

11.3 Boiling water at room temperature

Subjects: Properties of liquids, intermolecular forces, vapor pressure

Description: Water is boiled at room temperature due to a decrease in pressure

Materials:

Vacuum flask with tubing and water

Vacuum pump (in cabinet below)

Procedure:

1. Attach the tubing from the arm of the flask to the vacuum pump
2. Turn on the vacuum pump and observe.

Discussion:

The boiling point of a liquid depends in part on intermolecular forces of attraction. An input of energy is needed to give the molecules enough kinetic energy to break free from these forces. The pressure above the liquid also determines boiling point. When the vapor pressure of the liquid is equal to the external pressure, the liquid will boil. When the external pressure is lowered, so does the boiling point.

In the above procedure the pressure above the liquid is reduced by a vacuum pump. Enough pressure is lost to cause the water to boil. As the water boils, heat is lost because of the heat of vaporization of water being an endothermic process. Eventually the water will cool enough that its vapor pressure is less than the external pressure and the water will stop boiling.

Safety: Use caution when working with evacuated glassware to avoid implosion.

Disposal: None

References:

1. B.Z. Shakhashiri; *Chemical Demonstrations: A Handbook for Teachers*; Volume 2; Wisconsin; 1985; p. 81-84