My name is: _____

Word Problem 1, *Re, Dimensional Homogeneity and Unit Conversions*

Consider a large phytoplankton cell, whose diameter is 100 μm. Take its density to be 1.04 g cm^{-3}, fairly typical of small organisms. It should fall with a velocity described by Stokes' law, which we will explore in some detail in coming weeks:

$$w_s = \frac{2r^2(\rho_s - \rho)g}{9\mu}.$$

Here r is the radius of the particle, g is acceleration due to gravity, ρ is the density of the fluid, ρ_s is the density of the particle, and μ is dynamic viscosity. Calculate the cell's settling velocity in seawater at 20 ˚C. From this calculation and this week's lecture, calculate the Reynolds number of the flow affected by the cell. Specify the values used for each of the variables in the Reynolds number calculation as well as the quantitative result. If you don't use the values in your text, specify where you got them. Document on your paper that w_s has units of a speed [$L\ T^{-1}$] by showing that these dimensions apply to the right side of the equation and that *Re* is indeed dimensionless (by showing that the dimensions of its numerator and denominator are identical and therefore cancel).

Due in my mailbox (physical or electronic) by 0900 hours Monday, 8 September.