Midterm Quiz

PHYS205 Electricity and Magnetism

1$^{\text{st}}$ of October, 2008

A sphere made of (imperfectly) conducting and non-magnetizable ($\mu_r = 1$) material is spinning in a homogeneous magnetic field. The magnetic field is parallel to the axis of rotation. Find the following steady-state quantities:

(a) Volume charge density induced inside the sphere.

(b) Electric field and potential everywhere in space.

(c) Surface charge density on the surface of the sphere.

Assume that the equatorial velocity of the spinning sphere is not very large, i.e. $v \ll c$, and use approximations. How could we improve the precision of the result?

You may want to review Chapter 3 in D. J. Griffiths: Introduction to Electrodynamics for help with some mathematical methods.

Note: The deadline for submitting the solution is Monday, the 13$^{\text{th}}$ of October.