

# PHYSICS 2102

Problem Set #6

Due: April 7, 2010

Please hand in your solutions at the start of class on the given date. Please staple all pages and attach a cover sheet with your name, student number, and the course name on it. Please show your work neatly. All Problems are from the text unless otherwise stated.

1. Problem 44.4.
2. If a  $\Sigma^-$  at rest decays into a neutron and a  $\pi^-$ , what is the total kinetic energy (in MeV) of the decay products?
3. The Virgo cluster of galaxies is approximately 60 Mly away from the Earth.
  - (a) Using the Hubble Law, at what redshift  $z$  are galaxies in this cluster expected to be found?
  - (b) What is the expected mean recession speed of galaxies in this cluster?
  - (c) At what wavelength would you look to measure the  $H\alpha$  spectral line from hydrogen gas in a galaxy in the Virgo cluster?

4. For a flat universe, show that

$$t_0 = (2/3)H_0^{-1}, \quad (1)$$

where  $t_0$  is the age of the universe and  $H_0$  is the Hubble constant.

Practice problems:

Chapter 44 Problems 3, 6, 9, 32, 36, 41, 42.