

## Practical 2 – Topic 3

### The law of cooling

#### Criteria assessed

- DCP
- CE

#### Materials needed

- Thermometers – note: if a temperature sensor is available then the collection of temperature data, as well as the calculation of the rate of change of the water's temperature, is greatly simplified
- Heating plate
- Container of warm water
- Stopwatch
- Stirrer
- Fan

Warm a fixed quantity of water on the heating plate and record the temperature ( $\theta$ ) of the water at the start of the cooling phase when the container has been removed from the heating plate. Place a fan a fixed distance from the container so that a stream of air can move over the container. Record the temperature ( $\theta_0$ ) of the air in the lab. Measure the temperature of the water at regular time intervals.

The objective of the experiment is to see the dependence of the rate of cooling (i.e.  $\frac{\Delta\theta}{\Delta t}$ ) on the temperature difference  $\theta - \theta_0$  between the temperature of the liquid and the temperature of the air. It is expected that under the conditions of this experiment  $\frac{\Delta\theta}{\Delta t} \propto (\theta - \theta_0)^p$  where  $p$  is a positive constant.

- How can  $\frac{\Delta\theta}{\Delta t}$  be calculated?
- What variables need to be plotted so that a straight line will be obtained?
- How can the constant  $p$  be calculated?