It is important for hardware group to determine the resistance of the heating plate, so we also calculate the required resistance based on known voltage and temperature and our target temperature.

According to the equation $P = \frac{U^2}{R}$, and the equation $Q = cm\Delta T$

And assume that U=12V, room temperature T=25℃, the mass of water m=0.1 kg

The target temperature is 37℃.

Therefore

$$\Delta T = 37℃ - 25℃ = 11℃$$

The goal time that the temperature can reach 37℃ is t=5 min = 300 s

$$Q = cm\Delta T$$

$$Q = \frac{4.2kJ}{1kg \cdot ℃} \times 0.1kg \times 11℃ = 4.62kJ$$

$$Q = 4.62kJ = 4620J$$

$$P = \frac{Q}{t} = \frac{4620\ J}{300\ s} = 15.4W$$

$$R = \frac{U^2}{P} = \frac{(12V)^2}{15.4\Omega} = 9.35\Omega$$

Since there was no heating plate with resistance of 9.35Ω, we chose the heating plate with the closest resistance: 12Ω.

$$\frac{U}{R} = \frac{12V}{12\Omega} = 1A < 3A$$

(3A is the maximum current that the temperature control chip can work)

Therefore, we finally chose the heating plate with a resistance of 12Ω.