

CAMOSUN COLLEGE

PHYSICS DEPARTMENT

PHYS 215 Introduction To Quantum Physics

An introduction to selected topics in modern physics. Topics include quantum theory of light, atomic structure, matter waves, quantum mechanics in one dimension and three dimensions..

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| OFFERED: | Winter |
| CREDIT: | 4 |
| IN-CLASS WORKLOAD: | 4 lec, 2 lab |
| OUT-OF-CLASS WORKLOAD: | 6 |
| PREREQUISITES: | Phys 200, Math 220, Math 235 B |
| COREQUISITES: | Math 225 |

OUTLINE

- I. Review of Wave Motion
 - A. The wave equation
 - B. Superposition and interference

- II. Quantum Theory of Light
(Text Chapter 2)
 - A. Blackbody radiation
 - B. Photoelectric effect
 - C. Compton effect
 - D. Pair production

- III. Particle Nature of Matter
(Text Chapter 3)
 - A. Rutherford scattering
 - 1. Derivation of alpha particle scattering formula
 - 2. Derivation of Rutherford's scattering formula
 - B. Bohr atom
 - 1. Energy levels
 - 2. Spectra

- IV. Matter waves
(Text Chapter 4)
 - A. de Broglie waves
 - B. Davison-Germer Experiment
 - C. Wave packets

- D. Heisenberg's Uncertainty Principle
- V. Quantum mechanics in one dimension (Text Chapter 5 & 6)
 - A. Postulates of quantum mechanics
 - B. Schroedinger's equation
 - 1. Time dependent form
 - 2. Time independent form
 - C. Particle in a box
 - 1. Energy levels
 - 2. Expectation values
 - 3. Probability density
 - D. Finite squarewell and harmonic oscillator
 - E. Barrier tunneling
 - 1. Transmission coefficient
 - 2. Square barrier
- VI. Quantum Mechanics in three dimensions (Text Chapter 7)
 - A. Particle in a 3-dimension box
 - B. Schroedinger's eqn for the H atom
 - 1. Wave functions
 - 2. Radial probability density
 - 3. Quantum numbers
 - 4. Selection rules
- VII. Atomic structure
(Text Chapter 8)
 - A. Zeeman effect
 - B. Spin
 - C. Pauli's exclusion principle
 - D. Periodic table
- VIII. Particle physics
(Text Chapter 15)
 - A. Classification of Particles
 - B. Four forces
 - C. Standard Model

TEXT: Serway, R.A. Moses, C.J., and Moyer, C.A. Modern Physics, 2nd Edition (1997)

ADDITIONAL REFERENCES:

Beiser, A., Concepts of Modern Physics 5th Edition

Serway, R.A., Physics for Scientists and Engineers with Modern Physics: 3rd Edition

It is the policy of the physics department that instructors are not required to give make-up tests. At their discretion, instructors may give make-up tests in the case of documented excuses.