



In Fascinating Physics, you will study the laws of nature governing movement, energy, and sound. You will learn about the forces of electricity, magnetism, gravity, and the atomic nucleus. Finally, you will understand how mathematical formulas summarize and predict events around us.

Lesson 1: Movement

- Graphs
- Velocity vs. time
- Acceleration
- Distance

Lesson 2: Vectors

- Speed and direction
- Adding vectors
- Tangent, cosine, and sine
- X and Y components of vectors

Lesson 3: Forces

- Newton's First Law
- Inertia
- Newton's Second Law
- Mass vs. weight
- Newton's Third Law
- Static friction
- Kinetic friction
- Pulleys

Lesson 4: Energy-Work-Power

- Potential energy
- Kinetic energy
- Momentum
- Impulse
- Work
- Springs
- Spring constant
- Conservation of Energy
- Collisions
- Terminology Chart

Lesson 5: Circular Motion

- Angular distance
- Angular velocity
- Angular acceleration
- Angular vectors
- Centripetal acceleration
- Tangential velocity
- Centripetal force
- Moment of inertia
- Torque
- Angular momentum
- Precession

- Work in angular motion
- Summary chart
- Center of gravity
- Levers
- Universal Law of Gravitation

Lesson 6: Fluids and Gases

- Buoyancy
- Density
- Pressure
- Work Performed by Fluids and Gases
- Hydraulics
- Bernoulli's Principle
- Energy of a Gas
- Ideal Gas Law
- Fahrenheit and Celsius Temperature Scales
- Kinetic Energy of a Gas
- Heat vs. Temperature
- Specific Heat Capacity
- Water's Kinetic and Potential Energy
- Latent Heat of Fusion
- Latent Heat of Vaporization
- Measuring Specific Heat Capacity
- Heat Flow

Lesson 7: Waves

- Simple harmonic motion
- Springs: potential and kinetic energy
- Spring constant
- Pendular motion
- Time constant
- Cycloid
- Waves: frequency and length
- Sound waves
- Sound intensity: decibels
- Doppler Effect
- Guitar strings and pitch
- Open and closed organ pipes

Lesson 8: Light, Part 1

- Photons: electromagnetic waves
- Light refraction
- Index of Refraction
- Snell's Law
- Speed of light
- Temperature of light
- Summary chart
- Critical angle
- Light transparency
- Rainbows
- Mirages

Lesson 9: Light, Part 2

- Sunlight
- Ionizing energy
- Orbitals
- Suborbitals
- Planck's Constant
- Wavelength frequency
- Rydberg's Formula
- Spectroscopy
- Fraunhofer lines
- Emission spectrums
- Max Planck: energy quanta
- Louis de Broglie
- Erwin Schroedinger
- Lasers
- Reflection: Brewster's Angle
- Polarized light

Lesson 10: Light, Part 3

- Light reflection
- Concave mirrors
- Center of curvature
- Focal point
- Principal axis
- Calculating object, image size, and location

- Convex mirrors
- Convex lenses
- Concave lenses
- Light interference
- Thomas Young: measuring light wavelength

Lesson 11: Electrical Charges

- Electrical charge
- Electrical field
- Permittivity
- Electrical force
- Gravitational force
- Millikan: electrical charge on electron
- Strong Force
- Calculating electrical forces
- Lightning
- Van der Graaf generators
- Electrical flux
- Electrical field strength
- Hollow conductors
- Voltage
- Capacitors
- Comparing linear motion and electricity

Lesson 12: Moving Electrical Charges

- Voltage, current, resistance
- Series Circuits
- Adding up resistors in a series circuit
- Parallel circuits
- Adding up resistors in a parallel circuit
- Capacitors
- Adding up capacitors in a series circuit
- Adding up capacitors in a parallel circuit
- Magnetic fields around electrical fields
- Right-Hand Rule
- Solenoids

- Magnetic pole strength
- Magnetic field strength
- Calculating magnetic force from moving electrical charges

Lesson 13: Electrical Currents

- Galvanometer
- Voltmeter
- Electrical motor
- Changing magnetic flux
- Lenz' Law
- Alternating current
- Eddy currents
- Root Mean Square
- Joule's Law
- Back EMF
- Transporting electricity
- Impedance
- Inductance
- Phase lag in alternating current
- Resonant frequency

Lesson 14: The Atom

- Wave properties of light
- Maxwell's Equations
- Heinrich Hertz: detecting electromagnetic Waves
- Photoelectric effect
- Albert Einstein: photons of electromagnetic Energy
- Compton effect
- Louis deBroglie: wave properties of mass
- Heisenberg Uncertainty Principle
- Metastable atoms
- Maiman: The laser
- Fluorescent light bulbs

Lesson 15: The Nucleus

- Thomas Edison: rectification
- Sir John Fleming: detecting electromagnetic waves
- Lee De Forest: amplifying electrical currents
- transistors
- Michaelson and Morely: speed of light

Lesson 15: The Nucleus (continued)

- Albert Einstein: Theory of Special Relativity
- Interchangeability of mass and energy
- Energy in the nucleus
- Nuclear Radiation: Alpha, Beta, and Gamma
- Henri Bequerel: radioactivity
- Half Lives of radioactive elements
- The Atom Bomb
- Nuclear fusion by the sun