

Readings for Weeks #1 and #2 of Quantum Mechanics

Pages 1-56 in Boccio Wave Mechanics Notes
(My first 4 lectures)

Chapter 3 in Boccio textbook (pp 3.1-3.8)
(A more mathematical introduction to probability ideas)

Chapters 1 in French textbook
(For background on experiments leading to wave mechanics)

There will not be exact overlap between my lecture notes and the text readings in any given week. We will, however, cover the same topics roughly over the course of the final nine weeks.

Homework Assignment : Due Tuesday March 15 (after break).

Exercises(at end of lecture notes) : 1, 2, 3

Textbook problems :

- 1.04 - Thomson's determination of e/m
- 1.07 - Quantization of circular orbits in the Thomson atom
- 1-13 - Rutherford scattering and the size of the nucleus
- 1-17 - The sizes of highly excited atoms
- 1-22 - X-ray determination of N and e

Extra Problems

EP-1 - Express each of the following quantities in terms of $\hbar, e, c, m = \text{electron mass}, M = \text{proton mass}$. Also determine their numerical values.

EP-2 - Explain what was learned from:

Photoelectric effect
Black body radiation
Franck-Hertz experiment
Rutherford-Bohr atom
Compton effect

EP-3

(a) Sum the series $y = 1 + 2x + 3x^2 + 4x^3 + \dots$, $|x| < 1$

(b) If $p(x) = xe^{-x/\lambda}$ is the probability density function over the interval $0 < x < \infty$, find the mean, standard deviation and most probable value (where probability density is maximum) of x .

(c) Find the eigenvalues and normalized eigenvectors of the matrix

$$\begin{pmatrix} 1 & 2 & 4 \\ 2 & 3 & 0 \\ 5 & 0 & 3 \end{pmatrix}$$