

**Massachusetts Institute of Technology
Department of Physics**

8.276 Nuclear and Particle Physics February 15, 2007

{Note: No lecture on Tuesday, February 20}

Reading Assignment for 2/22 and 2/27

- Topics:** Electron-nucleon scattering; deep inelastic scattering
- Reading:** *Particles and Nuclei*, Chapter 6, Section 1;
Chapter 7, Sections 1 and 2
- Optional Reading:** Cahn and Goldhaber, *The Experimental Foundations of
Particle Physics*, Chapter 8 (strongly recommended)

Coughlan and Dodd, *The Ideas of Particle Physics*,
Chapters 26 and 27

Problem Set #2 (due 2/27)

1. Derive the form factor $F(q^2)$ for a uniform spherical charge distribution of radius R . Sketch your result as a function of the momentum transfer q .
2. An electron of energy 500 MeV is scattered at an angle of 10° by a calcium nucleus ($A = 40$). Assuming no recoil, find the momentum transfer. Calculate the Mott differential cross section (for a point-like nucleus). Find the factor by which the cross section is reduced if the calcium nucleus is assumed to have a uniform spherical charge distribution of radius $R = 1.2A^{1/3}$ fm.
3. *P & N*, 5-1, parts a) and b). Evaluate your answers for electron scattering off ^{12}C with $E_e = 1$ GeV.
4. *P & N*, 5-4.