Faculty of Natural and Applied Sciences
Department of Science

PHS 212

1. A sphere of linear dielectric has, embedded in it, a uniform free charge density ρ. The sphere has a radius R and the dielectric has a constant ε_r.
   a. Find the electric displacement **D** inside and outside the sphere.
   b. Find the electric field inside and outside.
   c. Find the potential at the center of the sphere (relative to infinity).
   d. Find the energy stored in the sphere.

2. Of the three vectors in the equation $\mathbf{F} = q\,\mathbf{v} \times \mathbf{B}$, Which pairs are at right angles ?

3. A very long conductor has a square cross section and contains a coaxial cavity also with a square cross section. Current is distributed uniformly over the material cross section of the conductor. Find the magnetic field inside the cavity.

4. A straight conductor carrying a current I is split into identical semicircular turns as shown in the figure. What is the magnitude of the magnetic field at the center C of the circular loop so formed?