

The Atom- Section 1, p. 5-8

I. Early Models of the Atom

A. atom

II. Atoms in Ancient Philosophy

A. Greek philosophy

1. Democritus
2. Leucippus
3. Kanada
4. Plato
 - a. Four basic elements
 - b. Five Platonic solids
 1. Figure 1
5. Aristotle
 - a. Anti-atomist thinking
6. Decline of atomic ideas & rebirth of the existence of atoms
7. Robert Boyle
 - a. Corpuscular theory
 - b. Isaac Newton

III. Dalton's Atomic Theory

A. Antoine Lavoisier

B. Joseph Proust

C. John Dalton

1. A New System of Chemical Philosophy
2. First atomic theory

D. Dmitri Mendeleev

1. Classification of elements

IV. Thomson's "Plum Pudding" Model

A. Michael Faraday

1. Cathode ray

B. J.J. Thomson

1. Electrons
2. New atomic model

V. Rutherford's Planetary Model

A. Hans Geiger and Ernest Marsden

B. Rutherford

1. Nucleus
 - a. Figure 4
2. Planetary model
 - a. Phenomena not accounted for

The Bohr Model- Section 1, p. 8-14

I. Quantum Theory

II. Wave Theory of Light

A. Opticks

1. Isaac Newton
2. Christian Huygens
3. Thomas Young
 - a. double-slit interference
4. Maxwell's theory
 - a. electromagnetic spectrum
 1. figure 6
 - b. frequency

III. Energy Quantization & Photons

A. Max Planck

1. quantum
2. $E = nhf$,
 - a. E equals
 - b. n equals
 - c. h equals
 - d. f equals
 - e. quantized
3. Planck's hypothesis
4. photoelectric effect
 - a. Heinrich Hertz
 - b. J.J. Thomson
 - c. Philipp Lenard
 1. figure 7

B. Albert Einstein

1. photons
 - a. characteristics

C. Arthur Compton

IV. Atomic Spectra

A. phenomena of quantum nature of radiation

1. examples
 - a. serve as a ...
2. Two types of atomic spectra
 - a. emission spectrum
 - b. absorption spectrum
 1. figure 8
 - c. atomic spectroscopy

V. The Bohr Model of Hydrogen

A. Niels Bohr

1. Bohr's hypothesis
 - a. figure 9
 - b. key modification to Rutherford model

VI. Energy Levels

- A. Quantum number
- B. Ground state
 - 1. as the quantum number increases ...
 - 2. ionization energy
- C. Balmer series
 - 1. figure 10
- D. James Franck and Gustav Hertz
- E. Limitations of the Bohr model

VII. The de Broglie Hypothesis

- A. Louis de Broglie
 - 1. the faster a particle is moving ...
 - a. figure 11
 - 2. Clinton Davisson and Lester Germer
 - 3. Wave nature of Matter
 - a. transmission electron microscope (TEM)
 - 4. Characteristics of ordinary matter
 - a. examples

VIII. Wave-Particle Duality

- A. essence
 - 1. Young double-slit experiment
 - a. figure 12
 - b. Quantum theory

Modern Atomic Model- Section 1, p. 14-16

I. Quantum Mechanics

- A. Newtonian mechanics
 - 1. deterministic
 - 2. probabilistic
 - 3. “Schrödinger’s cat”
 - a. quantum perspective

II. Heisenberg Uncertainty Principle

- A. Uncertainty
 - 1. Macroscopic scale
 - a. measuring the position of an object
 - 2. Werner Heisenberg
 - a. George Gamow’s 1940 book Mr. Tompkins in Wonderland
 - 1. quantum jungle

III. Modern Quantum Model

- A. Schrödinger model (1926)
 - 1. figure 14
- B. Bohr model
 - 1. n
 - 2. l
 - 3. m_l
 - 4. m_s
- C. Pauli exclusion principle
 - 1. stacking
 - 2. figure 15