

PHYS 212, Honors Section – Review Material

Chapters 39 and 40: Modern Physics

- **Background:** The main ideas about physics at the end of the 19th century. Concept of reference frame and the Principle of Galilean Relativity; The Galilean position and velocity transformations.
- **Special Relativity:** The concept of ether; The Michelson-Morley experiment (general idea and significance); The two postulates of Einstein's theory of special relativity; First consequences of the theory, relativity of simultaneity, length contraction and time dilation,

$$L = L_p / \gamma, \text{ and } \Delta t = \gamma \Delta t_p, \gamma = 1/(1-v^2/c^2)^{1/2},$$

where L_p is the proper length and t_p the proper time.

- **Quantum Theory:** The black-body spectrum and Planck's 1900 hypothesis; Einstein's 1905 work on the photoelectric effect and the existence of photons; Photon energy

$$E = hf.$$

The 1913 Bohr model for the hydrogen atom and de Broglie's 1923 postulate of a particle's wavelength, $\lambda = h/p$; Two-slit interference experiments with electrons. Complementarity and the wave-particle duality; The uncertainty principle, $\Delta x \Delta p \geq (1/2) h/2\pi$.

Note: You are not required to know the topics and equations inside square brackets.

Website by Luca Bombelli <bombelli"at"olemiss.edu>; Content of this page last modified on 7 may 2011