College Prep Physics—Grades 11 & 12

Unit: **Mechanics**

Content Standard: **Organize theoretical and experimental information using analytical and descriptive techniques.**

State Curriculum Standard: **(3.1.12.D) Analyze scale as a way of relating concepts and ideas to one another by some measure.**
(3.2.12.B) Evaluate experimental information for appropriateness and adherence to relevant science processes.

Course Content	Student Performance	Resources	Assessments

A. The scientific method is a way of answering questions about the world around us.
 	
B. Measurements are uncertain because instruments are never error-free and because of inherent properties of nature.
 	
C. Measurements in science must be both precise and accurate.
 	
D. SI is used worldwide in science as a standard of measurement.
 	
E. SI units can be combined to form derived units.
	• Use scientific method
	
	• Recognize error in the measurements
	
	• Use the SI system and its prefixes
	
	• Use scientific notation
	
	• Calculate percent error
	
	• Explain the differences between precision and accuracy
	
	• Solve problems converting SI and non SI units
		• Conceptual Physics (Prentice Hall 2006)
		
		• Worksheets using SI conversions, scientific notations, and percent error
		
		• Lab
		  • Measuring Mass and Volume
		
		• Software
		  • PowerPoint
			• Homework Check
			
			• Individual Portfolios
			
			• Publisher Tests
			
			• Teacher Observations
			
			• Teacher Quizzes
			
			• Laboratory Reports
			
			• Student Problem Presentations
			
			• Student PowerPoint Presentations

College Prep Physics—Grades 11 & 12

Unit: **Mechanics**

Content Standard: **Analyze Linear Motion.**

State Curriculum Standard: **(3.4.12.C) Apply the principles of motion and force.**
(3.2.12.C) Apply the elements of scientific inquiry to solve multi-step problems.

Course Content	Student Performance	Resources	Assessments
A. Vocabulary. • Average Speed. • Instantaneous Speed. • Uniform acceleration. • Free Fall. B. How Far? C. How Fast? D. Galileo's Ideas. E. Laboratory Activities. • Acceleration in Free Fall. • Graphing Data. • Computer Graphing.	• Use appropriate vocabulary to describe and analyze freely falling objects • Solve simple problems using kinematic equations • Explain some basic concepts of Aristotle and Galileo regarding motions • Analyze motions on inclined planes • Use computer to analyze data	• Conceptual Physics (Prentice Hall 2006) • Demonstrations • Vacuum Tube Free Fall • Free Fall in Air • Acceleration on an Inclined Plane • Teacher Notes • Software • Graph Analysis • Excel • PowerPoint	• Homework Check • Individual Portfolios • Publisher Tests • Teacher Observations • Teacher Quizzes • Laboratory Reports • Student Problem Presentations • Student PowerPoint Presentations

College Prep Physics—Grades 11 & 12

Unit: **Mechanics**

Content Standard: **Use vectors to analyze nonlinear motions.**

State Curriculum Standard: **(3.4.12.C) Apply the principles of motion and force.**
(3.2.12.C) Apply the elements of scientific inquiry to solve multi-step problems.
(3.1.12.C) Assess and apply patterns in science and technology.

Course Content	Student Performance	Resources	Assessments
A. Vector and Scalar Quantities . B. Vector and Horizontal Projectiles. C. Circular Motion. D. Centripetal and Centrifugal Forces. E. Laboratory Activities. • Bull's Eye. • Forces in Equilibrium.	• Distinguish between vector and scalar quantities. Add and resolve vectors • Calculate the range of a horizontal projectile • Define centripetal and centrifugal forces • Compare a calculated range to an actual range • Use photogate and computer to measure velocity	• Conceptual Physics (Prentice Hall 2006) • Lecture Notes • Demonstrations • Ballistic Car • Launching Projectile • Rotating Candle Paradox • Software • Logger Pro • PowerPoint	• Homework Check • Individual Portfolios • Publisher Tests • Teacher Observations • Teacher Quizzes • Laboratory Reports • Student Problem Presentations • Student PowerPoint Presentations

College Prep Physics—Grades 11 & 12

Unit: **Mechanics**

Content Standard: **Analyze and apply impulse and momentum to collisions and explosions**.

State Curriculum Standard: **(3.4.12.C) Apply the principles of motion and force.**
(3.2.12.C) Apply the elements of scientific inquiry to solve multi-step problems.
(3.1.12.C) Assess and apply patterns in science and technology.

Course Content	Student Performance	Resources	Assessments
A. Momentum and Impulse. B. Impulse equals change in Momentum. C. Bouncing. D. Conservation of Momentum. E. Elastic Collisions. F. Inelastic Collisions. G. Laboratory Activity. • Tailgated by a Dart.	o Define momentum and impulse o State the Law of Conservation of Momentum • Distinguish between elastic and inelastic collisions • Give examples of the vector nature of momentum • Explain why impulses are greater when objects bounce • Measure and calculate momentum	• Conceptual Physics (Prentice Hall 2006) • Lecture Notes • Demonstrations • Super Ball • Collision of Spheres • Inelastic and Elastic • Collision with a Wooden Block • Software • Logger Pro • Excel • PowerPoint	• Homework Check • Individual Portfolios • Publisher Tests • Teacher Observations • Teacher Quizzes • Laboratory Reports • Student Problem Presentations • Student PowerPoint Presentations

College Prep Physics—Grades 11 & 12

Unit: **Mechanics**

Content Standard: **Use Newton's Laws to explain the causes of motion.**

State Curriculum Standard: **(3.4.12.C) Apply the principles of motion and force.**
(3.2.12.C) Apply the elements of scientific inquiry to solve multi-step problems.
(3.1.12.C) Assess and apply patterns in science and technology.

Course Content	Student Performance	Resources	Assessments
A. Newton's Three Laws of Motion. B. Inertia. C. Terminal Speed. D. Newton's Laws and Circular Motion. E. Newton's Laws and Rockets. F. Laboratory Activities. • Changing Mass Lab. • Changing Force Lab.	• State Newton's Laws of Motion • Define and give examples of Inertia • Define terminal speed and explain why it occurs • Solve simple Newton Second Law problems • Explain the relationship between inertia and turning earth • Construct and analyze graphs. Use the computer to measure acceleration	• Conceptual Physics (Prentice Hall 2006) • Lecture Notes • Demonstrations • Inertia • Action-Reaction • Free Fall • Software • Logger Pro • Graph Analysis • Exel • PowerPoint	• Homework Check • Individual Portfolios • Publisher Tests • Teacher Observations • Teacher Quizzes • Laboratory Reports • Student Problem Presentations • Student PowerPoint Presentations

College Prep Physics—Grades 11 & 12

Unit: **Mechanics**

Content Standard: **Analyze and apply the concepts of Work, Power, and Energy.**

State Curriculum Standard: **(3.4.12.C) Apply the principles of motion and force.**
(3.2.12.C) Apply the elements of scientific inquiry to solve multi-step problems.
(3.4.12.B) Apply and analyze energy sources and conversions and their relationship to heat and temperature.

Course Content	Student Performance	Resources	Assessments
A. Work. B. Power. C. Mechanical Energy. D. Work-Energy Theorem. E. Conservation of Energy. F. Simple Machines. G. Efficiency. H. Laboratory Activities. • Energy of a Pendulum. • Energy of a Spring.	• Define: Work, Power, and Energy • Determine the amount of work done, given force and distance moved • Distinguish among mechanical energy, potential energy, and kinetic energy • State Law of Conservation of Energy • Calculate the mechanical advantages of simple machines • Measure the forces in springs and pendulums	• Conceptual Physics (Prentice Hall 2006) • Lecture Notes • Demonstrations • Pendulum • Spring • Free Fall • Software • Logger Pro • Graph Analysis • Excel • PowerPoint	• Homework Check • Individual Portfolios • Publisher Tests • Teacher Observations • Teacher Quizzes • Laboratory Reports • Student Problem Presentations • Student PowerPoint Presentations

College Prep Physics—Grades 11 & 12

Unit: **Mechanics**

Content Standard: **Apply Newton's Laws to rotational motions.**

State Curriculum Standard: **(3.4.12.C) Apply the principles of motion and force.**
(3.2.12.C) Apply the elements of scientific inquiry to solve multi-step problems.
(3.1.12.B) Apply concepts of models as a method to predict and understand science and technology.

Course Content	Student Performance	Resources	Assessments

A. Newton's Laws and Circular Motion.
 	
B. Center of Gravity and Center of Mass.
 	
C. Torque-Moments.
 	
D. Mechanical Stability.
 	
E. Centrifugal and Centripetal Forces.
 	
F. Laboratory Activity.
• Centripetal Force Lab.
	• Define center of gravity and center of mass
	
	• Locate center of gravity
	
	• Predict when an object will fall
	
	• Define centripetal and centrifugal force
	
	• Calculate centripetal and centrifugal forces
	
	• Describe how to simulate gravity
	
	• Measure centripetal forces
		• Conceptual Physics (Prentice Hall 2006)
		
		• Lecture Notes
		
		• Demonstrations
		  • Orbits of Planets
		  • Rotating Candle
		  • Stopper on a String
		
		• Software
		  • Logger Pro
		  • Graph Analysis
		  • Excel
		  • PowerPoint
			• Homework Check
			
			• Individual Portfolios
			
			• Publisher Tests
			
			• Teacher Observations
			
			• Teacher Quizzes
			
			• Laboratory Reports
			
			• Student Problem Presentations
			
			• Student PowerPoint Presentations

College Prep Physics—Grades 11 & 12

Unit: **Mechanics**

Content Standard: **Explain how Newton's Universal Law of Gravity applies to satellite motion.**

State Curriculum Standard: **(3.4.12.C) Apply the principles of motion and force.**
(3.2.12.C) Apply the elements of scientific inquiry to solve multi-step problems.
(3.4.12.D) Analyze the essential ideas about the composition and structure of the universe.

Course Content	Student Performance	Resources	Assessments
A. Kepler's Laws. B. Gravity and Distance. C. Newton's Law of Universal Gravitation. D. Weight and Weightlessness. E. Tides. F. Black Holes. G. Laboratory Activities. • Period of a Pendulum. • Distance-Brightness of Light.	• State Newton's Universal Law of Gravitation • Explain the significance of an Inverse Square Law • State Kepler's Laws • Explain how something can have weight but appear weightless • Explain why the moon does not fall into the earth or the planets into the sun • State factors that influence the period of a pendulum. Determine the Acceleration of Gravity from the period of a pendulum	• Conceptual Physics (Prentice Hall 2006) • Lecture Notes • Demonstrations • Inverse Square Law • Magnets and Gravity • Computerized Gravity • Software • Logger Pro • Graph Analysis • Excel • PowerPoint	• Homework Check • Individual Portfolios • Publisher Tests • Teacher Observations • Teacher Quizzes • Laboratory Reports • Student Problem Presentations • Student PowerPoint Presentations

Unit: **Electrostatics**

College Prep Physics—Grades 11 & 12

Content Standard: **Using Atomic theory, explain different methods of electrostatic charging.**

State Curriculum Standard: **(3.1.12.B) Apply concepts of models as a method to predict and understand science and technology.**
(3.4.12.A) Apply concepts about the structure and properties of matter.

Course Content	Student Performance	Resources	Assessments
A. Coulomb's Law. B. Law of Conservation of Charge. C. Methods of Producing an Electrostatic Charge. D. Electric Field. E. Conductors and Insulators. F. The Electroscope. G. The Van De Graaff Generator. G. Laboratory Activity. • Static Cling.	o State Coulomb's Law and the Law of conservation of charge o Do Coulomb's Law problems o Describe and give examples of objects being charged by induction, conduction, and polarization o Describe structure and operation of the Van De Graaff generator and the electroscope o Charge objects using polarization, induction, and conduction	• Conceptual Physics (Prentice Hall 2006) • Lecture Notes • Demonstrations • Methods of Charging • Electroscope • Van De Graaff • Leyden Jar • Electroscope as a Measuring Tool • Software • PowerPoint	• Homework Check • Individual Portfolios • Publisher Tests • Teacher Observations • Teacher Quizzes • Laboratory Reports • Student Problem Presentations • Student PowerPoint Presentations

Unit: **Electric Currents**

College Prep Physics—Grades 11 & 12

Content Standard: **Use the Electron Theory to analyze electric currents.**

State Curriculum Standard: **(3.2.12.C) Apply the elements of scientific inquiry to solve multi-step problems.**
(3.1.12.B) Apply concepts of models as a method to predict and understand science and technology.

Course Content	Student Performance	Resources	Assessments
A. Ohm's Law. B. Kirchoff's Rule. C. Short Circuits. D. Series and Parallel Circuits. E. Galvanometer, ammeter, and Voltmeter-Oerstead's Principle. F. Batteries and Generators. G. Electrical Circuits in the Home. H. Laboratory Activities. • Electromagnetic Induction. • Ohm's Law.	• State: Ohm's Law • Solve problems using Coulomb's Law, Kirchoff's rules, Principle of Electromagnetic Induction and Oerstead's Principle • Build series and parallel circuits. Solve problems to determine current flow in series and parallel circuits • Explain operation of electric motors and generators • Build simple electric circuits • Measure centripetal forces	• Conceptual Physics (Prentice Hall 2006) • Lecture Notes • Demonstrations • Cathode Ray Tubes • Electric Generator • Potato Battery • Electric Motor • Software • Logger Pro • Graph Analysis • Excel PowerPoint	• Homework Check • Individual Portfolios • Publisher Tests • Teacher Observations • Teacher Quizzes • Laboratory Reports • Student Problem Presentations • Student PowerPoint Presentations

Unit: **Magnetism**

College Prep Physics—Grades 11 & 12

Content Standard: **Use magnetic properties to explain the operation of motors and meters.**

State Curriculum Standard: **(3.2.12.C) Apply the elements of scientific inquiry to solve multi-step problems.**
(3.1.12.B) Apply concepts of models as a method to predict and understand science and technology.

Course Content	Student Performance	Resources	Assessments
A. Magnetic poles and magnetic fields. B. Oerstead's Principle. C. Electromagnets. D. Electric Motors. E. Earth's Magnetic Field. F. Faraday's Law. G. Electric Generators. H. Transformers. I. Laboratory Activity. • Principle of Electromagnetic Induction.	• Define magnetic domain • State Oerstead's Principle • State the Principle of Electromagnetic Induction • List the main parts of an electric motor and explain how it works • Explain why charged particles can be bent by a magnetic field. Suggest possible causes for the Earth's magnetic field • Measure induced voltages on the computer	• Conceptual Physics (Prentice Hall 2006) • Lecture Notes • Demonstrations • Cathode Rays • Electromagnetic Induction • Making something magnetic • Software • Logger Pro • Graph Analysis • Excel • PowerPoint	• Homework Check • Individual Portfolios • Publisher Tests • Teacher Observations • Teacher Quizzes • Laboratory Reports • Student Problem Presentations • Student PowerPoint Presentations

Unit: **Sound and Light**

College Prep Physics—Grades 11 & 12

Content Standard: **Use Wave Theory to explain observations about sound and light.**

State Curriculum Standard: **(3.2.12.C) Apply the elements of scientific inquiry to solve multi-step problems.**
(3.1.12.B) Apply concepts of models as a method to predict and understand science and technology.

Course Content	Student Performance	Resources	Assessments
A. Types of Waves. B. Harmonic Motion. C. Variations of Waves. • Inference. • Diffraction. • Refraction. • Doppler Effect. • Polarization. D. Careers. E. Laboratory Activity. • Velocity of Sound.	• Describe two types of waves • Give examples of harmonic motion • Give examples of the variations of waves as they apply to sound and light. Do lens problems • Explain what an engineer does and types of engineering • Relate the pitch, loudness and quality of sound to different parts of the sound wave. (Use resonance to determine the velocity of sound)	• Conceptual Physics (Prentice Hall 2006) • Lecture Notes • Demonstrations • Resonance • Tuning Forks • Oscilloscope and Sound Variations • Career Room • Resonance Tubes	• Homework Check • Individual Portfolios • Publisher Tests • Teacher Observations • Teacher Quizzes • Laboratory Reports • Student Problem Presentations • Student PowerPoint Presentations

Unit: **Electromagnetic Radiation**

College Prep Physics—Grades 11 & 12

Content Standard: **Understand important properties of the electromagnetic spectrum.**

State Curriculum Standard: **(3.2.12.C) Apply the elements of scientific inquiry to solve multi-step problems.**
(3.1.12.B) Apply concepts of models as a method to predict and understand science and technology.

Course Content	Student Performance	Resources	Assessments
A. Members of the Electromagnetic Spectrum. B. Common characteristics of all members of the electromagnetic spectrum. C. Difference among members of the electromagnetic spectrum. D. Velocity of the electromagnetic radiation. E. Energy of photon. F. Atomic spectrum. G. Laboratory Activities. • Sources of EM. • Inverse Square Law.	• List members of the electromagnetic spectrum in increasing order of frequency • List common characteristics of all members of the electromagnetic spectrum • Find velocity using wavelength and frequency • Calculate energy of a photon • Explain using an electron theory how atomic spectrum is produced • Understand EM obeys an Inverse Square Law	• Conceptual Physics (Prentice Hall 2006) • Lecture Notes • Video: "Electromagnetic Spectrum." • Demonstrations • Dr. Gauss • Radiometer • Spectrum Worksheets • Software • Graph Analysis • Excel • PowerPoint	• Homework Check • Individual Portfolios • Publisher Tests • Teacher Observations • Teacher Quizzes • Laboratory Reports • Student Problem Presentations • Student PowerPoint Presentations

Unit: **Atomic and Nuclear Physics**

College Prep Physics—Grades 11 & 12

Content Standard: **Use atomic theory to explain basic nuclear changes.**

State Curriculum Standard: **(3.4.12.A) Apply concepts about the structure and properties of matter.**
(3.1.12.B) Apply concepts of models as a method to predict and understand science and technology.

Course Content	Student Performance	Resources	Assessments
A. Radioactivity. B. Cosmic Rays. C. Dating and isotopes. D. Fission and Fusion. E. Mass Defect. F. Artificial Transmutation. G. Energy Changes in Nuclear Reactions. H. Laboratory Activity. • Half-Life.	• List the main sources of ionizing radiation in our environment • Solve simple half-life problems • Trace a decay series on chart of nuclides • Calculate energy changes when nuclear changes occur • Write nuclear equations • Determine the half-life of an isotope from activity and time data	• Conceptual Physics (Prentice Hall 2006) • Lecture Notes • Demonstrations • Electroscope and ionizing radiation • Geiger Counter • Ionizing Radiation • Chart of Nuclides • Periodic Table • Video: “Cosmic Rays”	• Homework Check • Individual Portfolios • Publisher Tests • Teacher Observations • Teacher Quizzes • Laboratory Reports • Student Problem Presentations • Student PowerPoint Presentations