AP Physics Practices for 2024-2025

A Practice, when I capitalize it, describes actions demonstrated by students as they engage with the skills and knowledge specific to this class. Practices often involve a combination of strategies, knowledge, and behaviors that are applied in a coherent and purposeful manner. They emphasize the application of skills and knowledge to solve complex problems, make decisions, and create meaningful outcomes. In educational contexts, Practices are often associated with higher-order thinking and real-world application.

These are the 6 practices that you will be developing over the course of this year in AP Physics.

LP12 – Modeling: The goal is to create useful representations that accurately depict physical phenomena. General examples of models are labeled sketches, pictures, diagrams, tables, charts, schematics, qualitative and/or quantitative graphs. Specific examples of representations used to model introductory physics are force diagrams, graphs, energy bar charts, ray diagrams, and circuit diagrams. You are expected to be able to make connections between different representations of a scenario.

LP13 – Solving Problems: The goal is to use mathematical representations to derive, calculate, estimate, and/or predict scientific phenomena. Mathematical representations are tools used to model, interpret, and visualize mathematical ideas and relationships. They can include numbers, symbols, algebraic expressions, and equations. The process of quantitative problem solving shows the concepts used, how they tie together, and the steps used to generate the answer. The steps of the problem solving process generally include givens and variables on a labeled sketch or illustration, diagrams (MD, FBD, Bar Charts), equations used, numbers plugged in, and an answer to the question asked. Units are necessary on all values.

LP14 – Asking Scientific Questions: The goal is to describe experimental procedures and analyze data. In order to do this, you must be able to identify and/or ask relevant questions, develop and/or carry out procedures, and know the assumptions and limitations of the experimental design. When questions have the appropriate scope and specificity, they address a specific problem or topic, are answerable within the time and with the resources you have, and allow you to make clear observations or conclusions. Data analysis may include any or all of the following: sample calculations, theoretical derivations, error analysis, and/or discussion questions.

LP15 – Creating an Argument: The goal is to create a persuasive and meaningful argument about a claim using evidence they have identified to support those claims. Relevant physics includes definitions, laws, mathematical models, equations, or relationships from the previous and current unit(s) of study.

LP4 - Using Feedback: The using feedback section is where you annotate your lab, highlighting the changes you made from the previous lab. The goal is to communicate what changes you made, why you made them, and how you have improved over time.

LP11 – AP Exam Practice: The goal is to increase your test-taking abilities specifically for the AP Physics 2 exam. This means that you complete both the Unit Tests and the Personal Progress Checks (MCQ) and (FRQ) for each unit accurately, according to their scoring requirements.

Using the Practices in this Course

Our Practices	***AP Physics Questions***					***Our Assignments***		
	MCQ	*MR Question*	*TBR Question*	*LAB Question*	*QQT Question*	*Personal Progress Checks*	*Lab Reports*	*Unit Tests*
LP12: Modeling			*x*				*x*	*x*
LP13 – Solving problems					*x*			*x*
LP14 – Asking Scientific Questions				*x*			*x*	*x*
LP15 – Creating an Argument		*x*		*x*			*x*	*x*
LP4 - Using Feedback							*x*	
LP11 – AP Exam Practice	*x*					*x*		*x*

AP Physics Learning Progressions

	Not Enough Evidence	Beginning	Developing	Proficient	Advanced	Expert
LP12 – Modeling *1A, 1B, 1C* **This practice can be used for Lab Reports (quantitative graphs and their interpretation) and The Translation Between Representations (TBR) question on the unit test. See Note 1.*	I do not create or revise a model.	I create and/or revise a model (diagrams, tables, charts, schematics, qualitative and/or quantitative graphs.)	I create and/or revise a relevant model. I use the model to identify the relevant characteristics of a system (components) or phenomenon (interactions between components).	I create and/or revise the correct model. The model identifies the correct characteristics of a system and/or phenomenon. I explicitly state the relevant big idea(s), process(es), theories, and/or law(s).	The model is correctly made and includes all required features. The big idea(s), process(es), theories, and/or law(s) is correctly stated, used, and/or modeled. When appropriate, I use advanced analysis methods (see Note 2). When appropriate, I use my model(s) to generate data, support explanations, make predictions, analyze systems and/or reconcile divergent outcomes (see Note 3).	When appropriate, the model is complex (e.g. integrates content from multiple units). Correctly applied big idea(s), process(es), theories, and/or law(s) are drawn from multiple units. When appropriate, I correctly use advanced analysis methods. When appropriate, I correctly use my model(s) to generate data, support explanations, make predictions, analyze systems and/or reconcile divergent outcomes.
LP13 – Solving Problems (2A, 2B, 2D) **This practice can be used for Qualitative-Quantitative Translation (QQT) questions on the Unit Tests. See Note 4.*	I do not show the pictorial or mathematical representation when solving the problem.	I show some relevant work when solving the problem (pictorial and/or mathematical representation).	I describe the given situation using relevant pictorial representations <u>And</u> I choose a relevant mathematical representation.	The process I use generates an answer to the question asked. I show my supporting work so that someone can follow my thought processes. I select and follow a logical computational pathway. When appropriate, I justify why using a particular equation to analyze a situation is useful and/or state the conditions under which this particular equation can be used. (See Note 5.)	I work with the algebraic form of the equation(s) without substituting values. I correctly derive, calculate, or estimate an unknown quantity from known quantities. I include units when appropriate. When appropriate, my justification of the equation and/or statement of use conditions are correct.	I correctly derive a complex symbolic expression that requires the application of multiple units of study. When appropriate, my justification of the equation <u>and</u> statement of use conditions are correct. When appropriate, I use my mathematical analysis to: • make a prediction about another (related) situation • reconcile alternative outcomes • analyze sensitivity to alterations
LP14 – Scientific Questioning (3A) **This Practice will be used to score Lab Reports (Experimental Design and Data Analysis, except for Graphing) as well as The Experimental Design and Analysis (LAB) question on the Unit Tests.* See Note 6.	*I do not identify or ask a scientific question. I do not describe experimental procedures. I do not state a source of experimental error.*	*I ask a scientific question. I describe experimental procedures used to gather data. I list multiple issues of measurement uncertainty and/or assumptions in data collection (see Note 10).* I do some relevant data analysis (see Note 7).	*I identify or ask a relevant scientific question. I describe experimental procedures that allow relevant data to be collected (see Note 8). I identify relevant issues of measurement uncertainty and/or assumptions in data collection.* I do some relevant data analysis.	*The scientific question has the appropriate scope and specificity (see Note 9).* I describe data-collection strategies that are descriptive enough for someone else to replicate the data collection during the experiment. I correctly describe issues of measurement uncertainty and/or assumptions in data collection. I describe and/or conduct one or more correct quantitative analyses of the data in order to answer the posed question, including the most significant analyses of the data. I use the available analysis tools correctly.	The M&M are correct and complete. I predict how each source contributes to the error in the experiment. I offer <u>reasonable and specific</u> suggestions to fix those sources of experimental error next time. I include all the most significant and effective analyses of the data, omitting none. It is done correctly. When appropriate, I make a reasoned estimate or calculation of the percent error or percent difference.	I identify how to improve experimental designs and/or data-collection strategies. I correctly predict the effects of experimental error on the experiment. I describe what I did to address sources of experimental error that I saw in previous labs, to avoid the same effects here. I correctly use the theoretical derivation to calculate the percent error.
LP15 – Argumentation (2C, 3B and 3C) **Used* for Lab Reports *(CER section)* or *The Mathematical Routines (MR) question (aka Creating Explanations) on the Unit Test.*	I do not make a claim.	I make a claim. I support the claim with evidence or reasoning.	The claim is relevant to the question. My claim states a scientific or mathematical relationship or a specific value. I support the claim with evidence (see Note 11). I state relevant physics concept(s) as reasoning (See Note 12.)	Based upon the available evidence, my claim is correct. I present convincing evidence, in the form of qualitative or quantitative relationships, connection, and/or patterns. I describe the correct physics concept(s) as reasoning.	The supporting evidence used to justify my claim is correct. The reasoning is clearly related to the variables in the claim. There is no extra or irrelevant information. I justify my answer in a clear, coherent, paragraph-length explanation (see Note 13).	When appropriate, I additionally justify my claim by using error analysis (see LP3). I produce an accurate explanation or prediction for a complex situation. This may require the use of multiple steps and/or multiple Big Ideas, applying previously learned material when appropriate. *The justification is a logical and sequential application of physics concepts that demonstrates my ability to connect multiple concepts to each other.*

LP4 - Using Feedback This will be done on labs and tests.	I did not identify changes that I made since the previous assessment.	I identify changes that I made since the previous assessment.	I describe at least 6 changes that I made since the previous assessment, correlated to feedback from my peers, the instructor, class discussion, or my own understanding of this rubric.	I request feedback from the instructor, identifying areas with which I am uncertain or struggling. I explicitly state why changes needed to be made (or not made) based on relevant physics or skills requirements.	My requested feedback from the instructor is specific, targeted, and leads to significant progress. My reasoning regarding why changes were made is correct and robust.	I communicate and document the rationale behind alternate approaches to similar (but not identical) situations, based on feedback received prior to the current attempt. I communicate areas of weakness and document the methodical application of strategies that I used to improve.
LP11 -- AP Exam Testing	I do not complete both of the Personal Progress Checks (PPCs).	I complete both PPCs: the MCQ and FRQ. I earn a combined score equivalent to a 1 on the AP Physics Exam (combined raw score less than 30%).	I earn a combined score equivalent to a 2 on the AP Physics Exam (combined raw score between 30-44%).	I earn a combined score equivalent to a 3 on the AP Physics Exam (combined raw score between 45-59%).	I earn a combined score equivalent to a 4 on the AP Physics Exam (combined raw score between 60-75%).	I earn a combined score equivalent to a 5 on the AP Physics Exam (combined raw score greater than 75%).

NOTE 1: This practice is for modeling that is the end in and of itself. When the models are specifically used to support mathematical representations, they will be scored using Practice 2.

NOTE 2: Advanced analysis methods include linearization of the graph and/or interpretation of the mathematical model

NOTE 3: There are many possible applications of the representations, including but not limited to generating data, supporting explanations, making predictions, analyzing sensitivity of systems and/or reconciling divergent outcomes.

NOTE 4: This practice includes modeling (pictorial representations like labeled sketches, free body diagrams, schematics, etc) that is/are specifically used to support mathematical representations. When modeling is the end in and/of itself, they will be scored using Practice 1.

NOTE 5: Stating the conditions under which the equation can be used includes limits ("only when acceleration is zero", "only for an isolated system") and/or assumptions ("assuming force is held constant").

NOTE 6: Evaluation of Graph Creation and Interpretation will be done using Practice 1.

NOTE 7: Data analysis may include any or all of the following: Sample calculations, Theoretical Derivations, Error Analysis, and/or Discussion Questions). Although detailed error analysis is not necessary, students should make reasoned estimates of the %error or % difference.

NOTE 8: The experimental procedure is expected to be scientifically sound: vary a single parameter, and measure how that change affects a single characteristic.

NOTE 9: When questions have the appropriate scope and specificity, they address a specific problem or topic, it is answerable within the time and with the resources you have, and allows you to make clear observations or conclusions.

NOTE 10: Students should make claims about sources of uncertainty and error and how each source contributes to the error.

NOTE 11: Evidence may be qualitative or quantitative. Depending on the experiment or question, this may involve relationships, connections, and/or patterns in the data or analysis. Students need to provide/use the most sophisticated evidence available at the time. (See the Hierarchy of Evidence.)

NOTE 12: Physics concepts may be theories, laws, definitions, or relationships. Equations may be used as support for a concept, but are insufficient alone.

NOTE 13: For AP Physics 1 and 2 exams, the MR question will ask students to make a claim or prediction about the scenario and use appropriate physics concepts and principles to support and justify that claim.

FOR USE ON LAB REPORT TEMPLATE

(Refer to notes on your green sheets.)

	Not Enough Evidence	Beginning	Developing	Proficient	Advanced	Expert
LP12 – Modeling *1A, 1B, 1C* **This practice can be used for Lab Reports (quantitative graphs and their interpretation) and The Translation Between Representations (TBR) question on the unit test. See Note 1.*	I do not create or revise a model.	I create and/or revise a model (diagrams, tables, charts, schematics, qualitative and/or quantitative graphs.)	I create and/or revise a relevant model. I use the model to identify the relevant characteristics of a system (components) or phenomenon (interactions between components).	I create and/or revise the correct model. The model identifies the correct characteristics of a system and/or phenomenon. I explicitly state the relevant big idea(s), process(es), theories, and/or law(s).	The model is correctly made and includes all required features. The big idea(s), process(es), theories, and/or law(s) is correctly stated, used, and/or modeled. When appropriate, I use advanced analysis methods (see Note 2). When appropriate, I use my model(s) to generate data, support explanations, make predictions, analyze systems and/or reconcile divergent outcomes (see Note 3).	When appropriate, the model is complex (e.g. integrates content from multiple units). Correctly applied big idea(s), process(es), theories, and/or law(s) are drawn from multiple units. When appropriate, I correctly use advanced analysis methods. When appropriate, I correctly use my model(s) to generate data, support explanations, make predictions, analyze systems and/or reconcile divergent outcomes.
LP14 – Scientific Questioning (3A) **This Practice will be used to score Lab Reports (Experimental Design and Data Analysis, except for Graphing) as well as The Experimental Design and Analysis (LAB) question on the Unit Tests.* See Note 6.	*I do not identify or ask a scientific question.* *I do not describe experimental procedures.* *I do not state a source of experimental error.*	*I ask a scientific question.* *I describe experimental procedures used to gather data.* *I list multiple issues of measurement uncertainty and/or assumptions in data collection (see Note 10).* I do some relevant data analysis (see Note 7).	*I identify or ask a relevant scientific question.* *I describe experimental procedures that allow relevant data to be collected (see Note 8).* I identify relevant *issues of measurement uncertainty and/or assumptions in data collection.* I do some relevant data analysis.	*The scientific question has the appropriate scope and specificity (see Note 9).* I describe data-collection strategies that are descriptive enough for someone else to replicate the data collection during the experiment. I correctly describe issues of measurement uncertainty and/or assumptions in data collection. I describe and/or conduct one or more correct quantitative analyses of the data in order to answer the posed question, including the most significant analyses of the data. I use the available analysis tools correctly.	The M&M are correct and complete. I predict how each source contributes to the error in the experiment. I offer <u>reasonable and specific</u> suggestions to fix those sources of experimental error next time. I include all the most significant and effective analyses of the data, omitting none. It is done correctly. When appropriate, I make a reasoned estimate or calculation of the percent error or percent difference.	I identify how to improve experimental designs and/or data-collection strategies. I correctly predict the effects of experimental error on the experiment. I describe what I did to address sources of experimental error that I saw in previous labs, to avoid the same effects here. I correctly use the theoretical derivation to calculate the percent error.
LP15 – Argumentation (3B and 3C) **Used for Lab Reports (CER section) or The Mathematical Routines (MR) question (aka Creating Explanations) on the Unit Test.*	I do not make a claim.	I make a claim. I support the claim with evidence or reasoning.	The claim is relevant to the question. My claim states a scientific or mathematical relationship or a specific value. I support the claim with evidence (see Note 11). I state relevant physics concept(s) as reasoning (See Note 12.)	Based upon the available evidence, my claim is correct. I present convincing evidence, in the form of qualitative or quantitative relationships, connection, and/or patterns. I describe the correct physics concept(s) as reasoning.	The supporting evidence used to justify my claim is correct. The reasoning is clearly related to the variables in the claim. There is no extra or irrelevant information. I justify my answer in a clear, coherent, paragraph-length explanation (see Note 13).	When appropriate, I additionally justify my claim by using error analysis (see LP3). I produce an accurate explanation or prediction for a complex situation. This may require the use of multiple steps and/or multiple Big Ideas, applying previously learned material when appropriate. *The justification is a logical and sequential application of physics concepts that demonstrates my ability to connect multiple concepts to each other.*
LP4 - Using Feedback This will be done on labs <u>and</u> tests.	I did not identify changes that I made since the previous assessment.	I identify changes that I made since the previous assessment.	I describe at least 6 changes that I made since the previous assessment, correlated to feedback from my peers, the instructor, class discussion, or my own understanding of this rubric.	I request feedback from the instructor, identifying areas with which I am uncertain or struggling. I explicitly state why changes needed to be made (or not made) based on relevant physics or skills requirements.	My requested feedback from the instructor is specific, targeted, and leads to significant progress. My reasoning regarding why changes were made is correct and robust.	I communicate and document the rationale behind alternate approaches to similar (but not identical) situations, based on feedback received prior to the current attempt. I communicate areas of weakness and document the methodical application of strategies that I used to improve.