10. Resistive heating (8 points) After noting the temperature of the calorimeter, connect the batteries, resistor (in the calorimeter) and ammeter in series. Choose a convenient time interval Δt and note the ammeter reading until batteries are depleted.

Measure the temperature at the end, after waiting a bit or stirring the calorimeter. We want to get maximum temperature difference for precise measurement. Since $P = RI^2$,

$$\frac{Q}{R} \approx \sum_n \Delta t \left(I_n/2 + I_{n+1}/2\right)^2,$$

$$R = \frac{\left(c_a m_a + c_w m_w\right) \Delta T}{\sum_n \Delta t \left(I_n/2 + I_{n+1}/2\right)^2}.$$

The resistance used was $R = 0.47\,\Omega \pm 5\%$. In the described circuit the batteries were depleted in 10 to 15 minutes and the temperature of the calorimeter rose by 7 to 10 degrees.