

PRAXIS Secondary Education Physics Content Sheet

University of Northern Colorado
Department of Science Education
Created August 2023

i. Mechanics

- a. Description of motion in one and two dimensions
 - i. Scalar quantities (e.g., mass, speed, time, distance, energy)
 - ii. Vector quantities (e.g., displacement, velocity, acceleration, force, momentum)
- b. Newton's laws of motion
 - i. First law (mass, inertia)
 - ii. Second law (net force, mass, acceleration)
 - iii. Third law (action-reaction pairs)
- c. Mass, weight, and gravity
 - i. Distinguish between weight and mass
 - ii. Newton's law of universal gravitation and gravity fields
 - iii. Acceleration due to gravity
- d. Analysis of motion and forces
 - i. Contact forces (e.g., friction, normal force, and tension)
 - ii. Projectile motion
 - iii. Uniform circular motion and centripetal acceleration
 - iv. Rotational motion and torque
 - v. Periodic motion (e.g., Hooke's law; pendulum and spring oscillations)
 - vi. Work, mechanical energy, and power (e.g., conservation of energy, mechanical advantage, efficiency)
 - vii. Conservation of linear momentum (one dimension)
 - viii. Properties of fluids (e.g., buoyancy, density, pressure)

ii. Electricity and Magnetism

- a. Electrical nature of common materials
 - i. Electric charge and charge separation (attractive and repulsive forces)
 - ii. Coulomb's law and electric fields
 - iii. Conductors and insulators
- b. Basic electrical concepts
 - i. Current, resistance, capacitance, potential difference (sometimes called voltage), and power
 - ii. Ohm's law
 - iii. Distinguish between direct current and alternating current
 - iv. Sources of potential difference (e.g., batteries, generators, photocells)
 - v. Analysis of simple series and parallel circuits
- c. Magnetic fields, forces, and materials
 - i. Magnetic forces and fields (magnetic poles, attractive and repulsive forces)
 - ii. Magnets (e.g., permanent magnets, electromagnets)
 - iii. Magnetic field generated by steady current

- iv. Electric current generated by a changing magnetic field
- v. Motors and generators
- iii. **Waves and Optics**
 - a. Electromagnetic waves and the electromagnetic spectrum
 - i. Nature of light (e.g., electric and magnetic fields, speed of light, energy, photons)
 - ii. Electromagnetic spectrum, including the visible spectrum (colors)
 - b. Types of waves and their characteristics
 - i. Distinguish between transverse and longitudinal waves
 - ii. Distinguish between mechanical and electromagnetic waves
 - iii. Relationships between amplitude, wavelength, frequency, period, wave speed, and energy
 - c. Wave phenomena
 - i. Reflection, refraction, dispersion, and total internal reflection
 - ii. Diffraction, interference, superposition (standing waves), polarization
 - iii. Scattering, absorption, transmission
 - iv. Doppler effect, including apparent frequency and wavelength, moving source or observer
 - d. Basic geometric optics
 - i. Mirrors (plane, convex, concave)
 - ii. Lenses and their applications (e.g., human eye, microscope, telescope)
 - e. Sound
 - i. Sound as a longitudinal (compression) wave
 - ii. Pitch (frequency) and loudness (intensity)
 - iii. Applications of Doppler effect