

Changes of the state of aggregation

Boiling and condensation

Boiling at reduced pressure

Object of the experiment

1. Investigating the boiling temperature of water at reduced pressure

Setup



Safety note:

Allow the water to boil for a short time only as water vapour is drawn in by the vacuum pump leading to impurity of the pump oil. For this reason the pump should be operated under gas ballast.

Apparatus

1 Rotary-vane vacuum pump S 1.5.....	378 73
1 Pointer manometer, DN 16 KF.....	378 510
1 Air inlet valve, DN 10 KF.....	378 771
1 Cross piece DN 16 KF.....	378 015
1 Hose nozzle, DN 16 KF.....	378 031
2 Centering rings, DN 16 KF, set of 2.....	378 045ET2
1 Centering ring (adapters) DN 10/16 KF, set of 2.....	378 040ET2
4 Clamping rings DN 10/16 KF.....	378 050
1 Vacuum experiment plate.....	378 89
1 Vacuum bell jar, coated.....	378 561
1 Vacuum rubber tubing, 8 mm diam.	667 186
1 Plastic beaker.....	590 06
1 Chemical thermometer, -10...+110 °C/1 K.....	666 160
1 Immersion heater.....	303 25

- Evacuate the vacuum bell jar.
- Observe the water in the beaker.
- When the water starts to boil, read the boiling temperature ϑ_b and the pressure p_b .
- Vent the vacuum bell jar via the air inlet valve of the pump, and take it off the vacuum experiment plate.

Measuring example

Boiling temperature ϑ_b in °C	Pressure p_b in hPa
60	200

Evaluation

The boiling temperature of water depends on the pressure.

If the pressure on the water is below the normal air pressure (1013 hPa), the water boils at a temperature below 100 °C.

Table values:

Boiling temperature ϑ_b in °C	Pressure p_b in hPa
100	1013.3
80	473.4
60	199.2
40	73.8
20	23.4

Carrying out the experiment

- Fill about 700 ml of water with a temperature of approx. 65 °C into the plastic beaker, and immerse the thermometer.
- Then put the plastic beaker on the vacuum experiment plate and put the vacuum bell jar over it.