CALIFORNIA SCIENCE FRAMEWORK

HIGH SCHOOL 9-12 PHYSICS

CORRELATION TO CORD'S *PHYSICS IN CONTEXT*

STANDARD SET 1: INVESTIGATION AND EXPERIMENTATION	
Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and addressing the content of the other four strands, students should develop their own questions and perform investigations. **Students Will:**	
a. Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data,	Embedded in Student Text, Teachers Guide, Lab Manuals, and Assessment CD & Web-site: www.learningincontext.com, support materials.
b. Identify and communicate sources of unavoidable experimental error.	Embedded in Student Text, Teachers Guide, Lab Manuals, and Assessment CD & Web-site: www.learningincontext.com, support materials.
c. Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.	Embedded in Student Text, Teachers Guide, Lab Manuals, and Assessment CD & Web-site: www.learningincontext.com, support materials.
d. Formulate explanations by using logic and evidence.	Embedded in Student Text, Teachers Guide, Lab Manuals, and Assessment CD & Web-site: www.learningincontext.com, support materials.
e. Solve scientific problems by using quadratic equations, and simple trigonometric, exponential, and logarithmic functions.	Embedded in Student Text, Teachers Guide, Lab Manuals, and Assessment CD & Web-site: www.learningincontext.com, support materials.
f. Distinguish between hypothesis and theory as scientific terms.	Embedded in Student Text, Teachers Guide, Lab Manuals, and Assessment CD & Web-site: www.learningincontext.com, support materials.
g. Recognize the usefulness and limitation of models and theories as scientific representations of reality.	Embedded in Student Text, Teachers Guide, Lab Manuals, and Assessment CD & Web-site: www.learningincontext.com, support materials.
h. Read and interpret topographic and geologic maps.	Embedded in Student Text, Teachers Guide, Lab Manuals, and Assessment CD & Web-site: www.learningincontext.com, support materials.
i. Analyze the location, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem.	Embedded in Student Text, Teachers Guide, Lab Manuals, and Assessment CD & Web-site: www.learningincontext.com, support materials.

j. Recognize the issues of statistical variability and the need for controlled tests.	Embedded in Student Text, Teachers Guide, Lab Manuals, and Assessment CD & Web-site: www.learningincontext.com, support materials.
k. Recognize the cumulative nature of scientific evidence	Embedded in Student Text, Teachers Guide, Lab Manuals, and Assessment CD & Web-site: www.learningincontext.com, support materials.
l. Analyze situations and solve problems that require combining and applying concepts from more than one area of science.	Embedded in Student Text, Teachers Guide, Lab Manuals, and Assessment CD & Web-site: www.learningincontext.com, support materials.
m. Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.	Embedded in Student Text, Teachers Guide, Lab Manuals, and Assessment CD & Web-site: www.learningincontext.com, support materials.
n. Know that when an observation does not agree with accepted scientific theory, the observation is sometimes mistaken or fraudulent (e.g., Piltdown Man fossil or unidentified flying objects). And that the theory is sometimes wrong (e.g., Ptolemaic model of the movement of the Sun, Moon and planets).	Embedded in Student Text, Teachers Guide, Lab Manuals, and Assessment CD & Web-site: www.learningincontext.com, support materials.

STANDARD SET 1: MOTION AND FORCES	
1. Newton's laws predict the motion of most objects. **As a basis for understanding the concept:**	Student Text pp. 4-26, 47-61, 324-351; Teachers Guide pp. T4-T26, T47-T61, T324-T351; Lab Manual pp. 1.7-1.24, 7.1-7.12; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
a. *Students know* how to solve problems that involve constant speed and average speed.	Student Text 120-166, 184-196, 354-364; Teachers Guide pp. T120-T166, T184-T196, T354-T365; Lab Manual pp. 3.1-3.34, 4.9-4.14, 8.1-8.28; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
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).	Student Text pp.4-26; Teachers Guide pp. T4-T26; Lab Manual pp. 1.1-1.10; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
c. Students know how to apply the law *F=ma* to solve one-dimensional motion problems that involve constant forces (Newton's second law).	Student Text pp.168-183; Teachers Guide pp. T168-T183; Lab Manual pp. 4.3-4.8; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
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.)	Student Text pp. 324-338; Teachers Guide pp. T324-T338; Lab Manual pp. 7.1-7.12; Appropriate sections in Assessment CD & web-site: www.learningincontext.com

e. Students know the relationship between the universal law of gravitation and the effect of gravity on an object at the surface of Earth.	Student Text pp. 47-63; Teachers guide pp. T47-T63; Lab Manual pp. 1.17-1.24; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
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).	Student Text pp. 339-351; Teachers Guide pp. T339-T351; Lab Manual pp. 7.1-7.12; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
g. Students know circular motion requires the application of a constant force directed toward the center of the circle.	Student Text pp.326-338; Teachers Guide pp. T326-T328; Lab Manual pp.7.1-7.12; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
h. Students know Newton's laws are not exact but provide very good approximations unless an object is moving close to the speed of light or is small enough that quantum effects are important.	Student Text pp. 170-183; Teachers Guide pp. T170-T183; Lab Manual pp. 4.1-4.8; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
i. Students know how to solve two-dimensional trajectory problems	Student Text pp. 122-137; Teacher Guide pp. T122-T137; Lab Manual pp. 3.1-3.8; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
j. Students know how to resolve two-dimensional vectors into their components and calculate the magnitude and direction of a vector from its components.	Student Text pp. 4-26; Teachers Guide pp. T4-T26; Lab Manual pp. 1.1-1.10; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
k. Students know how to solve two-dimensional problems involving balanced forces (statics).	Students Text pp. 4-26; Teachers Guide pp. T4-T26; Lab Manual pp. 1.1-1.10; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
l. Students know how to solve problems in circular motion by using the formula for centripetal acceleration in the following form: $a=t^2/r$.	Student Text pp. 122-137; Teachers Guide pp. T 122-T137; Lab Manual pp. 3.1-3.8; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
m. Student know how to solve problems involving the forces between two electric charges at a distance (Coulomb's law) or the forces between two masses at a distance (universal gravitational).	Student Text pp. 106-117; Teachers Guide pp. T106-T117; Lab Manual pp. 2.31-2.33; Appropriate sections in Assessment CD & web-site: www.learningincontext.com

STANDARD SET 2: CONSERVATION OF ENERGY AND MOMENTUM	
2. The laws of conservation of energy and momentum provide a way to predict and describe the movement of objects. **<u>As a basis for understanding this concept:</u>**	Student Text pp. 228-295, 324-351; Teachers Guide pp. T228-T295, T324-T351; Lab Manual pp. 7.1-7.12, 5.1-5.40; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
a. Students know how to calculate kinetic energy by using the formula E=(1/2) mv^2	Student Text pp. 230-242; Teachers Guide pp. T230-T242; Lab Manual pp. 5.1-5.10; Appropriate sections in Assessment CD & web-site: www.learningincontext.com

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).	Student Text pp. 243-258, 262-276; Teachers Guide pp. T 243-T258, T262-T276; Lab Manual pp.5.11-5.34; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
c. Students know how to solve problems involving conservation of energy in simple systems, such as falling objects.	Student Text pp. 243-258; Teachers Guide pp. T243-T258; Lab Manual pp.5.11-5.18; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
d. Students know how to calculate momentum as the product *mv.*	Student Text pp. 326-338; Teachers Guide pp. T 326-T338; Lab Manual pp. 7.1-7.12; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
e. Students know momentum is a separately conserved quantity difference from energy.	Student Text pp. 324-338; Teachers Guide pp T324-T338; Lab Manual pp.7.1-7.12; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
f. Students know an unbalanced force on an object produces a change in its momentum.	Student Text pp. 339-351; Teachers Guide pp. T339-T351; Lab Manual pp. 7.1-7.12; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
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.	Student Text pp. 324-351, 243-258; Teachers Guide pp. T 243-T258; Lab Manual pp.7.12-7.12, 5.11-5.18; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
h. Students know how to solve problems involving conservation of energy in simple systems with various sources of potential energy, such as capacitors and springs.	Student Text pp. 230-242, 262-276; Teachers Guide pp. T 230-T242, T262-T276; Lab Manual pp.5.19-5.34, 5.1-5.10; Appropriate sections in Assessment CD & web-site: www.learningincontext.com

STANDARD SET 3: HEAT AND THERMODYNAMICS	
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:**	Student Text pp. 149-166, 228-295; Teachers Guide pp. T149-T166, T228-T295; Lab Manual pp. 5.1-5.40, 3.19-3.28; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
a. Students know heat flow and work are two forms of energy transfer between systems	Student Text pp. 262-275; Teachers Guide pp. T262-T275; Lab Manual pp. 5.19-5.34; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
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.	Student Text pp. 157-165, 262-292; Teachers Guide pp. T157-T165, T262-T292; Lab Manual pp. 3.29-3.34, 5.35-5.40; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
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	Student Text pp.230-295; Teachers Guide pp. T230-T295; Lab Manual pp. 5.1-5.40; Appropriate sections in Assessment CD &

energy. The greater the temperature of the object, the greater the energy of motion of atoms and molecules that make up the object.	web-site: www.learningincontext.com
d. Students know that most processes tend to decrease the order of a system over time and that energy levels are eventually distributed uniformly.	Student Text pp230-295; Teachers Guide pp. T230-T295; Lab Manual pp. 5.1-5.40; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
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	Student Text pp.277-294; Teachers Guide pp. T277-T294; Lab Manual pp. 5.1-5.40; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
f. Student know the statement “Entropy tends to increase” is a law of statistical probability that governs all closed systems (second law of thermodynamics)	Student Text pp.277-294; Teachers Guide pp. T277-T294; Lab Manual pp. 5.1-5.40; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
g. Students know how to solve problems involving heat flow, work, and efficiency in a heat engine and know that all real engines lose some heat to their surroundings.	Student Text pp.228-295; Teachers Guide pp. T228-T295; Lab Manual pp. 5.1-5.40; Appropriate sections in Assessment CD & web-site: www.learningincontext.com

STANDARD SET 4: WAVES	
4. Waves have characteristic properties that do not depend on the type of wave. **As a basis for understanding this concept:**	Student Text pp352-383, 384-421; Teachers Guide pp. T352-T383, T384-T421; Lab Manual pp. 8.1-8.28, 9.1-9.30; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
a. Students know waves carry energy from one place to another.	Student Text pp254-364; Teachers Guide pp T254-T364; Lab Manual pp. 8.1-8.16: Appropiate sections in Assessment CD & web-site: www.learningincontext.com
b. Students know how to identify transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves).	Student Text pp.369-382; Teachers Guide pp. T369-T382; Lab Manual pp. 8.17-8.28; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
d. Students know sound is a longitudinal wave whose speed depends on the properties of the medium in which it propagates.	Student Text pp.352-383; Teachers Guide pp. T352-T383; Lab Manual pp. 8.1-8.28; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
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 3x10m/s (186,000 miles /second).	Student Text pp.352-383; Teachers Guide pp. T352-T383; Lab Manual pp. 8.1-8.28; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
f. Students know how to identify the characteristic properties of waves: interference (beats), diffraction, refraction, Doppler effect, and polarization.	Student Text pp.352-383; Teachers Guide pp. T352-T383; Lab Manual pp. 8.1-8.28; Appropriate sections in Assessment CD & web-site: www.learningincontext.com

STANDARD SET 5: ELECTRIC AND MAGNETIC PHENOMENA	
5. Electric and magnetic phenomena are related and have many practical applications. **<u>As a basis for understanding this concept:</u>**	Student Text pp.47-63, 106-117,149-156, 200-215; Teachers Guide pp. T47-T63, T106-T117, T149-T156, T200-T215; Lab Manual pp. 1.17-1.24, 2.31-2.34, 3.19-3.28, 4,15-4,32; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
a. Students know how to predict the voltage or current in simple direct current (DC) electric circuits constructed from batteries, wires, resistors, and capacitors.	Student Text pp47-63; Teachers Guide pp. T47-T63; Lab Manual pp. 1.17-1.24; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
b. Students know how to solve problems involving Ohm's law.	Student Text pp.200-215; Teachers Guide pp. T200-T215; Lab Manual pp.4.15-4.34; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
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 = *IR (potential difference) X I (current) =* I^2R.	Student Text pp.149-156, 316-322; Teachers Guide pp. T149-T156, T316-T322; Lab Manual pp. 3.19-3.28, 6.25-6.30; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
d. Students know the properties of transistors and the role of transistors in electric circuits.	Student Text pp.262-276; Teachers Guide pp. T262-T276; Lab Manual pp. 5.19-5.34; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
e. Students know changed particles are sources of electric fields and are subject to the forces of the electric fields from other charges.	Student Text pp.106-117; Teachers Guide pp. T106-T117; Lab Manual pp. 2.31-2.34; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
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.	Student Text pp.262-276; Teachers Guide pp. T262-T276; Lab Manual pp.5.19-5.34; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
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.	Student Text pp.200-215; Teachers Guide pp. T200-T215; Lab Manual pp. 4,15-4.32; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
h. Students know changing magnetic fields produce fields, thereby inducing currents in nearby conductors.	Student Text pp.47-63, 149-156; Teachers Guide pp. T47-T63, T149-T156; Lab Manual pp. 1.17-1.24, 3.19-3.28; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
i. Students know plasmas; the fourth state of matter, contain ions or free electrons or both and conduct electricity.	Student Text pp.27-46; Teachers Guide pp. T27-T46; Lab Manual pp. 1.11-1.16; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
j. Students know electric and magnetic fields contain energy and act as vector force fields.	Student Text pp.262-276; Teachers Guide pp. T262-T276; Lab Manual pp.5.19-5.34; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
k. Students know the force on a charged particle in an	Student Text pp.47-63; Teachers Guide pp.

electric field is *qE,* where *E* is the electric field at the position of the particle and *q* is the charge of the particle.	T47-T63; Lab Manual pp. 1.17-1.24; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
l. Students know how to calculate the electric field resulting from a point change.	Student Text pp.47-63; Teachers Guide pp. T47-T63; Lab Manual pp.1.17-1.24; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
m. Students know static electric fields have as their source some arrangement of electric charges.	Student Text pp.200-215; Teachers Guide pp. T200-T215; Lab Manual pp.4.15-4.32; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
n. Students know the magnitude of the force on a moving particle (with charge *q*) in a magnitudes of vectors *v* and *B,* respectively), and students use the right-hand rule to find the direction of this force.	Student Text pp.47-63; Teachers Guide pp. T47-T63; Lab Manual pp. 1.17-1.24; Appropriate sections in Assessment CD & web-site: www.learningincontext.com
o. Students know how to apply the concepts of electrical and gravitational potential energy to solve problems involving conservation of energy.	Student Text pp.262-276; Teachers Guide pp. T262-T276; Lab Manual pp. 5.19-5.34; Appropriate sections in Assessment CD & web-site: www.learningincontext.com