The dispersion interaction energy between two neutral atoms is given by

$$U(x) = -\frac{C}{x^6}$$

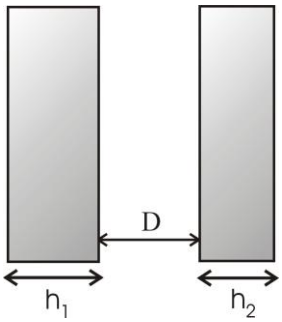
where C is a parameter which describes the strength of the interaction between individual atoms (in Jm^6) and x is the interatomic separation (m).

a) Use this result to show that the dispersion interaction energy between an atom and a solid film of thickness, h_1, is given by

$$U(D) = -\frac{\pi n_1 C}{6}\left(\frac{1}{D^3} - \frac{1}{(D+h_1)^3}\right)$$

where D is the separation between the atom and the surface of the film and n_1 is the number density of atoms in the solid (m^{-3}). ***You should assume that the other two dimensions of the film are infinite***

b) Two thin films of thickness, h_1, and, h_2, with atom densities *n1*, and *n2* are brought to within a small distance, D, of each other as shown in the diagram below.



Use your answer to part b) above to derive an expression for the magnitude of the dispersion *pressure* experienced by the two films.