

Review

Waves

Sinusoidal waves

- Wave speed (sound)

- Doppler effect (sound)

- frequency, wavelength, period, transverse, longitudinal, intensity

Superposition and interference

Interference

- Single slit diffraction; circular opening

- Double slit

- Strings (transverse) and organ pipes (longitudinal)

Electricity

Basic laws

- Coulomb's law

- Multiple charges (vector)

- Electric field (vector)

- Field lines

- Gauss' law

Electric potential energy and electric potential

Getting the field and force vectors from scalar quantities

- Potential energy vs. potential

- Equipotentials

- Multiple charges

- Capacitance

Circuits

Ohm's law Power, voltage, current, resistance, resistivity

- Series and parallel resistance (derive?)

- Series and parallel capacitance (derive?)

- Kirchhoff's rules (apply!!)

Magnetic fields

Magnetic force

- On charged particle

- On current (long straight wire; wire loop)

- Torque

- Ampere's law

Electromagnetic induction

Induced EMF & Faraday's law

Moving conductor

Changing magnetic flux

Lenz's law

Generators and motors

Mutual inductance and self inductance

LRC circuits; amplifiers

Electromagnetic waves

Shape, spectrum, speed, energy, power

Doppler effect

Polarization

Reflection

Mirrors, concave and convex; real and virtual images; magnification; mirror equation

Refraction

Snell's law

Apparent depth

Total internal reflection

Lenses; ray tracing

Thin lens equation

Combinations: telescopes and microscopes

Magnification

Superposition and Interference

Interference

Double slit

Thin film

Interferometer

Diffraction (slit and circular)

Resolving power

Special Relativity

Postulates: the principle of relativity and constancy of the speed of light

Time dilation (light clocks)

Length contraction

Relativistic energy

Relativistic momentum

Relativistic addition of velocities

Particles and Waves

Wave-particle duality

Planck relation

de Broglie wavelength

Compton effect

Uncertainty principle

The nature of the atom

Bohr model of the hydrogen atom Radii for Bohr orbits

Bohr energies

Line spectra: Lyman, Balmer, Paschen . . .

Quantum mechanical model of atoms Quantum numbers: n, l, m_l, m_s

Pauli exclusion principle

Notation for electron configurations, $2p^5$

Nuclear physics and radioactivity

Atomic number, atomic mass number, number of neutrons

Binding energy of nuclei

α, β and γ decay and its relation to A, Z and N; decay series

Radioactive dating