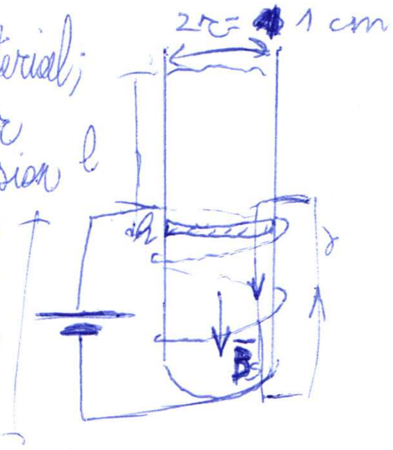

The water boils because it's a diamagnetic material; if the external field of the solenoid is present, the water creates an opposite field which creates a repulsion between the water and the external magnetic field. The water is then pushed upwards, creating a pressure that opposes the external one (atmospheric pressure + pressure due to the rest of the water), allowing the water to boil.

The external pressure at the top of the solenoid is $p_{ext} = p_0 + \rho_{H_2O}\, g\, l$.

To calculate the magnetic field produced by the solenoid in the water:

$$\oint_\gamma H\, d\gamma = N \cdot i \quad \Rightarrow \quad H = \frac{N}{l} i$$

If a small band of height dh boils, there will be a change in the potential energy of the magnetic field which will be equal in magnitude to the work done by the pressure of the vapour.

$$U_i = \frac{1}{2} \mu_0 \mu_r H^2 \cdot \pi r^2 \cdot dh \qquad U_f = \frac{1}{2} \mu_0 \mu_r H^2 \pi r^2 (l - dh) + \frac{1}{2} \mu_0 \frac{N^2}{l^2} i^2 \pi r^2 dh$$

$$= \frac{1}{2} \mu_0 \mu_r \pi r^2 dh \cdot \frac{N^2}{l^2} \cdot i^2$$

$$|\Delta U| = \frac{1}{2} \mu_0 \pi r^2 dh \cdot \frac{N^2}{l^2} i^2 |X|$$

The work done by the pressure is $W = p_{ext} \cdot \pi r^2 \cdot dh$.

$$|\Delta U| = W$$

$$\Rightarrow \frac{1}{2} \mu_0 \frac{N^2}{l^2} i^2 |X| = p_{ext}$$

$$i = \sqrt{\frac{2 l^2 (p_0 + \rho_{H_2O}\, g\, l)}{\mu_0 N^2 |X|}} = 4{,}49 \cdot 10^3 \text{ A}$$

I dind't consider the energy needed to transform water into vapour, since it is much lower than the work which has to be done against p_{ext}.