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ESF II project of the University of West Bohemia in Pilsen

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Electric resistance heaters

Measurement task:

Measure the thermal efficiency of various electric cookers. Process the results and plot the dependence of water temperature on heating time in graphs.

Theoretical backgroung:

$$\eta = \frac{Q_w}{Q_{el}} = \frac{m \cdot c_s \cdot (\theta_e - \theta_0)}{P \cdot t} \quad (1)$$

equation. 1: calculation of efficiency

- *m* - weight of heated water (kg)
- *c* - specific heat capacity of water (J/(kg K))
- θ_0, θ_e - initial and final water temperature (°C)
- *P* - average power consumption of the cooker (W)
- *t* - heating time (s)

To measure the efficiency, heat a given amount of water in the cooking vessel from the initial water temperature to 90°C. Using a wattmeter, we measure the power input of the el. cooker, which we read off at one-minute intervals along with the water temperature. In this case, the energy used to heat the actual cooker will be included in the efficiency and the value will be determined as the ratio of the amount of energy supplied to the heated water to the total energy consumed by the cooker according to the relationship.

Measurement procedure:

Heat 1 litre of water in selected cooking vessel with a thermometer. After every minute, read the water temperature and power input until the water temperature reaches 90°C. From the readings, graph the water temperature versus heating time. Calculate the efficiencies of each cooker.

Instruments used:

Measured and calculated values:

Cooker:

T **(°C)**								
t (s)								

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Graphs:

Conclusion:

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