AP Physics 1 Syllabus

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Curriculum Overview

CR1 Students and teachers have access to college-level resources including a college-level textbook and reference materials in print or electronic format.
CR2 The course provides opportunities to develop student understanding of the required content and related big ideas outlined in Unit 1: Kinematics as described in the AP Course and Exam Description (CED).
CR3 The course provides opportunities to develop student understanding of the required content and related big ideas outlined in Unit 2: Dynamics.
CR4 The course provides opportunities to develop student understanding of the required content and related big ideas outlined in Unit 3: Circular Motion and Gravitation.
CR5 The course provides opportunities to develop student understanding of the required content and related big ideas outlined in Unit 4: Energy.
CR6 The course provides opportunities to develop student understanding of the required content and related big ideas outlined in Unit 5: Momentum.
CR7 The course provides opportunities to develop student understanding of the required content and related big ideas outlined in Unit 6: Simple Harmonic Motion.
CR8 The course provides opportunities to develop student understanding of the required content and related big ideas outlined in Unit 7: Torque and Rotational Motion.
CR9 The course provides opportunities to develop student understanding of the required content and related big ideas outlined in Unit 8: Electric Charge and Electric Force.
CR10 The course provides opportunities to develop student understanding of the required content and related big ideas outlined in Unit 9: DC Circuits.
CR11 The course provides opportunities to develop student understanding of the required content and related big ideas outlined in Unit 10: Mechanical Waves and Sound.
CR12 The course provides opportunities for students to develop the skills related to Science Practice 1: Modeling.
CR13 The course provides opportunities for students to develop the skills related to Science Practice 2: Mathematical Routines.
CR14 The course provides opportunities for students to develop the skills related to Science Practice 3: Scientific Questioning.
CR15 The course provides opportunities for students to develop the skills related to Science Practice 4: Experimental Methods.
CR16 The course provides opportunities for students to develop the skills related to Science Practice 5: Data Analysis.
CR17 The course provides opportunities for students to develop the skills related to Science Practice 6: Argumentation.
CR18 The course provides opportunities for students to develop the skills related to Science Practice 7: Making Connections.
CR19 The course provides students with opportunities to apply their knowledge of AP Physics concepts to real-world questions or scenarios to help them become scientifically literate citizens.
CR20 Students spend a minimum of 25 percent of instructional time engaged in a wide range of hands-on laboratory investigations with an emphasis on inquiry-based labs to support the learning of required content and development of science practice skills throughout the course.

CR21 The course provides opportunities for students to record evidence of their scientific investigations in a portfolio of lab reports or a lab notebook (digital format).

Text

Knight, Jones, and Field. *College Physics*: A Strategic Approach 3rd ed. Pearson Education, 2015

Course Resources

https://apstudent.collegeboard.org/apcourse/ap-physics-1 (required account)

https://albert.io (required account)

Course Outline

The AP® Physics 1 course is a year-long course. Each student receives ____ credits for the completion of the course. It is a stand-alone course. The course is an inquiry-based course that focuses on experimentation and also conceptual understanding. Lessons that are teacher oriented will include the derivation of equations, demonstrations of physical phenomena, vocabulary associated with the content, and addressing any questions from the students based upon the material covered. The content of this course is based upon 6 big ideas:

Big Idea 1 – Objects and systems have properties such as mass and charge. Systems may have internal structure.
Big Idea 2 – Fields existing in space can be used to explain interactions.
Big Idea 3 – The interactions of an object with other objects can be described by forces.
Big Idea 4 – Interactions between systems can result in charges in those systems.
Big Idea 5 – Changes that occur as a result of interactions are constrained by conservation laws.
Big Idea 6 – Waves can transfer energy and momentum from one location to another without the permanent transfer of mass and serve as a mathematical model for the discretion of other phenomena.

Please read the following district policy:

Students are required to take the first semester exam for AP or IB courses.

An AP or IB exam will be taken in lieu of a teacher developed final (semester 2) exam in those designated courses. In such case, the student must still attend his or her regular subject area classes for structured activities and/or projects until the end of the grading period.

In the event that the student does not sit for the AP or IB exams accompanying the coursework during the school year, a final exam grade of zero (0) will be entered. For AP or IB exams administered after the last day of the school year, final grade for the course will be determined within one day of the exam date.

Grading

Your grade will be weighted based on two categories:

1) 50% *Academic Assessments*
-Unit Tests
-Topic Quizzes

2) 50% *Lab Assignments*
-Digital Lab Notebook

It is the student's responsibility to use the web resources available to obtain make-up work due to an absence. Per district policy, students will have the same number of days absent to make up work. Any work made up for an unexcused absence must be dropped one letter grade.

Students are allowed one make-up exam for an excused absence per semester. Students will not be provided the opportunity to make up exams after the first one missed each semester.

Lab experiments cannot be made up during class time after an absence. Students will be provided with a virtual lab to replace a missed lab due to an excused absence.

Late work will not be accepted. No extra credit will be given.

Student Practice

Throughout each unit, **Topic Questions** will be provided to help students check their understanding. The Topic Questions are especially useful for confirming understanding of difficult or foundational topics before moving on to new content or skills that build upon prior topics. Topic Questions can be assigned before, during, or after a lesson, and as in- class work or homework. Students will get rationales for each **Topic Question** that will help them understand why an answer is correct or incorrect, and their results will reveal misunderstandings to help them target the content and skills needed for additional practice.

At the end of each unit or at key points within a unit, **Personal Progress Checks** will be provided in class or as homework assignments in AP Classroom. Students will get a personal report with feedback on every topic, skill, and question that they can use to chart their progress, and their results will come with rationales that explain every question's answer. One to two class periods are set aside to re-teach skills based on the results of the Personal Progress Checks.

For extra help, request a lunch pass for Dr. Gloff's room to access Building 4.

Course Content

Unit	Topics	Content	Science Practice	Big Idea
1 Kinematics CR2	1.1 Position, Velocity and Acceleration	▪ Vector Measurements of displacement and velocity ▪ Vector addition and subtraction ▪ Systems of directional designations ▪ Acceleration and related quantities ▪ Relative Velocity	1.5 2.1 2.2 4.2 5.1	3, 4
	1.2 Representations of Motion	▪ Gravitational Acceleration ▪ Vector Addition Using Pythagorean theorem, law of sines and cosine law ▪ Projectile motion	1.2 1.4 2.2 2.3 6.4	

Complete **Personal Progress Check MCQ** for Unit 1.
Complete **Personal Progress Check FRQ** for Unit 1.
Take **Unit 1 Test.**

2 Dynamics **CR3**	2.1 Systems		1.1 7.1	1, 2, 3, 4
	2.2 The Gravitational Field	▪ Weight ▪ Gravitational field strength	2.2 7.2	
	2.3 Contact Forces	▪ Normal Force ▪ Tension ▪ Friction ▪ Spring Force	6.1 6.2	
	2.4 Newton's First Law	▪ Inertial mass vs. Gravitational Mass ▪ Newton's First Law	4.2	
	2.5 Newton's Third Law and Free Body Diagrams	▪ Free Body Diagrams ▪ Newton's Third Law	1.1 1.4 6.1 6.2 6.4 7.2	
	2.6 Newton's Second Law	▪ Newton's Second Law	1.1 1.4 1.5 2.2 4.2 5.1 6.4 7.2	
Complete **Personal Progress Check MCQ A** for Unit 2.				
	2.7 Applications of Newton's Second Law	▪ Applications of Newton's Second Law including friction in uniform and accelerated conditions, both at angled and horizontal and vertical surfaces	1.2 1.4 2.2 2.3 5.3 6.4	
Complete **Personal Progress Check MCQ B** for Unit 2. Complete **Personal Progress Check FRQ** for Unit 2. Take **Unit 2 Test**.				

3 Circular Motion and Gravitation **CR4**	3.1 Vector Fields		N/A	1, 2, 3, 4
	3.2 Fundamental Forces	▪ Gravitational Force ▪ Electromagnetic force ▪ Weak and Strong forces	7.1	
	3.3 Gravitational and Electric Forces	▪ Newton's Universal Law of Gravitation ▪ Connection between Gravitational Force and Electric Force	2.2 7.2	
	3.4 Gravitational Field/ Acceleration Due to Gravity on Different Planets	▪ Weight on different planets	2.2 7.2	
	3.5 Inertial vs. Gravitational Mass	▪ Inertial vs. Gravitational Mass	4.2	
	3.6 Centripetal Acceleration and Centripetal Force	▪ Centripetal Acceleration	5.3	
	3.7 Free Body Diagrams for Objects in Uniform Circular Motion	▪ Analysis of objects in uniform circular motion including conical pendulums.	1.1 1.4 1.5 2.2 4.2 5.1	
	Complete **Personal Progress Check MCQ A** for Unit 3.			
	3.8 Applications of Circular Motion and Gravitation	▪ Orbital Circular Motion ▪ Applications of Circular Motion and Gravitation	1.1 1.4 1.5 2.1 2.2 4.2 5.1 6.2 6.4 7.2	

Complete **Personal Progress Check MCQ B** for Unit 3.
Complete **Personal Progress Check FRQ** for Unit 3.
Take **Unit 3 Test**.

4 Energy CR5	4.1 Open and Closed Systems: Energy	▪ Defining Systems ▪ Conserved vs. Constant	6.4 7.2	3, 4, 5
	4.2 Work and Mechanical Energy	▪ Work ▪ Kinetic Energy ▪ Work/Energy Theorem ▪ Potential Energy	1.4 2.1 2.2 6.4 7.2	
	4.3 Conservation of Energy, the Work-Energy Principle, and Power	▪ Conservation of Mechanical Energy ▪ Power	1.4 1.5 2.1 2.2 4.2 5.1 6.4 7.2	

Complete **Personal Progress Check MCQ A** for Unit 4.
Complete **Personal Progress Check MCQ B** for Unit 4.
Complete **Personal Progress Check FRQ** for Unit 4.
Take **Unit 4 Test**.

5 Momentum CR6	5.1 Momentum and Impulse	▪ Center of Mass ▪ Momentum ▪ Change in Momentum ▪ Impulse	2.1 4.1 4.2 5.1 6.4	3, 4, 5
	5.2 Representations of Changes in Momentum	▪ Change in Momentum from representations ▪ Graph of net external force vs. time and change in momentum vs. time	1.4 2.2 5.1	
	5.3 Open and Closed Systems: Momentum	▪ Defining Systems ▪ Conserved vs. Constant	6.4 7.2	
	5.4 Conservation of Linear Momentum	▪ Center of Mass motion during collisions/explosions ▪ Elastic & Inelastic Collisions ▪ Using Conservation of Momentum and Energy to make predictions	2.1 2.2 3.2 4.1 4.2 4.4 5.1 5.3 6.4 7.2	

Complete **Personal Progress Check MCQ A** for Unit 5.
Complete **Personal Progress Check MCQ B** for Unit 5.
Complete **Personal Progress Check FRQ** for Unit 5.
Take **Unit 5 Test**.

6 Simple Harmonic Motion CR7	6.1 Period of Simple Harmonic Oscillators	▪ Hooke's Law ▪ Simple Harmonic Motion ▪ Pendulums ▪ Mass-Spring Systems	2.2 4.2 5.1 6.2 6.4 7.2	3, 5
	6.2 Energy of Simple Harmonic Oscillators	▪ Energy Analysis of Simple Harmonic Oscillators	1.4 2.1 2.2 6.4 7.2	

Complete **Personal Progress Check MCQ** for Unit 6.
Complete **Personal Progress Check FRQ** for Unit 6.
Take **Unit 6 Test**.

7 Torque and Rotational Motion **CR8**	7.1 Rotational Kinematics	▪ Rotational Kinematics	1.5 2.1 2.2	3, 4, 5
	7.2 Torque and Angular Acceleration	▪ Definition of Torque ▪ Force Diagrams ▪ Rotational Inertia ▪ Static Equilibrium ▪ Rotational Dynamics ▪ Rotational Impulse	1.4 2.1 2.2 2.3 4.1 4.2 5.1 5.3 6.4 7.2	
	7.3 Angular Momentum and Torque	▪ Angular Momentum ▪ Rotational Kinetic Energy	1.2 1.4 2.2 3.2 4.1 4.2 5.1 5.3	
	7.4 Conservation of Angular Momentum	▪ Conservation of Angular Momentum ▪ Collisions involving objects free to rotate and/or translate.	2.1 2.2 6.4 7.2	

Complete **Personal Progress Check MCQ A** for Unit 7.
Complete **Personal Progress Check MCQ B** for Unit 7.
Complete **Personal Progress Check FRQ** for Unit 7.
Take **Unit 7 Test**.

8 Electric Charge and Electric Force **CR9**	8.1 Conservation of Charge	▪ Identifying Electrical Systems	6.4 7.2	1, 3, 5
	8.2 Electric Charge	▪ Identifying Electric Charges ▪ Conservation of Charge	1.5 6.1 6.2 6.4 7.2	
	8.3 Electric Force	▪ Coulomb's Law for point charges	2.2 6.4 7.2	

Complete **Personal Progress Check MCQ** for Unit 8.
Complete **Personal Progress Check FRQ** for Unit 8.
Take **Unit 8 Test**.

9 DC Circuits **CR10**	9.1 Definition of Current	▪ Conservation of Charge in a Circuit ▪ Definition of Current ▪ Circuit Pieces Including wires, bulbs, resistors, batteries, ammeters, voltmeters and switches	6.4 7.2	1, 5
	9.2 Resistivity	▪ Resistivity ▪ Resistance	4.1	
	9.3 Ohm's Law Kirchhoff's Loop Rule (Resistors in Series and Parallel)	▪ Sources of Voltage in Series and Parallel Circuits ▪ Adding Resistors in Series and Parallel ▪ Drawing and using Circuit Schematics ▪ Conservation of Energy in Circuits ▪ Kirchhoff's Loop Rule ▪ Ohm's Law ▪ Ohmic and Non-Ohmic materials.	1.1 1.4 2.2 4.2 6.4 7.2	
	9.4 Kirchhoff's Junction Rule, Ohm's Law (Resistors in Series and Parallel)	▪ Power ▪ Brightness of bulbs ▪ Conservation of Charge in Circuits ▪ Kirchhoff's Junction Rule	1.4 2.2 4.1	

Complete **Personal Progress Check MCQ A** for Unit 9.
Complete **Personal Progress Check MCQ B** for Unit 9.
Complete **Personal Progress Check FRQ** for Unit 9.
Take **Unit 9 Test**.

10 Mechanical Waves and Sound CR11	10.1 Properties of Waves	• Transverse and Longitudinal Waves • Wave Pulses • Wave Characteristics • Standing Waves • Sound Transfers Energy & Momentum • Producing Sound • The Speed of Sound	1.2 1.4 6.2 6.4 7.2	6
	10.2 Periodic Waves	• Relationship Between Wave Speed, Frequency and Wavelength • Visual Representations of Periodic Waves • Wave Front Diagrams and Doppler Effect	1.4 2.2 4.2 5.1 7.2	
	10.3 Interference and Superposition (Waves in Tubes and on Strings)	• Principle of Superposition • Standing Waves in Open-Open and Open-Closed Tubes • Pressure vs. Displacement Waves • Standing Waves on Strings • Musical Instruments • Harmonics • Resonance • Beats	1.1 1.2 1.4 1.5 2.1 2.2 3.2 4.1 4.2 5.1 5.2 5.3 6.1 6.4	

Complete **Personal Progress Check MCQ A** for Unit 10.
Complete **Personal Progress Check MCQ B** for Unit 10.
Complete **Personal Progress Check FRQ** for Unit 10.
Take **Unit 10 Test**.

Labs

Laboratory investigations will occupy 25-50% of our class time, usually filling at least one entire double block. In the laboratory investigations, students will learn and master the usage of physical and scientific equipment. Students will use different methods of measuring, charting, calculating, and error analysis while completing the investigations. These investigations can be used to either introduce a new topic or to reinforce material previously covered. All investigations are typically guided, with the variables needed to be measured and calculated identified for the students. Of the labs performed, some are inquiry-based.

In the following laboratory investigations students may work in groups, but each student is responsible for completing their own work and lab report. Each lab report will consist of:
Title
Purpose: What is the purpose of the lab? What are we trying to find?
Design: A diagram of the lab setup, list of equipment, and description of procedure
Data: All data that is collected in the lab.
Data Analysis: Any calculations done in the lab, including graphs
Error Analysis: Sources of error and their effect on results
Conclusion: A statement that describes the purpose and essence of the investigation.

Students will be required to create lab reports using OneNote using a uniform, standard format. Students will be required to create an eportfolio in Canvas in which to store all lab reports.

	Name	Description	Science Practices
Unit 1: Kinematics	Runner Lab	Reproduce motion graphs using computer software	1.1, 1.5, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.1, 5.3, 6.1, 6.4, 7.2
	Incline Plane Lab [G.I.]	Graphically determine the acceleration of an object on an inclined plane	1.1, 1.4, 1.5, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.3, 6.1, 6.4, 7.2
	Gravitational Constant Lab [G.I.]	Graphically compare the acceleration of objects that are undergoing freefall	1.4, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.1, 5.3, 6.1, 6.4, 7.2
	2d Motion Lab #1	Determine the initial velocity of an object being launched horizontally from a table	1.1, 1.4, 1.5, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.3, 6.1, 6.4, 7.2
	2d Motion Lab #2 [G.I.]	Determine the initial velocity and angle of a projectile, and predict where the object will land	1.4, 1.5, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.3, 6.1, 6.4, 7.2

Unit 2: Dynamics	Tension Lab	Determine the tension in three different strings that are attached to a hanging mass	1.1, 1.4, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.1, 5.3, 6.1, 6.4, 7.2
	Newton's 2nd Law Lab [O.I.]	Determine the relationship between the acceleration of a cart, its mass and the net force applied to the cart CR14	1.1, 1.4, 1.5, 2.1, 2.2, 3.1, 3.2, 3.3, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, 6.1, 6.2, 6.4, 7.2
	Atwood Machine Lab	Determine the acceleration of objects and the tension in the string for an Atwood Machine	1.1, 1.4, 1.5, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.3, 6.1, 6.4, 7.2
	Angle of Repose Lab	Determine the angle of repose for multiple surface combinations	1.1, 1.4, 1.5, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.3, 6.1, 6.4, 7.2
	Friction Lab [O.I.]	Using computer software compare coefficients of static and kinetic friction for different surface combinations using multiple methods	1.1, 1.4, 1.5, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.3, 6.1, 6.4, 7.2
Unit 3: Circular Motion and Gravitation	Whirligig Lab [O.I.]	Determine the tension in the string on an object that undergoing centripetal acceleration. Compare theoretical and experimental periods	1.1, 1.2, 1.4, 1.5, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.3, 6.1, 6.4, 7.2
	Moon Lab	Graphically determine the mass of Jupiter by researching the planet's moons	1.1, 1.4, 2.1, 2.2, 3.3, 4.1, 4.2, 4.3, 4.4, 5.1, 6.1, 6.2, 6.4, 7.1

Unit 4: Energy	Rollercoaster Lab	Find the mechanical energy lost by a ball going around a rollercoaster by using forces, energy, and 2D motion	1.1, 1.4, 1.5, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.3, 6.1, 6.4, 7.2
	Conservation Lab	Determine if the mechanical energy of a dropped object is constant using video analysis	1.1, 1.4, 1.5, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.3, 6.1, 6.4, 7.2
	Energy Lost Due to Friction Lab	Determine the mechanical energy dissipated by a non-conserved force exerted on an object accelerating on a table **CR12** **CR17**	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.3, 6.1, 6.4, 6.5, 7.2
Unit 5: Momentum	Collisions Lab	Investigate conservation of momentum in different types of collisions	1.1, 1.4, 1.5, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.3, 6.1, 6.4, 7.2
	Impulse Lab [G.I.]	Graphically compare the impulse of an object hitting a force sensor in momentum experienced by the object	1.1, 1.4, 1.5, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.3, 6.1, 6.4, 7.2
Unit 6: Simple Harmonic Motion	Spring constant lab [G.I.]	Use multiple methods to determine the spring constant of a spring and compare the results **CR15**	1.1, 1.4, 2.1, 2.2, 3.3, 4.1, 4.2, 4.3, 4.4, 5.1, 6.1, 6.2, 6.4
	Pendulum Lab [O.I.]	Determine what factors influence the period of a pendulum	1.1, 1.4, 2.1, 2.2, 3.3, 4.1, 4.2, 4.3, 4.4, 5.1, 6.1, 6.2, 6.4
	Oscillating Spring Lab [G.I.]	Determine what factors influence the period of an oscillating spring	1.1, 1.4, 2.1, 2.2, 3.3, 4.1, 4.2, 4.3, 4.4, 5.1, 6.1, 6.2, 6.4
	Energy in Springs Lab	Investigate conservation of energy for an oscillating spring	1.1, 1.4, 2.1, 2.2, 3.3, 4.1, 4.2, 4.3, 4.4, 5.1, 6.1, 6.2, 6.4, 7.2

Unit 7: Torque and Rotational Motion	Equilibrium Lab [O.I.]	Build an apparatus and that is equilibrium when placed on a pivot point CR16 CR18	1.1, 1.2, 1.4, 1.5, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, 6.1, 6.2, 6.4, 7.1, 7.2
	Torque Lab	Determine the relationship between torque and the angular acceleration of the system	1.1, 1.4, 2.1, 2.2, 3.3, 4.1, 4.2, 4.3, 4.4, 5.1, 6.1, 6.2, 6.4, 7.2
	Moment of Inertia Lab [G.I.]	Determine what factors affect an object's rotational inertia	1.1, 1.4, 2.1, 2.2, 3.3, 4.1, 4.2, 4.3, 4.4, 5.1, 6.1, 6.2, 6.4
	Rotational Energy Lab	Using computer software, explore if mechanical energy is constant as object rolls down an incline	1.1, 1.4, 2.1, 2.2, 3.3, 4.1, 4.2, 4.3, 4.4, 5.1, 6.1, 6.2, 6.4
	Angular Momentum Lab	Compare the experimental and theoretical results of the conservation of angular momentum	1.1, 1.4, 2.1, 2.2, 3.3, 4.1, 4.2, 4.3, 4.4, 5.1, 6.1, 6.2, 6.4
Unit 8: Electrical Charge and electric Force	Charging Lab [G.I.]	Use a variety of methods to make observations of interactions between charged objects	1.2, 3.1, 4.1, 4.2, 5.1, 6.2, 7.2
	Pith Balls Lab [G.I.]	Determine the charge stored on a pair of charged pith balls repelling each other	1.1, 1.4, 2.1, 2.2, 3.3, 4.1, 4.2, 4.3, 4.4, 5.1, 6.1, 6.2, 6.4, 7.2
Unit 9: DC Circuits	Building Circuits Lab	Compare the theoretical and experimental results of equivalent resistances for complex circuits CR13	1.1, 1.4, 2.1, 2.2, 3.3, 4.1, 4.2, 4.3, 4.4, 5.1, 6.1, 6.2, 6.4
	Ohm's Law Lab [G.I.]	Explore current and voltage drops across a number of resistors hooked up to a power supply in both series and parallel circuits	1.1, 1.4, 2.1, 2.2, 3.3, 4.1, 4.2, 4.3, 4.4, 5.1, 6.1, 6.2, 6.4
	Ohmic vs Non-ohmic Lab [G.I.]	Determine if objects are ohmic or non-ohmic	1.1, 1.4, 2.1, 2.2, 3.3, 4.1, 4.2, 4.3, 4.4, 5.1, 6.1, 6.2, 6.4
	Brightness Lab [G.I.]	Investigate how removing bulbs affect the brightness of other bulbs in the circuit	1.1, 1.4, 2.1, 2.2, 3.3, 4.1, 4.2, 4.3, 4.4, 5.1, 6.1, 6.2, 6.4
Unit 10: Mechanical Waves and Sound	Sound Lab	Find the speed of sound using an open-closed pipe system	1.1, 1.4, 2.1, 2.2, 3.3, 4.1, 4.2, 4.3, 4.4, 5.1, 6.1, 6.2, 6.4
	Oscillator Lab [G.I.]	Determine the frequency of an oscillator by varying different factors	1.1, 1.4, 2.1, 2.2, 3.3, 4.1, 4.2, 4.3, 4.4, 5.1, 6.1, 6.2, 6.4

10 Mechanical Waves and Sound CR11	10.1 Properties of Waves	• Transverse and Longitudinal Waves • Wave Pulses • Wave Characteristics • Standing Waves • Sound Transfers Energy & Momentum • Producing Sound • The Speed of Sound	1.2 1.4 6.2 6.4 7.2	6
	10.2 Periodic Waves	• Relationship Between Wave Speed, Frequency and Wavelength • Visual Representations of Periodic Waves • Wave Front Diagrams and Doppler Effect	1.4 2.2 4.2 5.1 7.2	
	10.3 Interference and Superposition (Waves in Tubes and on Strings)	• Principle of Superposition • Standing Waves in Open-Open and Open-Closed Tubes • Pressure vs. Displacement Waves • Standing Waves on Strings • Musical Instruments • Harmonics • Resonance • Beats	1.1 1.2 1.4 1.5 2.1 2.2 3.2 4.1 4.2 5.1 5.2 5.3 6.1 6.4	

Complete **Personal Progress Check MCQ A** for Unit 9.
Complete **Personal Progress Check MCQ B** for Unit 9.
Complete **Personal Progress Check FRQ** for Unit 9.
Take **Unit 9 Test**.

10 Mechanical Waves and Sound CR11	10.1 Properties of Waves	▪ Transverse and Longitudinal Waves ▪ Wave Pulses ▪ Wave Characteristics ▪ Standing Waves ▪ Sound Transfers Energy & Momentum ▪ Producing Sound ▪ The Speed of Sound	1.2 1.4 6.2 6.4 7.2	6
	10.2 Periodic Waves	▪ Relationship Between Wave Speed, Frequency and Wavelength ▪ Visual Representations of Periodic Waves ▪ Wave Front Diagrams and Doppler Effect	1.4 2.2 4.2 5.1 7.2	
	10.3 Interference and Superposition (Waves in Tubes and on Strings)	▪ Principle of Superposition ▪ Standing Waves in Open-Open and Open-Closed Tubes ▪ Pressure vs. Displacement Waves ▪ Standing Waves on Strings ▪ Musical Instruments ▪ Harmonics ▪ Resonance ▪ Beats	1.1 1.2 1.4 1.5 2.1 2.2 3.2 4.1 4.2 5.1 5.2 5.3 6.1 6.4	

9 DC Circuits **CR10**	9.1 Definition of Current	▪ Conservation of Charge in a Circuit ▪ Definition of Current ▪ Circuit Pieces Including wires, bulbs, resistors, batteries, ammeters, voltmeters and switches	6.4 7.2	1, 5
	9.2 Resistivity	▪ Resistivity ▪ Resistance	4.1	
	9.3 Ohm's Law Kirchhoff's Loop Rule (Resistors in Series and Parallel)	▪ Sources of Voltage in Series and Parallel Circuits ▪ Adding Resistors in Series and Parallel ▪ Drawing and using Circuit Schematics ▪ Conservation of Energy in Circuits ▪ Kirchhoff's Loop Rule ▪ Ohm's Law ▪ Ohmic and Non-Ohmic materials.	1.1 1.4 2.2 4.2 6.4 7.2	
	9.4 Kirchhoff's Junction Rule, Ohm's Law (Resistors in Series and Parallel)	▪ Power ▪ Brightness of bulbs ▪ Conservation of Charge in Circuits ▪ Kirchhoff's Junction Rule	1.4 2.2 4.1	