Problem 27

A cubic block of side $l$ and mass density $\rho$ per unit volume is floating in a fluid of mass density $\rho_0$ per unit volume, where $\rho_0 > \rho$. If the block is slightly depressed and then released, it oscillates in the vertical direction. Assuming that the viscous damping of the fluid and air can be neglected, derive the differential equation of motion and determine the period of the motion. 

*Hint:* Use Archimedes’ principle: an object that is completely or partially submerged in a fluid is acted on by an upward (buoyant) force equal to the weight of the displaced fluid.