

The scenario

Subject (field/title)	Thermal properties of matter / Boiling of water under reduced pressure
Length of movie	3:05
Main Goals	Changes in the state of matter
Detailed Goals	Boiling water under reduced pressure
Structure and description of the experiments	
1. Introduction	Description: The video shows the phenomenon of boiling water at a pressure below atmospheric pressure
2. Main topic	Description: The video presents boiling as evaporation in the entire volume of a liquid, the temperature of which depends on the pressure.
Part 1	<p>Tools: Beaker, thermocouple (e.g. thermocouple), meter enabling temperature measurement using a thermocouple, vacuum bell with electrical feed-throughs, vacuum pump, manometer.</p> <p>Description: Pour water into the beaker. Place the beaker on the base of the vacuum bell, immerse the thermocouple in it and connect it to the electrical feed-throughs. On the other side of the feed-throughs, we connect a meter that allows temperature measurement using the used thermocouple. Put the vacuum bell on the base and turn on the vacuum pump.</p> <p>In the video, you can see small bubbles forming at the end of the thermocouple - air bubbles are coming out of the insulation of the thermocouple.</p> <p>The thermometer shows a temperature of about 24°C, and at the same time, the pressure drop under the glass cover can be observed on the manometer.</p> <p>At some point, when the right pressure is reached, bubbles of water vapour appear on the walls of the vessel. The phenomenon begins to occur in the entire volume of the liquid.</p> <p>After turning off the pump and equalising the pressure under the bell, you can see that the water stops boiling and the temperature drops slightly. The fact of lowering the temperature is due to the rapid evaporation of water.</p> <p>Questions: Is it possible to brew tasty tea on Mount Everest? Why does water boil at room temperature under reduced pressure?</p> <p>Conclusions: Boiling differs from evaporation in that the first one takes place at a constant temperature defined as the boiling point, and it is evaporation in the entire volume of the liquid. In contrast, the second one takes place at any temperature but only on the surface of the liquid. The boiling of water can occur at room temperature under</p>

	reduced pressure because water molecules can more easily be released from the volume of the liquid.
3. Summary and notes	<p>Point out to students that boiling is a physical phenomenon and that every substance has a boiling point that depends on the type of substance and the pressure acting on that substance.</p> <p>Level: primary school and high school</p>