

1. Theory of Light

visible light, double-slit experiment, Faraday's law, Maxwell equations, wave-particle duality, electromagnetic spectrum

2. Historical development of quantum mechanics

black body radiation, photoelectric effect, Compton scattering, de-Broglie matter waves

3. Quantum mechanics

Pauli principle, Heisenberg uncertainty relation, Schrödinger equation, particle-in-box, quantum numbers, spin

4. Atomic orbitals

aufbau principle, term symbols, Hund rules, absorption and emission of light

5. Atomic models

Dalton, Thomson, Rutherford and Bohr models, line spectra (Balmer and Rydberg model)

6. Spectroscopy

translational motion, rotational motion, vibrational motion, rot-vib spectroscopy, Raman spectroscopy, lasers

7. Magnetic resonance methods

electron paramagnetic resonance (EPR) spectroscopy, nuclear magnetic resonance (NMR) spectroscopy