물리화학2 숙제 1 2008. 9. 18 (2008년 9월 25일 수업전 제출)

- 1. (1) Derive that root mean square distance is given by $\sqrt{2Dt}$.
 - (2) What is the diffusion distance in the x direction of a source molecule due to its Brownian motion in one minute in water at 20°C?
 (D=4.65×10¹⁰ m²/s)
 - (3) There is an analogy between D and a (thermal diffusivity= $\frac{\kappa}{\rho Cp}$). Estimate the thermal conduction distance of solid in a minute (thermal conductivity=10⁻⁵, density=3, heat capacity=4 in SI units.)
- 2. (1) Provide a molecular interpretation for the observation that the viscosity of a gas increases with temperature, whereas the viscosity of a liquid decreases with increasing temperature.
 - (2) Use the Maxwell distribution of speeds to estimate the fraction of CO₂ molecules at 300K that have speeds in the range 200 to 250m/s
- 3. (1) Draw rough sketches of $f(\nu_x)$ vs. ν_x for O₂ at 100, 300, and 1000K.
 - (2) Draw rough sketches of $f(\nu)$ vs. ν for O₂ at 100, 300, and 1000K.
 - (3) The electric conductivity κ of pure water is $5.5 \times 10^{-6} \Omega^{-1} m^{-1}$ at 25°C. what is value of the product $K_w = [H^+][OH^-]?$
- The diffusivity of a CH₃CO₂− ion in aqueous solution at 25℃ is 1.09×10⁻⁹m²/s
 - (1) Calculate the mobility in water at 25 °C.
 - (2) Estimate the time required for a CH_3CO_2 ion to have a root mean square displacement in 3-dimension of 1cm.
 - (3) Estimate the effective hydration radius. The viscosity of water is 1.0 cP.
- 5. Derive the following equations.
- (1) 식 21.94
- (2) 식 21.97