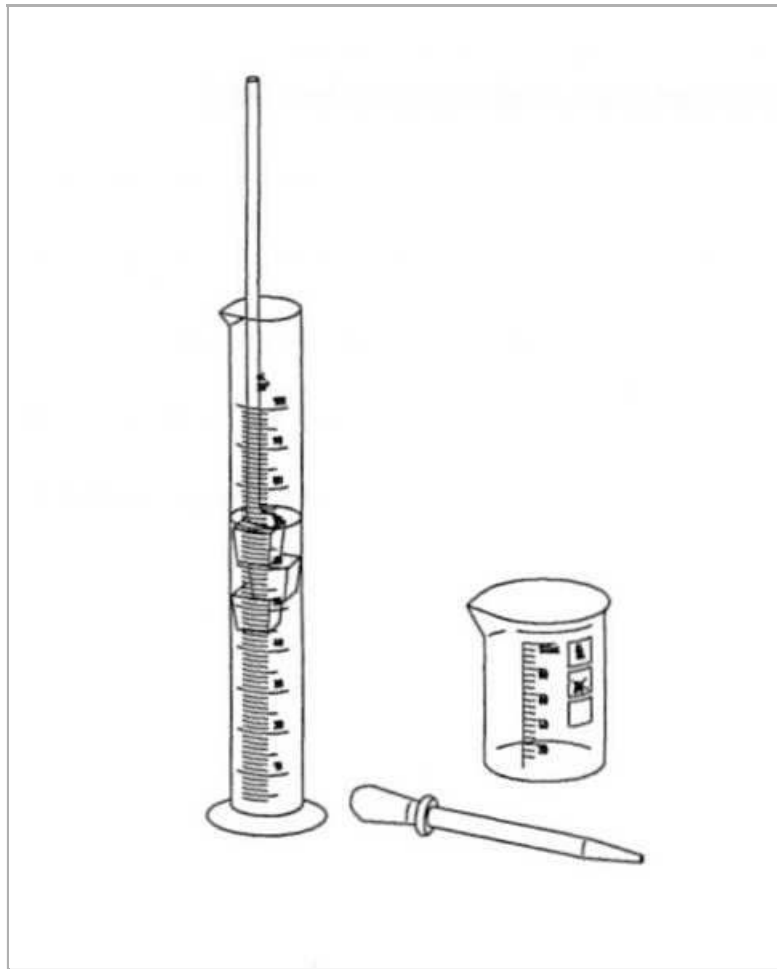
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Task and equipment

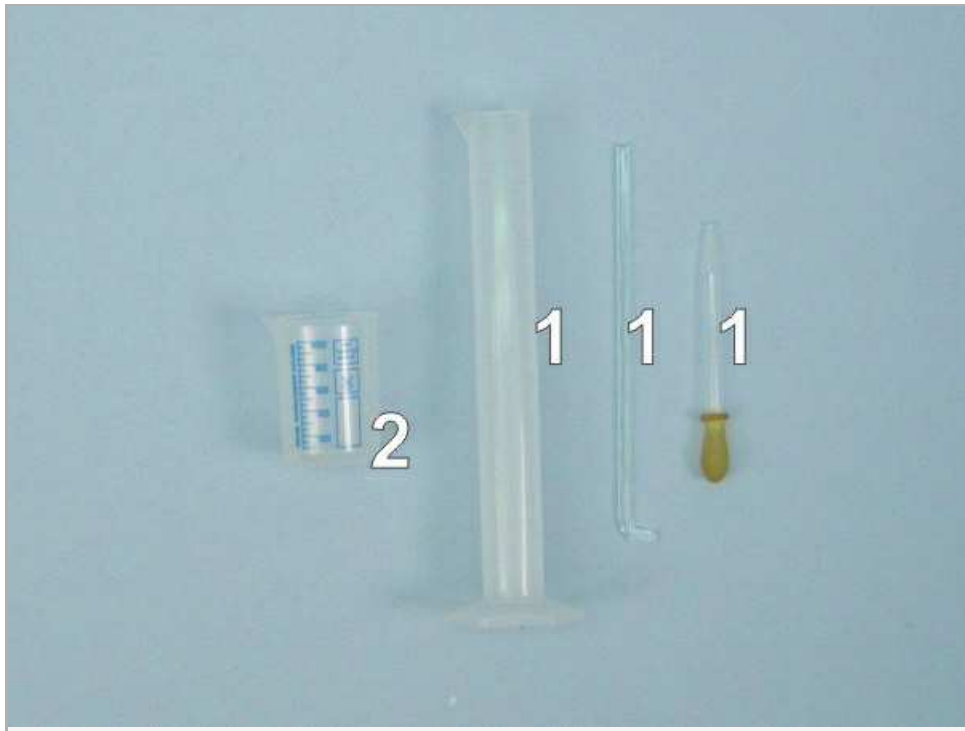
Task

Why can water-filled containers burst on freezing?

Determine the volume change of ice on melting.



Equipment



Position No.	Material	Order No.	Quantity
1	Agitator rod	04404-10	1
1	Graduated cylinder 100 ml, PP transparent	36629-01	1
1	Pipette with rubber bulb	64701-00	1
2	Beaker, low form, plastic, 100 ml	36011-01	1
Additional material:			
	Ice cubes		

Set-up and procedure

- Fill the graduated cylinder to the 40 ml mark (exact measurement using the pipette).
- Record the water volume V_1 in the report.
- Put three ice cubes in the graduated cylinder and hold them just below the water's surface with the aid of the agitator rod (only the very tip of the agitator rod should be immersed).
- Read the new water level V_1 immediately and record it.
- Heat the graduated cylinder with your hands (Fig. 1) and move the ice cubes with the agitator rod to accelerate the melting of the ice cubes.



- Wait until all the ice cubes have melted.
- Read the water's volume V_3 and record it.

Report: Volume change during melting of ice

Result - Table 1

Record the volume of water without (V_1) and with ice cubes (V_2) and also when the ice is molten (V_3).

volume of water	V in ml
V_1	1 ±0
V_2	1 ±0
V_3	1 ±0

Evaluation - Question 1

Calculate the volume of the ice cubes.

$$V_4 = V_2 - V_1 = \dots\dots\dots \text{ml.}$$

Evaluation - Question 2

How does the volume of ice change on melting?

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Evaluation - Question 3

Calculate the volume change on melting.

$\Delta V = V_2 - V_3 = \dots\dots\dots$ ml.

Evaluation - Question 4

How much (in percent) does the volume of the ice change on melting?

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Evaluation - Question 5

Can you explain why water-filled containers might burst on freezing?

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