Conceptual Physics

STUDENTS SHOULD KNOW	EXAMPLES OF WHAT STUDENTS SHOULD BE ABLE TO DO
The language of physics is mathematics.	
1. Physics relies on standardized units to define properties and relationships among physical quantities.	• Use and convert units within an appropriate system of measurement (emphasize the SI system of measurement).
2. Physical phenomena can be analyzed mathematically from fundamental principles.	• Graph relations between displacement vs. time and velocity vs. time.
3. Proportional relationships can be developed between quantities.	
Motion in one and two dimensions can be described by analyzing each dimension separately.	• Construct graphs representing one and two dimensional motion. • Identify and contrast examples of accelerated and constant velocity motion.
Net forces cause masses to change their motion.	
1. Free Body Diagrams specify which forces are involved in specified situations.	• Construct a Free Body Diagram of an object in uniform motion and accelerated motion. • Using Newton's Universal Gravitational Law, explain the motion of a satellite around Earth.
2. There are specific relations among force, mass and acceleration.	
An object with energy can do work.	
1. Total of energy and the mass can neither be created nor destroyed.	• Calculate the speed of a falling object using Conservation of Mechanical Energy • Identify the flow of energy through a system.
2. Heat is the transfer of thermal energy.	
Moving objects possess momentum.	
1. Total momentum is constant unless impulse is done.	• Demonstrate that total momentum remains unchanged in a collision. • Describe the changes in motion when two objects collide. • Describe a collision in which neither energy nor momentum changes.

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Waves are generated by objects oscillating in simple harmonic motion.		
1. It is common for energy to be transferred by waves.	• Describe how water waves and sound waves are created by oscillating sources .	
2. Waves can be categorized by many of their characteristics.	• Identify the qualities of a good oscillator. • Calculate the wavelength of a specific tuning fork.	
Interactions among particles with electric charge are responsible for the structure of matter.		
1. Electric charge appears in two types: positive and negative, which cannot be created or destroyed.	• Determine the magnitude and polarity of electric charge of an object.	
2. Interactions between charged particles occur via their respective electric fields.		
	• Determine proportional relationships of the current and voltage for simple circuits and compare these values to those measured in actual circuits.	
Magnetism, like electric charge, is a fundamental property of most matter.		
1. Magnetic charge appears in two types, or poles: north and south.	• Compare the effect on a moving electric charge of a magnetic and electric field. • Experiment with the magnetic fields of various magnets.	
Electric and magnetic fields and light are related.		
	• Calculate the wavelength of electromagnetic radiation produced by an electron moving in a circle.	
When light's speed changes, light's direction may change.		
	• Create ray diagrams for an image created by a lens and mirror.	
Special Relativity relates mass and space.		
	• Explain time, mass and contraction of space with respect to special relativity.	