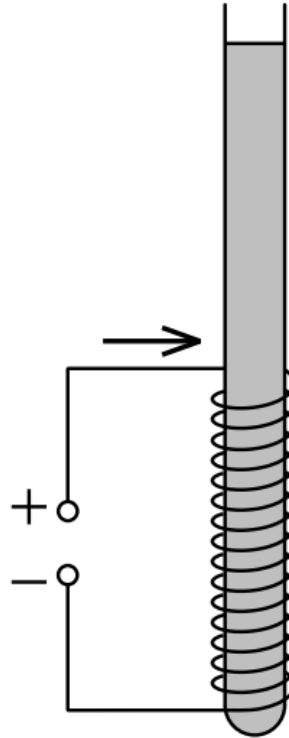


Solenoid

A solenoid of length $l = 20 \text{ cm}$ is wound around a vertical, cylindrical test tube made of glass, filled with water. The solenoid is thermally insulated from the water. The height of the water level is approximately 20 cm above the upper end of the solenoid, the diameter of the test tube is 1 cm , the number of turns of the coil is $N = 6000$.



The atmospheric pressure is $p_0 = 101 \text{ kPa}$, the temperature of water is 293 K . Magnetic susceptibility of water is $\chi \equiv \mu_r - 1 = -9.04 \cdot 10^{-6}$. Vacuum permeability $\mu_0 = 12.57 \cdot 10^{-7} \text{ H/m}$. The current in the solenoid is slowly increased until the water starts boiling inside the coil. At which current strength would this happen? Make reasonable approximations when needed. Note that the required current strength might be slightly too large for the present technology.