Homework #3

1. Calculate the vapor pressure of r = 90 nm water droplets at 20^0C. Assuming the density of water is 0.99823g/cm^3, Vm = 18.047 cm^3.
2. Calculate the work required to increase the surface area of mercury from 1 to 6 cm^2 at 20^0C. Assuming surface tension of mercury is 472 dyne cm^{-1}.
3. A bubble of air exists within a solution comprising acetone at 20^0C and 1 atm. Calculate the pressure in a gas bubble if the bubble has a radius of 0.002 mm.
4. Why the contact angle of a water droplet on Teflon higher than that of the same sized droplet on gold surface?
5. Calculate the height of a column of water in a nanocapillary tube of diameter of 800 nm.
6. Explain DLVO theory
7. A nanoparticle with mass 5 x 10^{-27} g exists in a 1-nm, one dimensional box. What is the wavelength of radiation that is emitted when the nanoparticle loses energy from the n=3 level to n=2 level?
8. What is meant by quantum confinement in a semiconductor dot? What are the implications of this for the energy levels?
9. A proton is confined to moving in a one-dimensional box of width 0.2 nm (a) find the lowest possible energy for the proton (b) what is the lowest possible energy of an electron confined to the same box? (c) How do you account for the large difference in (a) and (b)?