HW #4

1. **(Kasap 1.4) Ionic bonding and CsCl** a) The potential energy E per Cs^+-Cl^- pair within the CsCl crystal depends on the interionic separation r in the same fashion as in the NaCl crystal,

$$E(r) = -\frac{e^2 M}{4\pi\varepsilon_0 r} + \frac{B}{r^m}$$

   where for CsCl, M = 1.763, B = 1.192 x 10^{-104} J m^9 or 7.442 x 10^{-5} eV $(nm)^9$, and m = 9. Find the equilibrium separation (r_0) of the ions in the crystal and the ionic bonding energy, that is, the ionic cohesive energy, and compare the latter value to the experimental value of 657 kJ mol^{-1}.

   b) Given that the *ionization energy* of Cs is 3.89 eV and the *electron affinity* of Cl (energy released when an electron is added) is 3.61 eV, calculate the atomic cohesive energy of the CsCl crystal as joules per mole.