Recitation 4

In this recitation, we will look at:

- Review:
  - Types of Work: Electric and Magnetic
  - Brief Review of Tensors
  - Elastic Tensors
  - Elastic Strain Energy
  - Note: Happy Meal Deal.....

- Questions regarding homework

- Sample Problems

**Problem 1**
This problem was given as a Problem Set last year.

The bulk modulus, $K$, of an isotropic linear elastic solid is defined by the dilation, $\frac{\Delta V}{V_0}$, response to hydrostatic pressure, $P$:

$$\frac{\Delta V}{V_0} = \frac{V - V_0}{V_0} = \frac{P}{K}$$

(1)

- Typical values of $K$ for an ionic crystal are about 100 GPa.

- The electric permittivity of vacuum, $\kappa_0$, is $8.85 \times 10^{-12} \frac{C^2}{Nm}$. Typical values of the dielectric susceptibility, $\chi$ (\(\overrightarrow{P} = \kappa_0 \chi \overrightarrow{E}\)), of an ionic crystal are about 50 (unitless).

- The magnetic permittivity of vacuum, $\mu_0$, is $4 \pi \times 10^{-7} \frac{T^2m^3}{J}$. The magnetic susceptibility, $\psi$ (\(\overrightarrow{T} = \mu \psi \overrightarrow{H}\)), of a typical paramagnetic ionic crystal is about 10 (unitless).

Calculate all the ratios of: stored elastic energy, stored polarization energy and stored magnetic energy in a typical ionic crystal at 1 atm, 220 $\frac{V}{m}$ and in earth’s magnetic field.