Assignment 1

Q1. The electronic polarizability of the Ar atom is $\mathbf{1.7 \times 10^{-40}}$ F m^2. What is the static dielectric constant of solid Ar (below 84 K) if its density is **1.8 g cm**$^{-3}$? ***Note: Avog = 6.02 x 10***^{23} ***& M***$_{at}$***= 39.95 g mol***$^{-1}$ ***& ε***$_o$ ***= 8.85 x 10***$^{-12}$.

Q2. a) Derive the local field (Lorentz Equation).

b) Show that the local field is given by

$$E_{loc} = E\left(\frac{\varepsilon_r + 2}{3}\right)$$

Q3. Choose the correct answer

1. The permeability of a medium whose susceptibility is 100 equal to.
   a) -100
   b) 99
   c) -99
   d) 101

2. An air-filled parallel-plate capacitor has a capacitance of 1 pF. The plate separation is then doubled and a wax dielectric is inserted, completely filling the space between the plates. As a result, the capacitance becomes 2 pF. The dielectric constant of the wax is:

   a. 0.25
   b. 0.50
   c. 2.0
   d. 4.0