Advanced Placement Physics B

Text:	*Physics; principles with applications*, Douglas C. Giancoli; 5th Ed. Prentice Hall

Supplemental Materials:	Lab activities from various sources.

Course Description:	AP Physics B is an algebra-based, college level, introductory physics course which follows the AP Physics B Course Description and objectives covering kinematics, Newtonian motion, work, power, energy, momentum, circular motion, oscillations, gravitation, thermodynamics, fluid mechanics, electricity, magnetism, nuclear physics and waves/optics. Problem solving, reading, understanding and interpreting physical information as well as using basic mathematical reasoning is a vital component of this course. The lab component of this course is designed to give student experience in performing experiments, analyzing and graphing data, interpreting and presenting results, and evaluating error and uncertainty. Students are expected to take the AP examination in May. Should a student not sit the AP exam, they will be required to take a comprehensive course final exam during final exam week. All students are urged and expected to take the AP exam. Prerequisite: Recommendation of previous science teachers

Methods of Evaluation:	Students can be evaluated through tests, laboratory reports and quizzes, concept quizzes, class work, homework, projects, semester exams and/or any other form of evaluation instrument the instructor finds applicable to the course.

Pace of Instruction:	This course meets for 90 minutes a day, 5 days a week for the number of days seniors are present. A laboratory exercise is done approximately once every two weeks and takes from 1 to 3 class periods. The pacing of the course generally follows the percentages for coverage listed in the AP Physics B Course Description. The content is covered in time to leave the two weeks before the AP Exam for review. Please see attached syllabus.

Course Content:

I. Mechanics

Motion in One Dimension Chapter 2 (2 weeks)
Velocity and Acceleration
Freely Falling Objects
Motion in Two Dimensions Chapter 3 (1 ½ weeks)
Vectors, addition and subtraction, graphically and analytically
Projectile Motion
Forces-Newton's Laws Chapter 4 (2 weeks)
Newton's Laws
Mass and Weight
Free Body Diagrams
Friction
Inclined Planes
Circular Motion Chapter 5 (1 week)
Uniform Circular Motion
Non-uniform Circular Motion
Universal Gravitation
Satellites, Circular Orbits and Weightlessness
Kepler's Laws
Work and Energy Chapter 6 (1 ½ weeks)
Work
Kinetic Energy
Potential Energy
Conservation of Mechanical Energy
Linear Momentum Chapter 7 (1 ½ weeks)
Momentum, Impulse and Force
Conservation of Momentum
Collisions and Impulse
Elastic and Inelastic Collisions
Collisions in Two and Three Dimensions
Center of Mass
Rotational Motion and Equilibrium Chapters 8 and 9 (2 weeks)
Uniformly Accelerated Rotational Motion
Rolling Motion
Torque
Angular Momentum and its Conservation
Rotational and Translational Equilibrium

II. Fluid Mechanics and Thermal Physics

Fluids Chapter 10 (1 ½ weeks)
Density
Pressure; in fluids, atmospheric, gauge and absolute
Pascal's Principal
Buoyancy and Archimedes' Principle
Flow rate, equation of continuity
Bernoulli's Equation

Temperature, Kinetic Theory and Heat Chapters 13 and 14 (2 ½ weeks)
Atomic theory of matter
Temperature and thermometers
Thermal expansion
Gas Laws
Kinetic theory and molecular interpretation of temperature
Mechanical equivalent of heat
Distinction between temperature, heat and internal energy
Specific heat and Calorimetry
Latent Heat
Heat transfer-convection, conduction and radiation
Thermodynamics Chapter 15 (1 week)
Isobaric, isometric, isothermic, adiabatic expansion/compression in PV diagrams
1st Law of Thermodynamics
Work done on/by system, cyclic processes, work as area enclosed in PV diagrams
2nd Law of Thermodynamics
Entropy
Heat Engines and efficiency
Heat exchange
Carnot cycle

III. Waves and Optics

Vibrations and Waves Chapter 11 (1 ½ weeks)
Simple harmonic motion
Simple pendulum
Resonance and forced vibrations
Wave motion
Transverse and longitudinal waves
Reflection, refraction, diffraction, interference
Standing waves
Sound Chapter 12 (1 ½ weeks)
Characteristics of sound
Intensity
Vibrating strings and air columns
Interference of sound waves, beats
Doppler Effect
Light and Optics Chapters 22, 23 and 24 (2 ½ weeks)
Production of electromagnetic waves
The electromagnetic spectrum
Measuring the speed of light
Physical Optics:
Single and double slit interference, thin films
Geometric Optics:
Reflection, refraction and Snell's Law, total internal reflection, plane and spherical lenses, converging and diverging lenses, ray diagrams, lens/mirror equation

IV. Electricity and Magnetism

Electric Charge and Electric Field Chapter 16 (1 week)
Charge and Coulombs Law
Induced and polarized charges
Direction of forces on charges and their motions
Electric fields and conductors
Electric Potential and Electric Energy; Capacitance Chapter 17 (1 week)
Electric potential and potential difference
Electric potential and electric field
Test and point charges
Capacitance and dielectrics
Electric Circuits Chapters 18 and 19 (2 weeks)
EMF, current, power
Ohm's law: resistance
DC circuits
Series and Parallel Circuits
Batteries and internal resistance
Kirchhoff's Rules
Voltmeters and ammeters
Magnetism Chapter 20 (1 week)
Magnets and magnetic fields
Force of a magnetic field on moving charges
Force of a magnetic field on current carrying wires
Fields due to current carrying wires, straight and coiled
Electromagnetic Induction Chapter 21 (1 week)
Magnetic Flux
Faraday's Law and Lenz's Law
Induced EMF and current in a moving conductor
Motors and generators
Transformers

V. Atomic and Nuclear Physics

Modern Physics Chapters 27 and 28 (1 1/2 weeks)
Photons and the Photoelectric Effect
Compton Effect and pair production
Particle-wave duality-experimental evidence for each
Early models of the atom
Atomic energy levels and spectra-the Bohr model
Nuclear Physics Chapters 30 and 31 (1 week)
Structure and properties of the nucleus
Binding energy and mass defect
Alpha, Beta and Gamma decay, fusion and fission
Conservation of mass and charge
Mass-Energy Equivalence, Conservation of Mass and Energy

Lab List

Please note that for labs in which students generate their own procedure and equipment list the indication is made in the Lab Title.

#	Topic	Lab Title	Report Type	Class Periods
Mechanics				
1	Gravity, Free Fall	Measuring *g* with a tape timer Students design procedure.		1
2	Projectile Motion	Analyzing Projectile Motion	Standard Report	3
3	Free Fall	Mini-Lab, Reaction Time (procedure designed, data collected and written up during one period)	Standard Report	1
4	Friction, Inclined Planes	Measuring Coefficient of Friction Using Inclined Planes Students design procedure.	Standard Report	1
5	Circular Motion	Measuring *g* Using Circular Motion Students design procedure.	Standard Report	1
6	Energy Conservation	Conservation of Energy, Work vs. PE on an Inclined Plane	Standard Report	1
7	Hooke's Law	Determine spring constant using Hooke's Law and oscillation frequency. Students design procedure.	Standard Report	2
Fluids				
8	Archimedes' Principle	Archimedes' Principle	Standard Report	1
Waves				
9	Waves, Sound	Measuring the speed of sound in air Students design procedure.	Standard Report	1
Heat and Thermodynamics				
10	Heat Transfer, Newton's Law of Cooling	When to add the cream to the coffee--open-ended investigation. Students design the procedure and an equipment list.	Standard Report	2
11	Specific Heat	Identify 5 unknowns by determining their specific heat capacities. Students design procedure.	Standard Report	1
Electricity and Magnetism				
12	Electrostatics	Guided investigation of Electrostatic Phenomena (using a Van de Graaff, silk and glass, wool and plastic, pith balls, balloons, electroscopes)	Procedure, description and explanation of observations	1
13	Electric Circuits	Series and Parallel Circuits, Ohm's Law	Standard Report	1
14	Magnetic Fields	Mapping Magnetic Fields	Standard Report	1

15	Magnetic Induction	Mini-Lab Making a simple motor (motor made and summary paragraph written in one period	Paragraph Summary	1
Optics				
16	Refraction, Snell's Law	Determine index of refraction of crown glass Students design procedure.	Standard Report	1
17	Lenses	Determine focal length of convex and concave lenses Students design procedure.	Standard Report	1
18	Double-slit diffraction	Determining laser wavelength Students design procedure.	Standard Report	1
Modern Physics				
19	Energy levels in the Hydrogen atom	Using spectroscopy to determine the wavelengths of hydrogen light and then calculating the energies associated with the electron transitions.	Procedure, analysis and answer conclusion questions	2