T1: Floating cylinder (10 pts)

A solid, uniform cylinder of height $h = 10\,\text{cm}$ and base area $s = 100\,\text{cm}^2$ floats in a cylindrical beaker of height $H = 20\,\text{cm}$ and inner bottom area $S = 102\,\text{cm}^2$ filled with a liquid. The ratio between the density of the cylinder and that of the liquid is $\gamma = 0.70$. The bottom of the cylinder is above the bottom of the beaker by a few centimeters. The cylinder is oscillating vertically, so that its axis always coincides with that of the beaker. The amplitude of the liquid level oscillations is $A = 1\,\text{mm}$.

Find the period of the motion T. Neglect the viscosity of the liquid.