

AP Physics B Syllabus

Textbook: Physics: Serway-Vuille, College Physics 10th Edition

MECHANICS

Timeline Chapters	I. Newtonian Mechanics
September Chapters 2&3	A. Kinematics (including vectors, vector algebra, components of vectors, coordinate systems, displacement, velocity, and acceleration) <ol style="list-style-type: none">1. Motion in one dimension2. Motion in two dimensions including projectile motion
October Chapter 4&5	B. Newton's laws of motion (including friction and centripetal force) <ol style="list-style-type: none">1. Static equilibrium (first law)2. Dynamics of a single particle (second law)3. Systems of two or more bodies (third law)4. Newton's law of gravity
November Chapter 6	C. Work, energy, power <ol style="list-style-type: none">1. Work and work-energy theorem2. Conservative forces and potential energy3. Conservation of energy4. Power5. Machine Theory
December Chapter 5,7,8&10	D. Systems of particles, linear momentum <ol style="list-style-type: none">1. Center of mass (concept, not equation)2. Impulse and momentum3. Conservation of linear momentum, collisions4. Elastic & Inelastic Collisions E. Circular motion and rotation <ol style="list-style-type: none">1. Uniform circular motion2. Angular momentum and its conservation<ol style="list-style-type: none">a. Satellites & Keplers Lawb. $l = mvr$ examples (skater)3. Torque and rotational statics and dynamics F. Oscillations <ol style="list-style-type: none">1. Simple harmonic motion (dynamics and energy relationships)2. Mass on a spring3. Pendulum and other oscillations4. Orbits of planets and satellites G. Relativity: (after AP) <p>time dilation, spatial contraction, energy-mass conversion, gravitational anomalies.</p>

SKILLS	TRIGONOMETRY: breaking forces and motions into 2-D components, 2-D Collisions and momentum. MULTI-STEP Problems: simultaneous equations. VECTOR ALGEBRA: Cross Product, Dot Product, Vector Subtraction. AREA UNDER CURVE (pre-calc).
ASSESSMENT	Multiple Choice Drill: AP B problem Book Free Response Assessment: AP B Problem Book Problem Sets: (from text) Computer Simulations (Interactive Physics on CD ROM) Mechanical Universe Video Series
ACTIVITIES:	LABS: Torque & Tools, Balancing & Center of Mass, Collisions on a airtrack.

Fluid Mechanics and Thermal Physics

January Chapters 9,12,13 & 14	<p>A.Fluid Mechanics</p> <ol style="list-style-type: none"> 1.Hydrostatic pressure 2.Buoyancy 3.Fluid flow continuity 4.Bernoulli's equation 5. Specific Gravity 6. Archimedes Principle 7. Drag, viscosity, adhesion, cohesion. <p>B.Temperature and heat</p> <ol style="list-style-type: none"> 1.Mechanical equivalent of heat 2.Specific and latent heat (including calorimetry) 3.Heat transfer and thermal expansion <p>C.Kinetic theory and thermodynamics</p> <ol style="list-style-type: none"> 1.Ideal gases <ol style="list-style-type: none"> a.Kinetic model b.Ideal gas law 2.Laws of thermodynamics <ol style="list-style-type: none"> a.First law (including processes on pV diagrams) b.Second law (including heat engines)
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ASSESSMENT Activit	Multiple Choice Drill: AP B problem Book Free Response Assessment: AP B Problem Book Problem Sets: (from text) Computer Simulations (Interactive Physics on CD ROM)
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ies	Mechanical Universe Video Series LABS: Finding specific gravity and buoyant force, calorimeter measurements of specific heat, calibrate a thermometer demonstration.
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Electricity and Magnetism

<p>February Chapters 15,16,17 & 18</p>	<p>A. Electrostatics</p> <ol style="list-style-type: none"> 1. Charge, field, and potential 2. Coulomb's law and field and potential of point charges 3. Fields and potentials of other charge distributions (planar) <p>B. Conductors, capacitors, dielectrics</p> <ol style="list-style-type: none"> 1. Electrostatics with conductors 2. Capacitors <p>C. Electric circuits</p> <ol style="list-style-type: none"> 1. Current, resistance, power 2. Steady-state direct current circuits with batteries and resistors only 3. Capacitors in circuits (steady state)
<p>March Chapters 19,20</p>	<p>D. Magnetostatics</p> <ol style="list-style-type: none"> 1. Forces on moving charges in magnetic fields 2. Forces on current-carrying wires in magnetic fields 3. Fields of long current-carrying wires <p>E. Electromagnetism</p> <ol style="list-style-type: none"> 1. Electromagnetic induction (including Faraday's law and Lenz's law), inductors. <p>F. Electromagnetic Applications</p> <p>AC, impedance, inductance capacitive reactance, transformers, generators, motors, radio, television (cathode ray tube), lasers, ammeters & voltmeters.</p> <p>G. Electronics (post AP): semi-conductors, diodes, transistors.</p>

SKILLS	VECTOR ALGEBRA: Flux, Cross Product, Dot Product, Hand Rules.
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ASSESSMENT	Multiple Choice Drill: AP B problem Book Free Response Assessment: AP B Problem Book Problem Sets: (from text) Computer Simulations (Interactive Physics on CD ROM) Mechanical Universe Video Series
ACTIVITIES	LABS:discharging a capacitor, transformer measurements, oscilloscope.

Waves and Optics

April Chapters 11,23,24 & 25	<ul style="list-style-type: none"> A.Wave motion (including sound) <ul style="list-style-type: none"> 1.Properties of traveling waves 2.Properties of standing waves 3.Doppler effect 4.Superposition B.Physical optics <ul style="list-style-type: none"> 1.Interference and diffraction 2.Dispersion of light and the electromagnetic spectrum 3. Color Theory C.Geometric optics <ul style="list-style-type: none"> 1.Reflection and refraction 2.Mirrors 3.Lenses
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SKILLS	Geometric constructions, protractor & compass.
ASSESSMENT	Multiple Choice Drill: AP B problem Book Free Response Assessment: AP B Problem Book Problem Sets: (from text) Computer Simulations (Interactive Physics on CD ROM) Mechanical Universe Video Series
ACTIVITIES	LABS:lenses & mirrors, youngs double slit experiment, mixing colored pigments & colored light beams, filter

Atomic and Nuclear Physics

April (cont) Chapters 27-30	—	A.Atomic physics and quantum effects
	<ol style="list-style-type: none"> 1.Photons and the photoelectric effect 2.Atomic energy levels 3.Wave-particle duality <p>B.Nuclear physics</p> <ol style="list-style-type: none"> 1.Nuclear reactions (including conservation of mass number and charge) 2.Mass-energy equivalence 	
Assessment	Multiple Choice Drill: AP B problem Book Free Response Assessment: AP B Problem Book Problem Sets: (from text) Computer Simulations (Interactive Physics on CD ROM) Mechanical Universe Video Series	
Activities		
May 1 to exam	Review for AP test	
After AP test	Individual Projects and presentations	

Laboratory Experiments

AP Physics B

All labs are a minimum of 80 minutes long

- Lab 1 Determine the Thickness of Page
- Lab 2 Analyzing the 20-meter Sprint
- Lab 3 Motion Detector Graphs
- Lab 4 Galileo's Ball Drop: Acceleration of Gravity
- Lab 5 Bubble-level Accelerometer
- Lab 6 Water Balloon Kinematics (Projectile Motion)
- Lab 7: Range vs Angle with Projectile launcher
- Lab 8 String Tension: The Effect of Angle and Multiple strings
- Lab 9 Centripetal Force with Spinning Stopper
- Lab 10 Investigating Momentum with Carts
- Lab 11 Determine Work Done by Pulley and It's efficiency
- Lab 12 Hooke's law : Spring Extension
- Lab 13 Buoyancy measurements and Archimede's Principle
- Lab 14: The Period of a Pendulum
- Lab 15: Electrostatics with Fur and Rods
- Lab 16: Build a Working Electroscope
- Lab 17: mapping Equipotential Lines and Deducing Electric Field maps
- Lab18: Series and Parallel Circuits (including a Light Bulb lab)
- Lab 19: Measuring Resistance
- Lab 20: Mapping Magnetic fields
- Lab 21: Build a motor
- Lab 22: Water waves
- Lab 23: Geometric Optics with lenses and mirrors and an Optics Box
- Lab 24: Determening the Focal point with an Optical Bench
- Lab 25: Color Mixing
- Lab 26: Laser Interference Pattern: Determining the wavelength of Light with
Young's Double Slit Formula