AP Physics 1 Lab Descriptions:

Lab #1: *Pendulum Experiment*
Topic: Scientific Reasoning & Experimental Design
Science Practices & Lab Description: Guided Inquiry (SP 1, 3, 5)
This experiment will introduce students to scientific thinking and experimental design. We will learn about independent and dependent variables, measurement, data acquisition, data analysis (including creating and analyzing graphical representations), and communication of experimental results.

Lab #2: *Dune Buggy Experiment*
Topic: Kinematics, Constant Velocity
Science Practices & Lab Description: Guided Inquiry (SP 1, 2, 3, 4, 5)
This experiment will utilize battery powered dune buggies to help students determine the relationship between position and time for a battery powered truck. This will introduce students to constant velocity motion. Analysis of position vs. time graphs will lead to an understanding of constant velocity.

Lab Activity: *Motion Graph Matching*
Topic: Kinematics, Constant Velocity
Science Practices & Lab Description: (SP 1, 3)
Students will use motion detectors to graphically represent the motion of objects which have constant velocity. Students will predict the motion required to match a specific graph, and then walk it in front of a motion detector.

Lab #3: *Inclined Rail Experiment*
Topic: Kinematics, 1D Acceleration
Science Practices & Lab Description: Guided Inquiry (SP 1, 2, 3, 4, 5)
This experiment involves a steel ball which is rolls down an inclined rail. Students are introduced to using computers with sensors to acquire more accurate data. A graphical analysis of the relationship between position and time for the ball on the inclined rail will lead us to derive all of the equations of 1 dimensional kinematics.

Lab #4: *Gravitational Acceleration Experiment*
Topic: Kinematics, 1D Acceleration
Science Practices & Lab Description: Open Inquiry (SP 1, 3, 4, 5)
This will be a very open ended experiment. There are no prescribed steps to follow. Students must plan, design, and carry out their experiment. Students will utilize a variety of mini experiments to determine the acceleration of gravity.

Lab #5: *Shoot the Dime Lab*
Topic: Kinematics, 2D Motion
Science Practices & Lab Description: Open Inquiry (SP 2, 3, 4, 5, 6)
In this lab practicum students will demonstrate their understanding of projectile motion by predicting where on the floor to place a dime so that a ball rolling off the lab table will strike the dime. Students take whatever measurements students deem necessary while on the table, but students only get one shot at the dime!

Lab #6: *Cannon Lab*
Topic: Kinematics, 2D Motion
Science Practices & Lab Description: Open Inquiry (SP 2, 3, 4, 5)
In this lab students will demonstrate their understanding of projectile motion by determining how to find the launching velocity of a spring powered toy cannon. Each team will then be assigned a hoop to hang from the ceiling at a specified horizontal distance away from the cannon so that the cannonball flies through the hoop.

Lab #7: *Gravitational Force Experiment*
Topic: Dynamics, Forces
Science Practices & Lab Description: Open Inquiry (SP 1, 3, 4, 5)
Here students discover the relationship between the mass of an object and the gravitational force (weight) exerted on the object by the Earth. An analysis of the weight vs. mass graph will lead to an introduction of what a gravitational field is.

Lab #8: *Modified Atwood's Machine Experiment*
Topic: Dynamics, Newton's Laws
Science Practices & Lab Description: Guided Inquiry (SP 1, 2, 3, 4, 5, 6, 7)
This is actually a double experiment. In the first part students determine the relationship between net force and acceleration of an object. In the second part students determine the relationship between the mass and acceleration of an object. Combining these results gives students a clearer understanding of Newton's 2nd Law.

Lab #9: *Friction Experiment*
Topic: Dynamics, Newton's Laws, Forces
Science Practices & Lab Description: Guided Inquiry (SP 1, 3, 4, 5)
Students will experimentally determine the relationship between the Normal force and the force of Friction. Analysis of a Friction vs. Normal graph will introduce students to the coefficient of friction.

Lab #10: *Circular Motion Experiment*
Topic: Dynamics, Circular Motion
Science Practices & Lab Description: Guided Inquiry (SP 1, 2, 3, 4, 5, 7)
This double experiment involves finding relationships among spinning mass, central force, period, and velocity for a system that involves circular motion. Multiple graphical representations will aid in the understanding of these relationships.

Lab #11: *Universal Gravitation Analysis*
Topic: Universal Law of Gravitation
Science Practices & Lab Description: (SP 1, 2, 3, 4, 5, 6, 7)
Students will utilize solar system data to create a graph of orbital period vs. orbital radius, and use this graph to derive Newton's Law of Universal Gravitation.

Lab #12: *Collision Lab*
Topic: Momentum
Science Practices & Lab Description: Guided Inquiry (SP 1, 2, 3, 4, 5)
Students will use computer video analysis software as students investigate momentum, impulse, and conservation of momentum, using videos of various scenarios we film in the classroom. A graph of final momentum vs. initial momentum for various scenarios will give students an understanding of one of the important conservation laws of physics.

Lab #13: *Spring Force Experiment*
Topic: Dynamics, Forces; Energy, Work.
Science Practices & Lab Description: (SP 1, 4, 5, 7)
Students will determine the relationship between the spring force and the amount the spring stretches. This will be extended to determine how to find the work done in stretching a spring, utilizing the Force vs. Stretch graph.

Lab Activity: *Roller Coaster Lab*
Topic: Energy, Conservation of Energy
Science Practices & Lab Description: Guided Inquiry (SP 1, 2, 3, 4, 5, 6, 7)
Students will design and create roller coasters using pipe insulation and marbles. Calculations of energy at various points will be compared with experimental measurements to determine the amount of energy that is being dissipated.

Lab Activity: *Energy Race Lab*
Topic: Rotation, Rotational Energy
Science Practices & Lab Description: (SP 1, 2, 3, 5)
Students will roll a solid sphere, a solid cylinder, and a thin hoop down an incline, measure its velocity at the bottom, and experimentally determine the moment of inertia.

Lab Activity: *Figure Skating Lab*
Topic: Rotation, Conservation of Angular Momentum
Science Practices & Lab Description: (SP 1, 2, 3, 4, 5)
Students will use computer video analysis to measure the period of rotation, calculate the angular velocity, and determine the rotational inertia of a figure skater.

Lab #14: *Sticky Tape Lab*
Topic: Electrostatics, Electrostatic Forces
Science Practices & Lab Description: Open Inquiry (SP 1, 3, 4, 5, 6, 7)
Students will learn about electrostatic forces using clear sticky tape. Students will extend understanding of long range forces by comparing and contrasting the electrostatic force with the gravitational force.

Lab #15: *DC Circuits Lab*
Topic: Circuits, Ohm's Law
Science Practices & Lab Description: Guided Inquiry (SP 1, 2, 4, 5)
Students will use batteries, wires, and light bulbs to learn the basics of DC circuits. Students will be arranging components in series, parallel, and combinations.

Lab #16: *Wave Velocity Lab*
Topic: Mechanical Waves
Science Practices & Lab Description: Guided Inquiry (SP 1, 2, 3, 4, 5)
Students will use "snakey" springs to create various standing waves. Students will measure the wavelength and period/frequency of these standing waves. A graphical analysis of the data will allow students to experimentally determine the formula for wave velocity.

Lab Activity: *Speed of Sound Experiment*
Topic: Scientific Reasoning & Experimental Design
Science Practices & Lab Description: (SP 1, 2, 3, 4, 5)
Students will design and conduct an experiment to determine the speed of sound in air. They will discuss their proposed procedure and how they plan to complete the task.

Lab #17: *Hooke's Law & Oscillations*
Topic: Simple Harmonic Motion, Mass-Spring Oscillators
Science Practices & Lab Description: (SP 6, 7)
Students will predict what properties affect the period of a mass-spring oscillator, and then go on to test and communicate their prediction.

Lab #18: *Pendulum Experiment, Revisited*
Topic: Simple Harmonic Motion, Simple Pendulums
Science Practices & Lab Description: Guided Inquiry (SP 1, 2, 3, 4, 5)
To finish out the course, students repeat the Pendulum Experiment performed at the beginning of the course. However, this time the goal is to quantitatively determine the relationship between period and length of a simple pendulum. The use of graphical analysis will lead students to derive the formula for the period of a simple pendulum, from which they can experimentally determine the acceleration of gravity.