

**Advancing Science Activities List for High School (9-12)**

<b>Activity Number</b>	<b>Name of Activity</b>	<b>Capsule Description of Activity</b>	<b>Grade Level</b>	<b>Subject Area</b>
3.051	<b>Rewiring the Brain: An Exercise in Neuronal Plasticity</b>	Students discover how adaptable the brain really is in this simple yet powerful activity. Hitting a target is easy... until students don special "diopter" lenses. Can their brains get straightened out? And what happens once the lenses are removed? Great potential for inquiry learning in this lab.	7-12	B
3.061	<b>Osmosis and the Natural Membrane</b>	Students use decalcified chicken eggs to study the passage of three different solutions through the cell membranes of the egg.	7-12	B
3.102	<b>Advanced Simple Machines</b>	Students use materials from K'nex kits to create simple machines, study their uses, and solve problems.	4 - 9	P
3.103	<b>DNA K'Nex - Replication and Transcription</b>	Students use materials from K'nex kits to build DNA and mRNA molecules. This flexible set allows students to build and learn about phosphate groups, deoxyribose and ribose sugars, hydrogen bonds, codons, nucleotides, and more.	7 - 12	B
3.151	<b>Microbes In The Environment</b>	Students find out "where the germs are" as they swab a number of different choice locations, inoculate agar plates, then use an incubator to see how many microorganisms develop.	3 - 12	B
3.152	<b>Effectiveness of Hand Washing</b>	Students test their hand washing technique by inoculating agar plates before and after washing, then using an incubator to see how many microorganisms develop.	5 - 12	B
3.153	<b>Introduction to Microscopy &amp; Bacterial Staining Methods</b>	Students use proper technique to stain collected strains of bacteria, then examine them under the oil-immersion lens of a compound microscope. (Good follow up to labs 151, <i>Microbes In The Environment</i> , or 152, <i>Effectiveness of Hand Washing</i> )	9-12	B
3.230A	<b>Introduction to the Compound Microscope</b>	Students learn the parts and function of the compound microscopes while looking at a variety of prepared slides on low, medium and high power.	4-12	B,E
2.230B New	<b>Introduction to Digital Microscopes-What's in the Pond</b>	Students will develop skills need manipulate various features of digital microscopy. Using pond water samples they will capture, edit and compare	5 - 12	B, E
3.231	<b>Protozoa Lab</b>	Students explore and record the microscopic world of pond water using the Science Van's compound microscopes.	4-12	B
3.232	<b>The Effect of Drugs on Daphnia</b>	Students use compound microscopes to compare the heart rates of <i>Daphnia</i> before and after exposure to household drugs (alcohol, caffeine, nicotine) or temperature changes.	5-12	B, C

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3.233	<b>Hair Analysis</b>	Students use their observation and critical thinking skills to develop a procedure for identifying hairs collected from a crime scene. <b>Note: This is a multi-day lab.</b>	9 - 12	B
3.234	<b>The Effect of Environmental Toxins on Daphnia</b>	Students use compound microscopes to compare the heart rate and behavior of Daphnia before and after exposure to environmental toxins (antifreeze and laundry detergent).	5-12	B, C, E
3.241	<b>Static electricity</b> **Demonstration**	Teacher uses Van der Graaff generator to show various effects of static electricity.	K - 12	C, P
3.251	<b>Circuits: Simple, Series, And Parallel</b>	Students use Basic Electricity Kits to study the differences and similarities between three kinds of electrical circuits.	4-10	P
3.253	<b>Electrical Resistors</b>	Students will use a multi meter to increase their understanding of resistance, read the colors on a resistor to determine the resistance, compare color coded resistance to actual resistance, understand tolerance and its importance, and review how to change per cent to decimals.	6-12	P
3.281	<b>Water Quality Testing</b>	Students use Water Test Kits to measure various water quality parameters such as alkalinity and hardness.	4-12	C
3.282	<b>Stream Study</b>	Students use a variety of equipment from the Science Van, including Microscopes, Flow Meter, and Water Test Kits, to study the physical, biological and chemical aspects of a stream.	K - 12	B, C, E, P
3.283	<b>Dissolved Oxygen Lab</b>	Students compare the amount of dissolved oxygen in different samples of water using the Science Van's Water Test Kits.	5-12	B, C
3.284	<b>Advanced Stream Study</b>	Students use the LabPro Interface & TI-83+ Calculator with various sensors to make a high-tech examination of water quality. Parameters tested: Flow Rate, Turbidity, Temperature, pH, Nitrate concentration, Ammonium Nitrogen concentration, and Total Dissolved Solids.	7-12	B, C
3.285	<b>Macroinvertebrates as Stream Health Indicators</b>	Students use kicknets and other materials to collect macroinvertebrates from a stream or pond. Using the <i>Pollution Tolerance Index</i> they will then assess the health of the stream.	5-12	B, E, P
3.286	<b>ESI: Watching the Watershed</b>	Students analyze eight prepared water samples using water Test Kits to try to determine from which business/industry particular pollutants have come from.	7-12	B,C,E

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3.301	<b>Where Does the Water Go?</b> **Demonstration**	Teacher uses the Groundwater Simulation System to explain the movement of water beneath the surface of the earth, as well as the dangers of pollution.	3-12	E
3.302	<b>Enviroscape - Wetlands Model</b> **Demonstration**	Teacher uses the Wetlands model to demonstrate how our daily activities, as well as industry and agriculture affect wetlands through runoff.	K - 12	E
2.303 New	<b>Enviroscape-Drinking and Waste water Treatment Model</b>	Teacher uses the Wastewater and Drinking Water Treatment model to demonstrate water sources for cities, rural areas, industrial and recreational areas. Effective treatment methods will be demonstrated as well.	K - 12	E
3.311	<b>Observation and Classification of Mineral Specimens</b>	Students use microscopes and rock identification kits to examine and determine the identity of different mineral samples.	K - 12	E
3.321	<b>Topographic Map Lab</b>	Students use Contour Map Kits to learn how to create a two dimensional topographic Map from a three dimensional model.	4-12	E
3.322	<b>Topo Map II</b>	Students use rocks, oil-based clay, and Contour Map Kits to create their own topographic map, then exchange maps to try to re-create each others' models. (Designed as a follow up to Topographic Map Lab)	4-12	E
3.331	<b>Earth, Sun, Moon</b>	Students get concrete methods to learn the abstract concepts of rotation, revolution, time, seasons, and moon phases using Sun, Earth, & Moon Models.	5-9	E
3.401	<b>Household Acids and Bases Testing</b>	Students use pH meters and pH test paper to determine the relative acidity of various familiar substances. (Good introduction to the pH meter.)	4-12	B, C
3.403	<b>Acid Rain</b>	Students use pH Meters to explore the neutralizing effectiveness of two soil types. They also use the meters to discover how severe acid rain is in different parts of the country, and how power plants and other polluting facilities cause acid rain.	4-12	B, C, E
3.404	<b>pH, Inc.</b>	Problem solving activity in which students use pH meters to determine the best and most economical way to clean up an acid spill. (Good follow up to Acid Rain.)	4-12	B, C
3.405	<b>Soil Testing</b>	Determine the pH and water retention ability of three different soil types. Add different acidifying fertilizers and measure the pH change as you learn about acid loving plants.	5-12	B, C
3.406	<b>Effect of Temperature on Germination</b>	Students will manipulate the soil conditions to simulate seasonal change and day-night changes. Temperature will be monitored using Vernier Temperature probes.	4-12	B,E,P

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3.512	<b>Bright Line Spectroscopy</b>	Students use hand held spectrometers to observe the bright line spectra of elements such as hydrogen, helium, neon and more. Atoms of these gases are excited using electrical energy from the accompanying power supply.	8-12	C, P
3.531	<b>Introduction to Spectrophotometry</b>	Students view the visible light spectrum produced by the spectrophotometers in a interesting and unconventional way.	4-12	P,C
3.532	<b>Spectral Curve of Food Coloring</b>	Students use spectrophotometers to determine the wavelength at which a colored solution absorbs the most light energy.	4-12	C, P
3.533	<b>The Effect of Concentration on Absorbance</b>	Students use spectrophotometers to explore the relationship between the concentration of a substance and the amount of light energy it can absorb. (Good follow up to Spectral Curve.)	4-12	C, P
3.534	<b>Physical Or Chemical Change?</b>	Students use spectrophotometers to determine whether color changes are physical or chemical in nature. (Good follow up to Spectral Curve.)	7-12	C, P
3.535	<b>Spectral Curve Of Leaf Pigments</b>	Students use spectrophotometers to determine the wavelength at which an extract of leaf or vegetable pigment absorbs the most light energy. (Good "real world" substitute for Spectral Curve.)	7-12	B, C
3.536	<b>My Business is Going Under</b>	Determine the time of a "murder" using spectrophotometers as students perform a new twist on absorbance versus concentration in this Forensics Investigation. (Good substitute for lab 533, <i>The Effect of Concentration on Absorbance</i> )	9-12	C
3.537	<b>Spectral Analysis of Suntan Lotions</b>	Students use spectrophotometers to determine and compare how well various SPF sunscreens absorb ultraviolet radiation.	9-12	B, C
3.538	<b>Spectral Curve of Kool-Aid</b>	Students use spectrophotometers to determine if colors separated out in column chromatography are pure or mixtures. (Good follow up to lab 571, <i>Extraction And Identification Of Dyes.</i> )	8-12	C
3.539	<b>Analysis of Aspirin Using Visible Spectrophotometry</b>	Students use Spectrophotometers to determine the purity of synthesized aspirin or a brand of commercial aspirin product.	10-12	C
3.540	<b>Determination of Iron in Water</b>	Students use Spectrophotometers to determine the amount of iron in a variety of water samples.	10-12	C

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3.541	<b>A Study of Reaction Rates with the Spectrophotometer</b>	Students use the Spectrophotometers interfaced with computers with SpectroPro software and produce an absorbance versus time graph. The concentration of one reactant is halved and the reaction rates compared with the original. The order with respect to each reactant is determined.	10-12	C
3.542	<b>The Effect of Alcohol on Biological Membranes</b>	In this experiment, beet root is used to test the effect of three different alcohols (methanol, alcohol, propanol) on biological membranes. Spectrophotometers are used to quantify the effect of these alcohols and the damage they inflict on the cell membrane.	5-12	B, C
3.543	<b>Spectrophotometric Determination Of NO<sub>x</sub> In Car Exhaust</b>	Students collect air and car exhaust samples, prepare them and compare to a series of standards using the Spectronic 20 D+	10-12	C
3.571	<b>Extraction And Identification Of Dyes</b>	Students use column chromatography supplies to separate dyes in colored solutions.	5-12	C
3.572	<b>Thin Layer Chromatography</b>	Students use thin layer chromatography sheets (non-polar silica gel) to separate a variety of different commercial food colors and compare them to FD&C standards.	8-12	C
3.573	<b>Paper Chromatography of Candies</b>	Students use paper chromatography strips to separate the colors of the coatings of several candies and compare them to FD&C standard colors.	8-12	C
3.574	<b>Thin Layer Chromatography of Pen Inks</b>	Students use thin layer chromatography to determine which pen was used to leave a prank note.	8 - 12	C
3.651	<b>Newton's Laws of Motion</b>	Students use a kinesthesia cart to study inertia, the acceleration of different masses when propelled by a constant force, equal and opposite actions, and projectile motion. (For older students, a more in-depth look at Newton's second law involves ULI Motion Detectors and Computers.)	K - 12	P
3.652	<b>The Auditorium Luge</b>	Students use graphing calculators, calculator based laboratories, motion detectors and a kinesthesia cart to acquire and analyze data for an object undergoing constant acceleration.	9-12	P

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3.682	<b>DNA Electrophoresis</b>	Students separate fragments of DNA by size of molecule using electrophoresis gel boxes, then analyze the results. (Basis of DNA fingerprinting) <b>Note: This is a multi-day lab</b>	9-12	B
3.683	<b>Solving a Crime Using DNA Electrophoresis</b>	Set up a simulated murder scene and run crime scene DNA evidence on electrophoresis gel boxes to match to one of the suspects. <b>Note: This is a multi-day lab.</b>	9-12	B
3.721	<b>Computer Graphing</b>	Uses Excel™ Software on the Science Van's Computers to create simple bar, line and pie graphs from data collected by students.	4-12	B, C, E, M, P
3.723	<b>Stream Bottom Profile</b>	Students use Excel™ Software on Computers to create three dimensional maps of stream bottom depth profile data.	5-12	E, M, P
3.724	<b>The Revolution of the Moons of Jupiter</b>	Apply the laws of motion to calculate the mass of Jupiter using software from Project CLEA (Contemporary Laboratory Experiences in Astronomy)	9-12	E
3.725	<b>EcoBeaker HS</b>	Students use Portable Computers to investigate ecological scenarios in this interactive software. Concepts the software covers include: Population Ecology, Ecosystems, and Conservation Biology.	7-12	B, E
3.726	<b>Science Sleuths</b>	Students use Portable Computers to investigate and solve mysteries with this interactive software. Equipment, videos and other resources are used to determine who's at fault in an accident, what washed ashore, why people got sick or what is causing lawnmowers to explode. Can be used by students working in small groups or as a Teacher - led class project.	5-9	B, C, E, M, P
3.727	<b>Statistics with Microsoft Excel</b>	During this lab, students will not only learn how to edit simple mathematical formulas with Microsoft Excel spreadsheets, but will also learn about the $X^2$ Statistical Test and how the test can be run using a simple spreadsheet. Students can use their own data or follow instructions for pre-written experiments to gather data for this lab.	6-12	B, C, E, M, P
3.728	<b>Introduction to GIS Analysis</b>	Students will identify the uses and benefits of GIS. While manipulating data layers, students will produce maps and solve problems using the information obtained.	6-12	B, E

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3.729	<b>The Three G's: GPS, Geocache and GIS Part 1</b>	Part 1 is an introduction to the use of GPS receivers and how they acquire their data. Students will learn to find latitude and longitude coordinates as an introduction to geocaching.	6-12	B, E, P
3.730	<b>The Three G's: GPS, Geocache and GIS Part 2</b>	Part 2 Students will manipulate GIS data to produce maps which will be used to solve problems. The focus of the problems are Chesapeake Bay watershed related.	6-12	B, E
3.731	<b>Geocaching for Knowledge: A Mock Stream Study with GPS Receivers</b>	After an introduction to GPS and geocaching, students will be given latitude and longitude coordinates to find. Stream quality facts will be in the various caches. Working in teams the students will determine the overall health of the mock stream. Content of the caches can be adjusted to fit subject needs.	4-12	B, E, P
3.740	<b>Photosynthesis</b>	Students use computerized probes to determine the changes in CO <sub>2</sub> levels (reflecting rates of respiration and/or photosynthesis) of leaves in both light and dark chambers.	7 - 12	B
3.752	<b>A Good Sock</b>	Smelly or not, socks usually do a good job keeping the heat in. In this activity, students use Laptop Computers and ULI Temperature Probes to discover the effectiveness of cotton and wool socks and the problem with wet socks. (This lab can also be done using the LabPro/TI-83+ system).	4-12	B, C, E, P
3.753	<b>Endothermic And Exothermic Reactions</b>	Students use Computers and ULI Temperature Probes to study the two different reaction types. (This lab can also be done using the LabPro/TI-83+ system.)	5-12	C
3.754	<b>Freezing and Melting of Water</b>	Students use Computers and ULI Temperature Probes to determine and compare the freezing and melting temperatures of water. (This lab can also be done using the LabPro/TI-83+ system.)	5-12	C
3.755	<b>Mixing Warm &amp; Cold Water</b>	Students use Computers and ULI temperature probes to construct a simple calorimeter, mix cold and warm water, then determine heat lost by the cooling water and gained by the warming water. (This lab can also be done using the LabPro/TI-83+ system.)	5-12	C, P
3.756	<b>Temperature Probe Response Time</b>	Students use Computers and ULI Temperature Probes to determine the response time of the probe. (This lab can also be done using the LabPro/TI-83+ system.)	5-12	B, C, E, P

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3.758	<b>Energy Content of Foods</b>	Students use Computers and ULI Temperature Probes to analyze the amount of energy contained in different food types. (This lab is available in both Biology and Chemistry based versions, and can also be done using the LabPro/TI-83+ system.)	9-12	B, C
3.759	<b>Evaporation and Intermolecular Attractions</b>	Students use Computers and ULI Temperature Probes to relate temperature changes during evaporation to the strength of intermolecular forces of attraction. (This lab can also be done using the LabPro/TI-83+ system.)	9-12	C
3.760	<b>Heat of Fusion for Ice</b>	Students use Computers and ULI Temperature Probes to determine the amount of energy required to melt a gram of ice, then calculate the molar heat of fusion for ice. (This lab can also be done using the LabPro/TI-83+ system.)	9-12	C, P
3.761	<b>Using Freezing Point Depression to Find Molecular Weight</b>	Students use Computers and ULI Temperature Probes to first find the freezing temperature of a pure solvent, then add a known mass of another substance, and determine the molecular weight of the added substance by the resulting change in the freezing point. (This lab can also be done using the LabPro/TI-83+ system.)	9-12	C
3.762	<b>Energy Comparison of Chemical and Physical Changes</b>	Determine the heat of combustion and the heat of solidification of wax using Computers and ULI Temperature Probes.	9-12	C, P
3.763	<b>The Complexity of Global Warming</b>	Students learn just how difficult it is to fully understand the concept of global warming. In this inquiry based lab, students can choose from a variety of relationships that can either increase or decrease the effect of global warming and test their hypotheses by using Laptop Computers and LabPro interfaces.	6-12	B, C, E
3.764	<b>The Greenhouse Effect</b>	Students use Laptop Computers and LabPro interfaces with temperature probes to investigate the Greenhouse Effect using various models.		
3.767	<b>Additivity of Heats of Reaction: Hess's Law</b>	Students use Computers and ULI Temperature Probes to measure the heat of three different chemical reactions, confirming Hess's Law. (This lab can also be done using the LabPro/TI-83+ system.)	9-12	C
3.768	<b>What Causes the Seasons?</b>	Students use a simulated sun—a light bulb—to shine on a ULI Temperature Probe attached to a globe. They then study how the tilt of the globe influences warming caused by the lighted bulb.	5-12	P, E
3.772	<b>Picket Fence Free Fall</b>	Students measure the acceleration of a freely falling body using Computers, ULI Photogates and a Picket Fence.	9-12	P

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3.773	<b>Projectile Motion</b>	Students measure the velocity of a ball using Computers and ULI Photogates, then predict the impact point of a ball in projectile motion.	9-12	P
3.781	<b>Effect of Water Type on pH of Acid Rain</b>	Students use Computers and ULI pH probes to compare the effect on pH of dissolving acid into various kinds of water. (This lab can also be done using the LabPro/TI-83+ system.)	5-12	B, C
3.782	<b>Generating Acid Rain</b>	Students use Computers and ULI pH probes to create and analyze the primary acids that comprise acid rain. (This lab can also be done using the LabPro/TI-83+ system.)	5-12	B, C, E
3.783	<b>Acid Dissociation Constant, <math>K_a</math></b>	Students use Computers and ULI pH probes to experimentally determine the dissociation constant of an acid, then see if changing solution concentration has an effect on the equilibrium constant.	9-12	C
3.784	<b>Titration Curves of Strong and Weak Acids and Bases</b>	Students use Computers and ULI pH Probes to study the shapes of titration curves made with various combinations of strong and weak acids and bases. (This lab can also be done using the LabPro/TI-83+ system.)	9-12	C
3.791	<b>Motion Match</b>	Students will gain a first-hand understanding of graphs and the information they convey through this interactive activity. Students move their bodies back and forth using Laptop Computers and ULI Motion Detectors to match a graph of distance (from the detector) vs. time. If they are successful matching the graph, they can attempt to match a velocity vs. time graph.	3-9	M, P
3.792	<b>Kinetic - Potential Energy Transfer</b>	Students use Computers and ULI Motion Detectors to compare energy transfers in two different types of common ball.	5-12	C, P
3.793	<b>Momentum: A Crash Lesson</b>	students will use computers and ULI motion detectors to measure the velocity of a vehicle and calculate its momentum as it crashes into a moveable barrier. (This lab can also be done using the LabPro/TI-83+ system.)	6-12	P
3.794	<b>Energy of a Tossed Ball</b>	Students use Computers and ULI Motion Detectors to study the energy changes as a ball is tossed straight upward, slows down until it reaches the top of its path and then speeds up on its way back down. (Similar to # 2.792, <i>Kinetic - Potential Energy Transfer</i> .) (This lab can also be done using the LabPro/TI-83+ system.)	5-12	P

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3.795	<b>Ocean Floor Mapping</b>	Students use portable computers and ULI Motion Detectors to simulate mapping the floor of the ocean. (Good follow up to lab 321, <i>Topographic Map Lab</i> .)	5-12	P, E
3.796	<b>Graph Matching</b>	Advanced version of lab 3.791 for Physics: students will analyze the motion of a student walking across the room, predict, sketch, and test distance vs. time and velocity vs. time kinematics graphs using a laptop computer and motion detector.	11-12	M, P
3.801	<b>Boyle's Law</b>	Students use Computers and ULI Pressure Sensors to determine the relationship between pressure and volume in a confined gas. (This lab can also be done using the LabPro/TI-83+ system.)	9-12	B, C, P
3.802	<b>Pressure Temperature Relationship in Gases</b>	Students will use computers with ULI Temperature and Pressure sensors to determine what kind of mathematical relationship exists between the pressure and absolute temperature of a confined gas. (This lab can also be done using the LabPro/TI-83+ system.)	9-12	C
3.803	<b>Enzyme Action: Testing Catalase Activity</b>	Students will use a Computer and ULI Pressure Sensor to measure and compare the initial rates of reaction for the destruction of hydrogen peroxide by the enzyme catalase at various enzyme concentrations, temperatures and pH values.	7-12	B
3.804	<b>Factors Affecting Transpiration</b>	Students will use a Computer and ULI Pressure Sensor to measure and compare the initial rates of transpiration of a plant subjected to varying environmental pressures such as humidity, light, and heat.	7-12	B
3.805	<b>Get A Grip!</b>	Students use Computers, interfaces and pressure sensors to measure their gripping power. They will see if their gripping power changes as they grip an object for a longer time. They will also compare their gripping power with their classmates.	5 - 9	B, C, P
3.811	<b>Effect of Temperature on Fermentation</b>	Students use Computers and ULI Pressure Sensors to determine how temperature effects the rate at which yeast respire. (This lab can also be done using the LabPro/TI-83+system.)	7-12	B, C, P
3.821	<b>Control of Human Respiration</b>	Students use Computers, ULI Biology Pressure Sensors and Respiration Belts to study human respiration under different conditions. (This lab can also be done using the LabPro/TI-83+ system.)	9-12	B

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3.831	<b>Limitations on Cell Size: Surface Area to Volume</b>	determine the importance of surface area to volume ratios using Computers and ULI Conductivity Probes. (This lab can also be done using the LabPro/TI-83+ system.)	7-12	B
3.832	<b>Diffusion Through Membranes</b>	Students use a portable computer and ULI Conductivity probe to study the effect of temperature, concentration gradients and the presence of a second molecule on diffusion.	7-12	B
3.853	<b>Heart Rate and Exercise</b>	Students use Computers and Vernier Heart Rate Monitors to determine their physical fitness level.	5-12	B
3.854	<b>Heart Rate</b>	Students use Computers and Vernier Heart Rate Monitors to measure human heart rates in different situations.	9-12	B
3.862	<b>Pulleys</b>	Use computerized Force Probes to explore the mechanical advantages of pulley systems.	5-12	P
3.871	<b>Reflectivity of Light</b>	Students compare the amount of light reflected by various surfaces using Computers and ULI Light Sensors. (This lab can also be done using the LabPro/TI-83+ system.)	5-12	P
3.872	<b>Polaroid Filters</b>	Students use Computers and ULI Light Sensors to measure the intensity of transmitted light and study the transmission of light by Polaroid filters. (This lab can also be done using the LabPro/TI-83+ system.)	5-12	P
3.873	<b>Lightstick Kinetics</b>	Students use Computers and ULI's with Light Sensors and Temperature Probes to measure the decay curve of the activity of a glow-in-the-dark light stick as a function of temperature.	10-12	C
3.881	<b>Alpha, Beta, and Gamma</b>	Students use Computers and ULI's with Radiation Detectors to determine the differences in alpha, beta and gamma radiation.	8-12	C, P
3.882	<b>Distance and Radiation</b>	Students use Computers and ULI's with Radiation Detectors to show how the intensity of gamma radiation varies with distance from a point source.	9-12	C, P
3.883	<b>Half-Life Measurement</b>	Students use Computers and ULI's with Radiation Detectors and Isogenerator to measure the half-life decay constant of Barium-137.	9-12	C, P
3.884	<b>Potassium in Dried Fruit</b>	Students use Computers and ULI's with Radiation Detectors to determine the radiation given off by various foods such as dried apricots, dried bananas and salt substitute.	9-12	C, P

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3.891	<b>Sound Waves &amp; Beats</b>	Students use computers and ULI Microphones to measure the amplitude, frequency and period of sound waves, as well as observe beats.	9-12	P
3.892	<b>Speed of Sound Lab</b>	Students use <b>Laptop Computers</b> and <b>LabPro interfaces</b> to measure the speed of sound and compare their experimental value to the known value.	8-12	P
3.896	<b>Magnetic Field Explorations</b>	Students use computers and ULI Magnetic Field Sensors to measure, graph and analyze magnetic field strength	5-12	P
3.897	<b>Electromagnets: Winding Things Up</b>	Students use computers and ULI Magnetic Field Sensors to study the relationship between coils of wire and the strength of an electromagnet.	5-12	P
3.898	<b>Seafloor Spreading</b>	Students use Laptop Computers and LabPro interfaces to study one of the major pieces of evidence supporting the Theory of Plate Tectonics. Magnetic Field Sensors are used to observe the changing polarity of simulated bedrock on both sides of a seafloor	5-12	E
3.901	<b>Alcohol Content in Commercial Products</b>	Students use the gas chromatograph to analyze products such as mouthwash and rubbing alcohol for actual alcohol content.	10-12	C
3.902	<b>Measurement of Petroleum Based Hydrocarbons</b>	Students use the gas chromatograph to separate and analyze hydrocarbons in various gasoline products.	10-12	C
3.903	<b>Volatile Organic Compounds in Cosmetics</b>	Students use the gas chromatograph to separate and identify organic compounds in various perfumes.	10-12	C
3.904	<b>Analysis and Comparison of Gasolines Using Gas Chromatography</b>	Students use the gas chromatograph to determine the octane rating of "regular" and "premium" gasolines.	10-12	C
3.905	<b>Analysis of the Stuff of Life</b>	Students use the gas chromatograph to separate and identify compounds in various products; many different compounds can be examined, as long as it has an odor, evaporates (leaves no residue on a glass surface) or is partially volatile (some of it evaporates when put in a glass vial.)	10-12	C
3.906	<b>Analysis of Hydrocarbon Distillate Mixture</b>	This advanced lab gives students the opportunity to separate a hydrocarbon mixture by fractional distillation and to examine their level of success in achieving a separation by gas chromatography.	10-12	C
3.921	<b>Evaluation of Fluorescent Highlighter Markers by Fluorometry</b>	Students will analyze and compare different brands of markers as well as various colors of each brand to compare and identify the degree of fluorescence of each.	10 - 12	C

**Advancing Science Activities List for High School (9-12)**

<b>Activity Number</b>	<b>Name of Activity</b>	<b>Capsule Description of Activity</b>	<b>Grade Level</b>	<b>Subject Area</b>
3.922	<b>Analysis of Nicotine in Cigarettes by Fluorometry</b>	Students compare the amount of nicotine in a variety of cigarettes (regular, lights, ultralights) for differences in nicotine content. A standard nicotine solution can be used for quantitative comparison.	9-12	C
3.923	<b>Analysis of Quinine in Tonic Water</b>	Students use fluorimeters to analyze and compare various brands tonic water for quinine content.	10 - 12	C
3.931	<b>Comparison of Synthetic versus Natural Perfumes</b>	Students use the infrared spectrophotometer to identify differences between synthetic and natural perfumes.	10-12	C
3.932	<b>Analysis of Combustion Exhaust</b>	Students use the infrared spectrophotometer with a gas cell to analyze car exhaust and identify its components.	10-12	C
3.933	<b>Analysis of Motor Oils</b>	Students use the infrared spectrophotometer to analyze and compare natural, synthetic, new and used motor oils.	10-12	C
3.934	<b>Characterization of Plastics For Recycling</b>	Students use the infrared spectrophotometer to analyze, identify and compare several common plastics.	10-12	C
3.935	<b>Comparison of Tapes &amp; Labels</b>	Students use the infrared spectrophotometer to analyze, identify and compare various glues and adhesives.	10-12	C
3.936	<b>Measurement of V. O. C.s in Essential Oils</b>	Students use the infrared spectrophotometer to analyze, identify and compare various volatile organic compounds.	10-12	C
3.937	<b>Analysis of Petroleum Hydrocarbons</b>	Students use the infrared spectrophotometer to analyze, identify and compare various hydrocarbon compounds found in fuels.	10-12	C
3.938	<b>IR Analysis of Stuff of Life</b>	Students use the infrared spectrophotometer to analyze, identify and compare various substances found around the home, from foodstuffs to motor oils.	10-12	C
3.941	<b>Confirming Esterification with the IR</b>	Students use the Thermo - Electron FTIR to analyze the reactants (alcohol and acid) and the the product (ester) to confirm that the desired reaction has taken place.	10 - 12	C
3.942	<b>Identifying Crime Scene Fibers Using the IR</b>	Students will analyze various fabrics and fibers to identify the polymer content for the purpose of linking a crime scene sample to a perpetrator.	10 - 12	C
3.943	<b>Identifying Crime Scene Plastic Films Using the IR</b>	Students will analyze various plastics and thin films to identify the polymer content for the purpose of linking a crime scene sample to a perpetrator.	10 - 12	C
3.944	<b>Identifying Crime Scene Powder Using the IR</b>	Students will try to identify a white powder from a crime scene using the FTIR. This evidence will be used to try to solve a mock crime.	10 - 12	C

*Advancing Science Activities List for High School (9-12)*

<b>Activity Number</b>	<b>Name of Activity</b>	<b>Capsule Description of Activity</b>	<b>Grade Level</b>	<b>Subject Area</b>
3.951	<b>Determine the SPF of Sunscreen Lotions</b>	Students use the Scanning UV-Visible Spectrophotometer to examine standard SPF's and then find the SPF value of an unknown sunscreen.	10-12	C
3.952	<b>Characterizing Colors of Spice Extracts</b>	Students use the Scanning UV-Visible Spectrophotometer to examine and catalog the spectra of known spices. Spectra of whole foods are then compared to identify what spices are in those foods.	10-12	C
3.953	<b>Analysis of Olive Oils</b>	Students use the Scanning UV-Visible Spectrophotometer to analyze three different grades of olive and then characterize an unknown oil.	10-12	C
3.971	<b>Microscale Synthesis of Aspirin</b>	Students use the Microscale Glassware to safely synthesize a small quantity of acetylsalicylic acid.	10-12	C
999.874 New	<b>Earth's Reflective Qualities</b>	Using the Vernier LabPros, students will measure the reflective quality of various surfaces and colors found on the Earth's surface.	5-12	E, B
999.741 New	<b>Cellular Respiration with Peas</b>	Using the Vernier LabPros and peas, students will measure the effect of germination on CO2 production during cellular respiration.	5-12	E, B
999.742 New	<b>Respiration and CO2 Production</b>	Using the Vernier LabPros and peas, students will measure the effect of salinity of the soaking solution used to germinate the peas and how this will effect CO2	5-12	E, B
999.733 New	<b>Hot Spots: Using GPS to Map Temperature Variations</b>	Using Vernier LabPros with TI 83 calculators and GPS units, students will investigate the presence of various microclimates within an area. Can be used in conjunction with the GIS lab # 999.734.	6-12	E
999.734 New	<b>Map your Schoolyard's Hot Spots</b>	Combining data collected from lab # 999.733 with the ArcView GIS software studnets will develop beginner level skills to develop and add data layers to a map	6-12	E