Problem T1. Magnetic properties of matter *(20 points)*

Part A. Diameter of the syringe needle *(3 points)*

Diameter of the syringes and their derivations:

$d_{\text{green}} =$ $\Delta d_{\text{green}} =$

$d_{\text{white}} =$ $\Delta d_{\text{white}} =$

Part B. Surface tension of water *(4 points)*

Critical water heights for both needles and the calculated surface tension, alongside their derivations:

$h_{\text{green}} =$ $\Delta h_{\text{green}} =$

$h_{\text{white}} =$ $\Delta h_{\text{white}} =$

$\sigma =$ $\Delta\sigma =$

Part C. Susceptibility of graphite *(4 points)*

Diameter of the magnet and the specific susceptibility of graphite:

$d_{\text{magnet}} =$ $\Delta d_{\text{magnet}} =$

$\chi_g =$ $\Delta\chi_g =$

Part D. Relative permeability of ferromagnetic strip *(9 points)*

i. (1 pt) Output lead voltage of the battery and the far away reading of the multimeter:

$\mathcal{E} =$

$V_0 =$

ii. (4 pts) Magnetic permeability of the ferromagnet alongside its derivation and the tabulated data. You may include appropriate graphs on separate papers, assuming they're marked accordingly.

$\mu =$ $\Delta\mu =$

iii. (2 pts) Tabulated data of the magnetic field strength as a function of the distance from the symmetry axis in addition to a plot (can be on separate paper) and comments on the result:

iv. (2 pts) Calculations for finding the magnetic field strenght inside the ferromagnetic in addition to an appropriate plot (can be on separate paper). Estimation of the saturation field strength:

$B_s =$