

Boğaziçi University  
Department of Physics

Phys 311/407

Summer 2014

Problem Set #1

**Reading:** Rohlf, Chapter 4.

**Problem 1:**

Find the ratio of **a)** The diameter of earth to the diameter of an apple, **b)** The diameter of an apple to the diameter of hydrogen atom. Are these two ratios comparable?

**Problem 2: (Rohlf, Problem 1.29)**

In the Millikan oil-droplet experiment, calculate the electric field needed to make a droplet rise at the same speed as it free-falls with the field off. Take the mass of the droplet to be  $10^{-14}$  kg and take the charge on the droplet to be electron charge.

**Problem 3:**

The mass of electron is  $m_e \approx 9.11 \times 10^{-31}$  kg. Express this mass in  $\text{MeV}/c^2$ . Assume that we can convert this amount mass to energy, how much energy would we get (in MeV)?

**Problem 4: (Rohlf, Problem 1.31)**

Which does your physical intuition tell you is greater, the **mass energy** of a mosquito or the kinetic energy of a 747 jumbo jet at cruising speed? Estimate the order of magnitude of each.

**Problem 5: (Rohlf, Problem 1.39)**

**a)** Estimate the size of an atom if the attraction of the electron and proton due to gravity. **b)** What is the typical kinetic energy of an electron in this “gravitational atom”?