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Integrated Physics and Chemistry							
(1) Scientific processes. The student, for at least 40% of instructional time, conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:						• 2000 APES question #2 (Recycling, environmental decision making, document based)	A minimum of 40% of a Pre-AP* IPC course should be spent with students performing actual experiments. These experiments should stress application and synthesis of knowledge.
(A) demonstrate safe practices during field and laboratory investigations; and	*	√	√	√	√		
(B) make wise choices in the use and conservation of resources and the disposal or recycling of materials.					√	• several SEPUP activities (an issue oriented science series available from lab-aids.com)	
(2) Scientific processes. The student uses scientific methods during field and laboratory investigations. The student is expected to:						• 2000 APES question #2 (Recycling, environmental decision making, document based) • 2001 APES question #1 (Energy conversions and calculations) • 2001 APES question #2 (Experimental design, document based) • 2001 APES question #4 (Environmental quality (water), environmental law, data interpretation) • 2002 APES question #1 (Energy conversions and calculations) • 1999 APPHY-B question #6 (Optics lab question) • 1999 APPHY-C Mech question #1	Pre-AP IPC students should do the basic labs as provided in all the adopted IPC textbooks. These labs should be adapted by increasing the level of analysis of data, prediction and application. To strengthen the critical thinking skills in regular IPC labs, the teacher can examine Physics I and Chemistry I labs as well as the listed AP exam

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						(Ballistic pendulum lab question) • 2000 APPHY-B question #6 (Specific heat lab question) • 2000 APPHY-C Mech question #1 (Pendulum lab question) • 2001 APPHY-B question #5 (Resistor used as a thermometer) • 2001 APPHY-C EM question #2 (Potential vs time experiment) • 2002 APPHY-B question #6 (Spring, fluid displacement lab question) • 2002 APPHY-C Mech question #3 (Potential energy, force, and displacement) • 1999 APCHEM question #5 (Gas molar mass lab question) • 2000 APCHEM question #5 (Freezing point depression lab question) • 2001 APCHEM question #6 (Kinetics lab question) • 2002 APCHEM question #5 (Molar heat of neutralization lab question)	questions.
(A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology;	*	√	√	√	√	• Invention Convention, Science Fair, Robotics Competition, Odyssey of the Mind	Independent investigation can most safely be accomplished in the Physics sections of IPC and with Science Fair type projects.
(B) collect data and make measurements with precision;	*	√	√	√	√		The use of computer

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							probes should continue in IPC.
(C) organize, analyze, evaluate, make inferences, and predict trends from data; and	*	√	√	√	√		Student graphing packages such as Graphical Analysis by Vernier should be used.
(D) communicate valid conclusions.	*	√	√	√	√		
(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:						• 2000 APES question #2 (Recycling, environmental decision making, document based) • 2001 and 2002 APES question #1 (Energy conversions and calculations) • 2002 APES question #3 (Environmental quality (toxicity levels), graphing)	
(A) analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information;	*	√					
(B) draw inferences based on data related to promotional materials for products and services;	*				√	• several SEPUP activities (an issue oriented science series available from lab-aids.com)	
(C) evaluate the impact of research on scientific thought, society, and the environment;					√	• several SEPUP activities (an issue oriented science series available from lab-aids.com)	
(D) describe connections between physics and chemistry, and future careers; and							
(E) research and describe the history of physics, chemistry, and contributions of scientists.			√	√			
(4) Science concepts. The student knows concepts of force and motion evident in everyday life. The student is expected to:						• Activities such as those in the CPO IPC & Physics, Vernier and TI's programs are good technology based labs for the	

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						study of forces, machines and motion. • 1999 APPHY-B question #1 (Force and motion of a Mars rover) • 1999 APPHY-C Mech question #1 (Dart fired into a block) • 2000 APPHY-B question #2 (Blocks and pulley) • 2000 APPHY-C Mech question #3 (Blocks and pulley) • 2001 APPHY-B question #2 (Pool balls colliding on a table) • 2001 APPHY-C Mech question #1 (Cart colliding with a force probe) • 2002 APPHY-B question #1 (Rocket thrusting upward) • 2002 APPHY-C Mech question #2 (Cart colliding with a spring)	
(A) calculate speed, momentum, acceleration, work, and power in systems such as in the human body, moving toys, and machines;	*			√			This unit should set precedence for problem solving.
(B) investigate and describe applications of Newton's laws such as in vehicle restraints, sports activities, geological processes, and satellite orbits;	*			√			
(C) analyze the effects caused by changing force or distance in simple machines as demonstrated in household devices, the human body, and vehicles; and				√			
(D) investigate and demonstrate mechanical advantage and efficiency of various machines such as levers, motors, wheels and axles, pulleys, and ramps.	*						
(5) Science concepts. The student knows the effects of waves on everyday life. The student is expected to:						• The CPO IPC & Physics, program has good technology based labs for the study	

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						of waves, sound and optics.	
(A) demonstrate wave types and their characteristics through a variety of activities such as modeling with ropes and coils, activating tuning forks, and interpreting data on seismic waves;	*		√	√	√	• Seismic wave activity (available in all science catalogs)	
(B) demonstrate wave interactions including interference, polarization, reflection, refraction, and resonance within various materials;	*		√	√		• Add reflection from two mirrors hinged at an angle • Add refraction of light through various liquids (students do not have to use Snell's law but can trace the wave paths and measure the angles)	
(C) identify uses of electromagnetic waves in various technological applications such as fiber optics, optical scanners, and microwaves; and			√	√		• 1999 APCHEM question #2 (Atomic structure w/ bond energy and line spectra)	
(D) demonstrate the application of acoustic principles such as in echolocation, musical instruments, noise pollution, and sonograms.				√	√	• student construction of musical instruments or independent project about musical instruments • guest lecture about sonograms or radar detectors	Students should learn about Doppler Effect and applications- no calculations.
(6) Science concepts. The student knows the impact of energy transformations in everyday life. The student is expected to:						• 2001 APES question #1 (Energy conversions and calculations) • 2002 APES question #1 (Energy conversions and calculations) • 2002 APES question #2 (Resource supply (water), environmental decision making) • 2002 APES question #4 (Global change, climate, document based)	
(A) describe the law of conservation of energy;	*		√	√	√		
(B) investigate and demonstrate the movement of heat through	*			√		• 1999 APPHY-B question #7	Students should be

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solids, liquids, and gases by convection, conduction, and radiation;						(PV diagram for an ideal gas)	introduced to the kinetic theory and calorimetery. Students should do $Q=mc\Delta T$ and $Q = mL$ calculations. $Q=mc\Delta T$ is tested on TAKS. NOTE: TEKS do not call for a heating/ cooling diagram; however, Pre-AP students should be introduced to these diagrams as well as do a lab.
(C) analyze the efficiency of energy conversions that are responsible for the production of electricity such as from radiant, nuclear, and geothermal sources, fossil fuels such as coal, gas, oil, and the movement of water or wind;				√	√	• Lab using immersion heaters to warm water (CPO- IPC) • Lab using mechanical energy to warm an object (falling shot or sand labs) • 2001 APPHY-B question #5 (Resistor used as a thermometer) • 2002 APPHY-B question #3 (Wattage of light bulbs)	
(D) investigate and compare economic and environmental impacts of using various energy sources such as rechargeable or disposable batteries and solar cells;	*				√		
(E) measure the thermal and electrical conductivity of various materials and explain results;			√	√		• 1999 APCHEM question #7 (Practical applications incl. conductivity, freezing pt., vapor pressure, and pH) • 2001 APCHEM question #5	These are important concepts and must involve experiments.

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						(Practical applications incl. conductivity, boiling pt., reactivity, and pH)	
(F) investigate and compare series and parallel circuits;	*			√		• 2000 APPHY-B question #3 (Resistance-Capacitance circuit) • 2000 APPHY-C EM question #1 (Resistance-Capacitance-Inductor circuit) • 2001 APPHY-C EM question #2 (Potential vs time grah for a capacitor) • 2002 APPHY-B question #3 (Light bulbs in a circuit) • 2002 APPHY-C EM question #2 (Resistance-capacitance circuit)	Pre-AP IPC students should be able to solve series and parallel circuits of 3 or more resistors. Students should be able construct both types of circuits in lab and measure voltage and current with a meter. Ohm's law and properties of circuits are tested on TAKS.
(G) analyze the relationship between an electric current and the strength of its magnetic field using simple electromagnets; and				√		• Students should map a magnetic field with a compass or magnetic paper. • Students should build a simple electric motor and an electromagnet. They should be able to list the factors that affect the strength of the field. CPO IPC and Physics have several labs on magnetism. • 2001 APPHY-C EM question #3 (Magnetic field due to a current-carrying wire)	
(H) analyze the effects of heating and cooling processes in systems such as weather, living, and mechanical.		√		√	√	• 1999 APPHY-B question #7 (PV diagram for an ideal gas)	Pre-AP students must be exposed to the gas laws (this is optional

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							and not specified in TEKS for IPC).
(7) Science concepts. The student knows relationships exist between properties of matter and its components. The student is expected to:							
(A) investigate and identify properties of fluids including density, viscosity, and buoyancy;	*		√	√		• 2002 APPHY-B question #6 (Fluid displaced by an object)	Buoyancy of gases and gas laws should be taught.
(B) research and describe the historical development of the atomic theory;			√	√		• There are several games and simulations that can be used. (CPO IPC has one as well as many Chemistry I lab manuals.)	Pre-AP IPC student should be taught atomic structure through electron-configurations. They should be able to write a configuration through element #56 or higher.
(C) identify constituents of various materials or objects such as metal salts, light sources, fireworks displays, and stars using spectral-analysis techniques;			√	√		• 1999 APCHEM question #2 (Atomic structure w/bond energy and line spectra)	Students should see a spectral-analysis chart and view different light sources through diffraction grating or spectrum displays.
(D) relate the chemical behavior of an element including bonding, to its placement on the periodic table;	*		√			• A 3-D periodic table project showing trends in properties is effective. • 1999 APCHEM question #2 (Atomic structure w/bond energy and line spectra) • 1999 APCHEM question #8 (Bonding and molecular structure) • 2000 APCHEM question #7 (Atomic structure w/isotopes, electron	Students need to understand both the historical development of the periodic chart and how to use the chart to predict the properties of elements by their position.

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						configuration, electron dot structures and ionization energy) • 2001 APCHEM question #8 (Chemical bonding and intermolecular forces) • 2002 APCHEM question #6 (Atomic structure and bonding)	Students should be required to write formulas and name both ionic and covalent compounds given only a periodic table. Electron configuration and how it relates to the position of the elements should be covered. The explanation of ion formation should include electron configurations of the ions. A discussion of the periodic trends should include ionization, size, and electronegativity.
(E) classify samples of matter from everyday life as being elements, compounds, or mixtures.	*		√			• Chromatography and other separation techniques should be used as labs in this section.	
(8) Science concepts. The student knows that changes in matter affect everyday life. The student is expected to:						• several SEPUP activities (an issue oriented science series available from lab-aids.com	
(A) distinguish between physical and chemical changes in matter such as oxidation, digestion, changes in states, and stages in the rock cycle.	*	√	√		√		

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(B) analyze energy changes that accompany chemical reactions such as those occurring in heat packs, cold packs, and glow sticks to classify them as endergonic or exergonic reactions;			√			• 1999 APCHEM question #6 (Entropy, enthalpy, and free energy) • 2000 APCHEM question #6 (Entropy, enthalpy, free energy and kinetics) • 2001 APCHEM question #2 (Entropy, enthalpy, free energy, and bond energy) • 2002 APCHEM question #3 (Stoichiometry, gases, thermo, isomerism) • 2002 APCHEM question #5 (Molar heat of neutralization lab question)	Labs that demonstrate these changes should be done.
(C) investigate and identify the law of conservation of mass;	*		√	√		• 2000 APCHEM question #3 (Stoichiometry and redox titration) • 2001 APCHEM question #3 (Stoichiometry, gases and titration) • 2002 APCHEM question #2 (stoichiometry and electrochemistry) • 2002 APCHEM question #3 (Stoichiometry, gases, thermo, isomerism) • 2001 APPHY-B question #7 (Nuclear fusion)	A lab should be done to verify this law. Students need to balance challenging equations and be able to predict products for single replacement, double replacement, and combustion reactions.
(D) describe types of nuclear reactions such as fission and fusion and their roles in applications such as medicine and energy production; and			√	√	√	• 1999 APPHY-B question #4cde (Nuclear decay equations) • 2001 APPHY-B question #7 (Nuclear fusion)	Students should be able to list the three forms of radiation and balance a nuclear equation.
(E) research and describe the environmental and economic impact of the end-products of chemical reactions.					√	• several SEPUP activities (an issue	

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						oriented science series available from lab-aids.com)	
(9) Science concepts. The student knows how solution chemistry is a part of everyday life. The student is expected to:						• several SEPUP activities (an issue oriented science series available from lab-aids.com)	
(A) relate the structure of water to its function as the universal solvent;	*	√	√		√		Polarity of water should be explained. The other forms of intra-molecular bonding should be introduced but students should not identify compounds as to type of attraction (beyond ionic and covalent). This is a very important concept in Pre-AP and AP Biology, Chemistry, and Environmental Science
(B) relate the concentration of ions in a solution to physical and chemical properties such as pH, electrolytic behavior, and reactivity;	*		√		√	• Ice-cream or candy lab where colligative properties are illustrated—should include questions about number of particles and how they effect the property. • 1999 APCHEM question #3 (Kinetics) • 1999 APCHEM question #7 (Practical applications incl. conductivity, freezing pt., vapor pressure, and pH)	Students should use the Brønsted-Lowry definitions of acids and bases. Students should be able to predict products given an acid and a base.

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						• 2000 APCHEM question #5 • (Freezing point depression lab question) • 2000 APCHEM question #6 (Entropy, enthalpy, free energy and kinetics) • 2000 APCHEM question #8 (Titration curve and indicators) • 2001 APCHEM question #5 (Practical applications incl. conductivity, boiling pt., reactivity, and pH) • 2001 APCHEM question #6 (Kinetics lab question) • 2002 APCHEM question #7 (Kinetics)	Students should use Lewis-dot models for atoms, ions, and molecules. Students should be able to name common acids. A lab that demonstrates these concepts should be performed.
(C) simulate the effects of acid rain on soil, buildings, statues, or microorganisms;		√			√		
(D) demonstrate how various factors influence solubility including temperature, pressure, and nature of the solute and solvent; and	*		√			• 2001 APCHEM question #1 (Solubility equilibria)	Students should be able to use a solubility graph to predict saturated, unsaturated and supersaturated solutions. A lab that demonstrates these concepts should be performed.
(E) demonstrate how factors such as particle size, influence the rate of dissolving.							A lab that demonstrates these concepts should be performed.