Green Dot Public Schools

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Physics 10th - 12th Grade
2011-2012 Benchmark Blueprint

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			Assessments			
Motion and Forces			**1**	**2**	**3**	**4**
1.0	**Students know Newton's laws predict the motion of most objects. As a basis for understanding this concept:**					
	1.a	Students know how to solve problems involving constant speed and average speed.	**4**	**3**		
	1.b	Students know when forces are balanced no acceleration occurs, and thus an object continues to move at a constant speed or stays at rest (Newton's First Law).	**4**	**3**		
	1.c	Students know how to apply the law F=ma to solve one-dimensional motion problems involving constant forces (Newton's Second Law).	**4**	**3**		
	1.d	Students know when one object exerts a force on a second object, the second object always exerts a force of equal magnitude and opposite direction. (Newton's Third Law).	**4**	**3**		
	1.e	Students know the relationship between the universal law of gravitation and the effect of gravity on an object at the surface of the Earth.	**4**	**3**		
	1.f	Students know applying a force to an object perpendicular to the direction of its motion causes the object to change direction but not speed (for example, the Earth's gravitational force causes a satellite in a circular orbit to change direction but not speed).	**4**	**3**		
	1.g	Students know circular motion requires application of a constant force directed toward the center of the circle.	**4**	**3**		
Conservation of Energy and Momentum						
2.0	**Students know the laws of conservation of energy and momentum provide a way to predict and describe the movement of objects. As a basis for understanding this concept:**					
	2.a	Students know how to calculate kinetic energy using the formula E=(1/2)mv2.		**3**	**3**	
	2.b	Students know how to calculate changes in gravitational potential energy near the Earth using the formula (change in potential energy) =mgh (change in the elevation).		**3**	**3**	
	2.c	Students know how to solve problems involving conservation of energy in simple systems such as falling objects.		**3**	**3**	**4**
	2.e	Students know momentum is a separately conserved quantity, different from energy.		**3**		
	2.f	Students know an unbalanced force on an object produces a change in its momentum.		**3**	**3**	
	2.g	Students know how to solve problems involving elastic and inelastic collisions in one dimension using the principles of conservation of momentum and energy.		**3**	**3**	**3**

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		Assessments			
Heat and Thermodynamics		**1**	**2**	**3**	**4**
3.0	**Students know energy cannot be created or destroyed, although in many processes energy is transferred to the environment as heat. As a basis for understanding this concept:**				
3.a	Students know heat flow and work are two forms of energy transfer between systems.			**3**	
3.b	Students know the work done by a heat engine that is working in a cycle is the difference between the heat flow into the engine at high temperature and the heat flow out at a lower temperature (First Law of Thermodynamics) and that this is an example of the law of conservation of energy.			**3**	**3**
3.c	Students know thermal energy (commonly called heat) consists of random motion and the vibrations and rotations of atoms and molecules. The higher the temperature, the greater the atomic or molecular motion.			**3**	
3.d	Students know most processes tend to decrease the order of a system over time, and energy levels are eventually distributed uniformly.			**3**	
3.e	Students know entropy is a quantity that measures the order or disorder of a system, and is larger for a more disordered system.			**3**	**3**
Waves					
4.0	**Students know waves have characteristic properties that do not depend on the type of wave. As a basis for understanding this concept:**				
4.a	Students know waves carry energy from one place to another.				**3**
4.b	Students know how to identify transverse and longitudinal waves in mechanical media such as springs, ropes, and the Earth (seismic waves).				**3**
4.c	Students know how to solve problems involving wavelength, frequency, and wave speed.				**3**
4.d	Students know sound is a longitudinal wave whose speed depends on the properties of the medium in which it propagates.				**3**
4.e	Students know radio waves, light and X-rays are different wavelength bands in the spectrum of electromagnetic waves whose speed in vacuum is approximately 3x108 m/s (186,000 miles/second).				**3**
4.f	Students know how to identify the characteristic properties of waves: interference (beats), diffraction, refraction, Doppler effect, and polarization.				**3**

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Electric and Magnetic Phenomena		Assessments 1	2	3	4
5.0	**Students know electric and magnetic phenomena are related and have many practical applications. As a basis for understanding this concept:**				
5.a	Students know how to predict the voltage or current in simple direct current electric circuits constructed from batteries, wires, resistors, and capacitors.			3	3
5.b	Students know how to solve problems involving Ohm's law.			3	
5.c	Students know any resistive element in a DC circuit dissipates energy which heats the resistor. Students can calculate the power (rate of energy dissipation) in any resistive circuit element by using the formula Power = (potential difference IR) times (current I) = I2R.			3	
5.f	Students know magnetic materials and electric currents (moving electric charges) are sources of magnetic fields and experience forces due to magnetic fields of other sources.			3	3
5.h	Students know changing magnetic fields produce electric fields, thereby inducing currents in nearby conductors.			3	3
	Total Number of Items	**28**	**39**	**45**	**40**