



SWEETWATER HIGH SCHOOL PROFESSIONAL LEARNING COMMUNITY

SEMESTER 1 PACING GUIDE 2007-2008

PHYSICS

STANDARDS	BIG IDEA	Focus points	
Investigation 1.a. Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.	investigation	Students will use a computer interface, motion detector, vernier caliper, force sensor, photocell (photogate), voltmeter, ammeter, ohm meter (digital and analog multimeter), a laser, strobe light at various points throughout the year to collect data. Students will use scientific calculators daily, and graphing calculators on an occasional basis	Revisited throughout the year
Investigation 1. b. Identify and communicate sources of unavoidable experimental error.	investigation	Students will state sources of error for every lab they complete throughout the year.	Revisited throughout the year
Investigation 1. c. Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.	investigation	Students will state sources of error for every lab throughout the year, comparing their data to a known standard or to the class average. Significant Figure rules/Scientific notation/metric conversion	Holt ch 1 text
Investigation 1. d. Formulate explanations by using logic and evidence.	investigation	Students will answer analysis questions for every lab throughout the year, using data they collected to explain their experimental results.	Revisited throughout the year
Investigation 1.f. Distinguish between hypothesis and theory as scientific terms.	investigation	Common scientific theories such as global warming, dark matter, new ideas about gravity will be discussed. Students will learn to recognize hypotheses as if...then statements. Theories will be addressed as explanation of observations.	10 ideas that changed science ws
Investigation 1. g. Recognize the usefulness and limitations of models and theories as scientific representations of reality.	investigation	Significant Figure rules/Scientific notation/metric conversion	Lab 2 from old Merrill Physics Principles and Problems book/ making measurements
Investigation 1. j. Recognize the issues of statistical variability and the need for controlled tests.	investigation	Students will perform percent error and percent difference calculations on experimental data.	Revisited throughout the year
Investigation 1. k. Recognize the cumulative nature of scientific	investigation	Covered throughout the year Students will complete a research project. A four page review of new scientific discoveries (within the last 5 years) will be	

JULY 16-AUG. 10, 2007

evidence.		required by the last school day in August. (8/31/07)	
Investigation 1. I. Analyze situations and solve problems that require combining and applying concepts from more than one area of science.	investigation	Covered throughout the year. Students will complete a research project. A four page review of new scientific discoveries will be required by the last school day in August.	
1. a. Newton's laws predict the motion of most objects. As a basis for understanding this concept, students know how to solve problems involving constant speed and average speed.	Motion & kinematics	Students can solve the equation $x = v t$ for any of the 3 variables given 2 of the others. v can be constant speed or an average speed. Students can identify any of the 3 variables using their units. Students can analyse a position vs time graph to find x, v, t Students can analyse a velocity vs time graph to find x, v, t .	Holt ch 2 Vernier labs Graphical analysis Determining G on an incline Picket Fence Free fall
<p>Common Assessment Date: August 9, 2007 Date to Analyze: August 20, 2007</p>			

Aug. 14-Sept. 14, 2007

STANDARDS	BIG IDEA	Focus points	
1. e. Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions.	Motion & kinematics	<p>Students can solve the four common kinematic equations for any given variable given 3 of the others.</p> <p>Students can resolve velocity, displacement, and acceleration vectors into x and y components, using trigonometric functions, and use the Pythagorean theorem to find the resultant vector for up to 4 vectors.</p> <p>Students can identify any of the 3 variables using their units.</p>	<p>Holt ch 2</p> <p>Vernier Modern Galileo lab</p> <p>Vernier Ball toss lab</p>
<i>i.* solve two-dimensional trajectory problems.</i>	Motion & kinematics	<p>Students can find horizontal distance & velocity, time in the air, vertical distance & velocity for an object projected horizontally from a height or upward at an angle.</p> <p>Students know the acceleration due to gravity near the surface of the earth is -9.8 m/s^2, which is abbreviated g.</p>	<p>Holt ch 3:3</p> <p>Virtual Projectile lab at http://www.hazelwood.k12.mo.us/~grichert/projectile/proj.html</p> <p>Vernier Projectile lab</p>
<i>j.* resolve two-dimensional vectors into their components and calculate the magnitude and direction of a vector from its components.</i>	Motion & kinematics	<p>Students can resolve velocity, displacement, force and acceleration vectors into x and y components, using trigonometric functions, and use the Pythagorean theorem to find the resultant vector for up to 4 vectors.</p> <p>Students can identify any of the 4 variables using their units.</p>	<p>Holt ch 3</p> <p>Force Vector lab from Energy Concepts Inc</p>
<i>k.* solve two-dimensional problems involving balanced forces (statics).</i>	Motion & dynamics	<p>Students can resolve velocity, displacement, force and acceleration vectors into x and y components, using trigonometric functions, and use the Pythagorean theorem to find the resultant vector for up to 4 vectors.</p> <p>Students know the unit for force and for weight is the Newton, which is a kg m/s^2</p>	<p>Holt ch 4</p>
1. b. Students know that when forces are balanced, no acceleration occurs; thus an object continues to move at a constant speed or stays at rest (Newton's first law).	Motion & dynamics	<p>Students can predict situations where no acceleration will occur given up to 4 force vectors and their directions.</p> <p>Students can distinguish between constant velocity and constant acceleration using graphs and numerical algebraic problem solving.</p> <p>Students can give at least one practical example of each of Newton's 3 laws of motion.</p>	<p>Holt ch 4</p>
1. c. Students know how to apply the law $F = ma$ to solve one-dimensional motion problems that involve constant forces (Newton's second law).	Motion & dynamics	<p>Students can solve $F = ma$ for any of the 3 variables, given 2 of the variables.</p> <p>Students can analyse a velocity vs time graph to find x, v, t and a in order to find whether forces are balanced.</p> <p>Students can analyse an acceleration vs time graph to find v, t and a in order to find whether forces are balanced.</p> <p>Students can predict acceleration from a force vs mass graph.</p> <p>Students can relate the equation $F = ma$ to the equation Weight = mg</p> <p>Students can give at least one practical example of each of Newton's 3 laws of motion.</p>	<p>Holt ch 4</p> <p>Vernier Newton's 2nd Law lab</p> <p>Hewitt 1st law video</p>

Common Assessment Date: September 6, 2007

Date to Analyze: October 15, 2007

STANDARDS	BIG IDEA	Focus points	
1. d. Students know that when one object exerts a force on a second object, the second object always exerts a force of equal magnitude and in the opposite direction (Newton's third law).	Motion & dynamics	Students can sketch free body diagrams for objects with constant velocity and for those that are accelerating and solve for a missing force Students can predict the shape of a force vs time graph given balanced forces. Students can give at least one practical example of each of Newton's 3 laws of motion.	Vernier Newton's 3 rd law lab
1. e. Students know the relationship between the universal law of gravitation and the effect of gravity on an object at the surface of Earth.	Motion & dynamics	Students can solve the universal law of gravitation equation for any of the 4 variables, given 3 of the 4 and the universal gravitational constant. Students can predict the effect moving an object from a planet's surface to a place in orbit around the planet will have on the weight of the object. Students can predict the acceleration due to gravity on any planet, given the orbital radius of a satellite.	Holt ch 7
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 (e.g., Earth's gravitational force causes a satellite in a circular orbit to change direction but not speed).	Motion & dynamics	Students clearly understand the difference between speed (scalar) and velocity (vector) Students can identify the direction of centripetal force, acceleration, and velocity for any object moving in a circular path. Students know speed is constant for any object moving in a circular path. Students can predict how speed for an object moving in a circle will change given a change in orbital radius.	Holt ch 7
1. g. Students know circular motion requires the application of a constant force directed toward the center of the circle.	Motion & dynamics	Students can identify the direction of centripetal force, acceleration, and velocity for any object moving in a circular path.	Centripetal force lab from Merrill Physics Principles and Problems

Oct. 8-Nov. 8, 2007

<p>1.* Students know <i>how to solve problems in circular motion, using the formula for centripetal acceleration in the following form: $a = v^2/r$</i></p>	<p>Motion & dynamics</p>	<p>Students can solve $a = v^2/r$ for any of the 3 variables given any 2 variables. Students can solve $v = 2\pi r/T$ for v, r or T where T is the period of vibration, and then substitute into $a = v^2/r$ to find a.</p>	<p>Holt ch 7</p>
<p>Common Assessment Date: November 8, 2007 Date to Analyze: November 19, 2007</p>			

Nov. 13-Dec. 14, 20067	STANDARDS	BIG IDEA	Focus points	
	<p>2. a. Students know how to calculate kinetic energy by using the formula $E = (1/2)mv^2$.</p>	<p>Motion & dynamics</p>	<p>Students can solve the equation $E = (1/2)mv^2$ for any of the 3 variables given 2 variables. Students know the unit for potential energy, kinetic energy and work is the joule, which is a scalar quantity, not a vector.</p>	<p>Holt ch 5</p>
	<p>2. b. Students know how to calculate changes in gravitational potential energy near Earth by using the formula (change in potential energy) = mgh (h is the change in the elevation).</p>	<p>Motion & dynamics</p>	<p>Students can solve the equation $E = (mgh)$ for any of the 3 variables given 2 variables and the value of g. Students know the acceleration due to gravity near the surface of the earth is -9.8 m/s^2, which is abbreviated g.</p>	<p>Holt ch 5</p>
	<p>2. c. Students know how to solve problems involving conservation of energy in simple systems, such as falling objects or work done by moving objects</p>	<p>Motion & dynamics</p>	<p>Students can explain the relationship between potential energy of an object at a height and the kinetic energy it gains as it falls. Students can draw a graph of how potential energy decreases and kinetic energy increases as an object falls or as a child moves through the arc of a swing. Students can use the equation $(1/2)mv^2 = mgh$ to find v, g or h. Students can use the work-energy theorem to find work, kinetic energy, force, displacement, change in velocity and acceleration</p>	<p>Holt ch 5</p>
	<p>2. d. Students know how to calculate momentum as the product mv.</p>	<p>Motion & dynamics</p>	<p>Students can solve the equation $p = mv$ given 2 of the 3 variables. Students know how momentum changes with changes in m and/or v.</p>	<p>Holt ch 6</p>
	<p>2. e. Students know momentum is a separately conserved quantity different from energy.</p>	<p>Motion & dynamics</p>	<p>Students can calculate momentum before and after a collision to demonstrate whether momentum is conserved.</p>	<p>Holt ch 6 Momentum lab</p>

2. f. Students know an unbalanced force on an object produces a change in its momentum	Motion & dynamics	<p>Students can solve Newton's second law, $F = ma$, in the form $Ft = m\Delta v$.</p> <p>Students know the quantity Ft is called impulse, and has the same units as momentum, the $N\cdot s$ or $kg\ m/s$</p> <p>Students can predict whether a force will produce a change in momentum.</p>	Holt ch 6 Impulse/momentum theorem lab
2. g. Students know how to solve problems involving elastic and inelastic collisions in one dimension by using the principles of conservation of momentum and energy.	Motion & dynamics	<p>Students can solve the equation $p_1 + p_2 = p_1' + p_2'$</p> <p>Students can calculate the kinetic energy for each object before and after a collision using $E = (1/2)mv^2$ and can show whether or not total kinetic energy before a collision has changed after a collision.</p> <p>Students know that elastic collisions result in conservation of momentum and energy. (In other words, total momentum and kinetic energy don't change when compared before and after a collision.)</p> <p>Students know that inelastic collisions result in conservation of momentum only.</p>	Holt ch 6 Momentum lab
Common Assessment Date: December 6, 2007		Date to Analyze: December 13, 2007	



SWEETWATER HIGH SCHOOL PROFESSIONAL LEARNING COMMUNITY
SEMESTER 2 PACING GUIDE 2007-2008
PHYSICS

STANDARDS	BIG IDEA	Focus Points	
3. 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.	Thermodynamics	First law of thermodynamics, work, heat, energy transfer, work input/work output, work done on gases $\Delta U = Q - W$	Holt <i>Physics</i> Chapter 10, Sect. 2 Pgs. 365-370 Work input/Work output labs (piston/pulley) Chapt. 10, Sect. 3 Pgs. 371-374 First & second law of thermodynamics song
3. b. Students know that 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.	Thermodynamics	Cyclic process, temperature, work, conservation of energy $\Delta U = Q - W$	Holt <i>Physics</i> Chapt. 11, Sect. 2 pgs. 409-419 On-line book applets
3. c. Students know the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy. The greater the temperature of the object, the greater the energy of motion of the atoms and molecules that make up the object.	Thermodynamics	Thermal energy, atom, molecule, motion, vibration, rotation	Holt <i>Physics</i> Chapt. 9, Sect. 2 pg. 329 Chapt. 10, Sect. 1 pgs. 358-360
3. d. Students know that most processes tend to decrease the order of a system over	Thermodynamics	Entropy, second law of thermodynamics	Holt <i>Physics</i> Chapt. 11, Sect. 4

Jan. 7-Feb. 7, 2008

time and that energy levels are eventually distributed uniformly.			pgs. 425-429 Entropy hand out.
3. e. Students know that entropy is a quantity that measures the order or disorder of a system and that this quantity is larger for a more disordered system.	Thermodynamics	Entropy	Holt <i>Physics</i> Chapt. 11, Sect. 4 pgs. 425-429
Common Assessment Date: February 7, 2008 Date to Analyze: March 3, 2008			

	STANDARDS	BIG IDEA	Focus points	
Feb. 12-Mar. 6, 2008	4. 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.	Wave motion	Medium, mechanical wave, pulse wave, periodic wave, damping, dissipation	Holt <i>Physics</i> Chapt. 12. Sect. 3 Pgs. 452-453, 458 Slinky lab Reflection lab
	4. b. Students know how to identify transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves).	Wave motion	Crest, trough, wavelength, longitudinal wave, transverse wave	Holt <i>Physics</i> Chapt. 12, Sect. 3 Pgs. 454-455 Earthquake wave handout Slinky lab
	4. c. Students know how to solve problems involving wavelength, frequency, and wave speed.	Wave motion	Wavelength, frequency	Holt <i>Physics</i> Chapt. 12, Sect. 3 pgs. 455-458
	4. d. Students know sound is a longitudinal wave whose speed depends on the properties of the medium in which it propagates.	Wave motion	Compression, rarefaction, pitch	Holt <i>Physics</i> Chapt. 13, Sect. 1 Pgs. 480-483 Slinky lab/tuning fork demo
	4. e. Students know radio waves, light, and X-rays are different wavelength bands in the spectrum of electromagnetic waves whose speed in a vacuum is approximately 3×10^8 m/s (186,000 miles/second).	Wave motion	Electromagnetic wave, spectrum	Holt <i>Physics</i> Chapt. 14, Sect. 1 pgs. 520-522

<p>4. f. Students know how to identify the characteristic properties of waves: interference (beats), diffraction, refraction, Doppler effect, and polarization.</p>	<p>Wave motion</p>	<p>Students can identify, describe and give examples of the following wave properties: Beat notes, interference, diffraction, refraction, the Doppler effect, polarization, coherence, path difference, order number, index of refraction, total internal reflection, linear polarization</p>	<p>Holt <i>Physics</i> Beats: Chapt. 13, Sect. 3, pgs. 502-503 Tuning fork demo Java applet, videoencyclopedia of Physics demo</p> <p>Diffraction/Interference: Chapt. 16, Sect. 1 and 2 pgs. 598-610 Measuring the wavelength of light lab Java applet</p> <p>Refraction: Chapt. 15, Sect. 1 pgs. 562-567 Snell's law lab</p> <p>Doppler Effect: Chapt. 13, Sect. 1 pgs. 485-486 Videoencyclopedia of Physics Java applet</p> <p>Polarization: Chapt. 14, Sect. 4 pgs. 546-548 pass around Polaroid filters show online text polaroid filter java applet</p>
<p>Common Assessment Date: March 6, 2008 Date to Analyze: April 21, 2008</p>			

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">April 14-May 8, 2008</p>	<p>STANDARDS</p>	<p>BIG IDEA</p>	<p>Focus points</p>	
	<p>5. 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 (DC) electric circuits constructed from batteries, wires, resistors, and capacitors.</p>	<p>Electricity & Magnetism</p>	<p>Trace the flow of electrons in simple circuits Construct a circuit from a lightbulb, battery and wire. Read color resistor code Know the symbols for battery, switch, wire, resistor, lightbulb and capacitor in a circuit</p>	<p>Holt <i>Physics</i> Ch 18 capacitors Chapt. 19, Sect. 1, 2 pgs. 694-702 light a light bulb lab series/parallel circuit labs</p>
<p>5. b. Students know how to solve problems involving Ohm's law.</p>	<p>Electricity & Magnetism</p>	<p>Plug numbers accurately into $V = IR$ and solve for one of the variables given any two variables.</p>	<p>Holt <i>Physics</i> Chapt. 20, Sect. 2, 3 pgs. 730-752</p>	

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 = IV = (potential difference IR) times I (current) = I ² R.	Electricity & Magnetism	Calculate power in simple series/parallel circuit resistors using P = IV, V = IR, P = I ² R, and P = V ² /R. Calculate heat loss in simple series and parallel circuits using E = I ² Rt and P = I ² R	Holt <i>Physics</i> Chapt. 19, Sect. 3 pgs. 708-713 series/parallel circuit labs Flywheel lab from Energy Concepts
5. e. Students know charged particles are sources of electric fields and are subject to the forces of the electric fields from other charges.	Electricity & Magnetism	Predict the direction of electric fields around charged particles and between 2 charged metal plates. Predict the direction of force on a charged particle in an electric field.	Holt <i>Physics</i> Ch 17 Mechanical Universe video
Common Assessment Date: May 8, 2008 Date to Analyze: May 12, 2008			

STANDARDS	BIG IDEA	Focus points	
5. f. Students know magnetic materials and electric currents (moving electric charges) are sources of magnetic fields and are subject to forces arising from the magnetic fields of other sources.	Electricity & Magnetism	Draw the magnetic field around magnets and current carrying wires, include direction. ID field strength and direction given magnetic field lines. ID poles given magnetic field lines and direction	Holt <i>Physics</i> Chapt. 21, Sect. 1 pgs. 766-769 right hand rule worksheet Right hand rule demo
5. g. Students know how to determine the direction of a magnetic field produced by a current flowing in a straight wire or in a coil.	Electricity & Magnetism	ID field direction and current flow given a diagram of a current flowing in a straight wire or in a coil.	Holt <i>Physics</i> Chapt. 21, Sect. 2 pgs. 770-771 right hand rule worksheet Right hand rule demo
5. h. Students know changing magnetic fields produce electric fields, thereby inducing currents in nearby conductors.	Electricity & Magnetism	ID direction of force on a moving wire carrying current in a magnetic field.	Holt <i>Physics</i> Chapt. 27, Sect. 1 pgs. 794-800 Video Encyclopedia of Physics demo Glencoe Physics motor hand-out
5. i. Students know plasmas, the fourth state of matter, contain ions or free electrons or both and conduct electricity.	Electricity & Magnetism	Know sources and characteristics of plasma and the practical application in fluorescent lights and tokamak reactors	Video Encyclopedia of Physics demo Fusion video from general atomics

May 12-June 4, 2008

			How do fluorescent lights work from How stuff works.com
5. d. Students know the properties of transistors and the role of transistors in electric circuits.	Electricity & Magnetism	Know the difference between pnp and npn transistors Know the primary function of transistors in a circuit: to act as a switch to control current flow and to amplify a signal.	Holt <i>Physics</i> Chapt. 24, Sect. 2 pgs. 877-878 Transistor handout
Common Assessment Date: May 29, 2008 Date to Analyze: June 11, 2008			