Theoretical Problem 2

An electric lamp of resistance $R_0 = 2\,\Omega$ working at nominal voltage $U_0 = 4.5\,\mathrm{V}$ is connected to accumulator of electromotive force $\mathrm{E} = 6\,\mathrm{V}$ and negligible internal resistance.

1. The nominal voltage of the lamp is ensured as the lamp is connected potentiometrically to the accumulator using a rheostat with resistance R. What should be the resistance R and what is the maximal electric current I_{max}, flowing in the rheostat, if the efficiency of the system must not be smaller than $\eta_0 = 0.6$?

2. What is the maximal possible efficiency η of the system and how the lamp can be connected to the rheostat in this case?