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Syllabus Development Guide: AP Physics B

<u>To the AP teacher</u>: Please take full advantage of this guide. It is designed to support you as you develop your syllabus for the AP Course Audit. The guide contains the following sections and information.

Curricular Requirements The curricular requirements are the core elements of the course. Your syllabus must provide clear evidence that each requirement is fully addressed in your course.

Scoring Components Some curricular requirements consist of complex, multi-part statements. These particular requirements are broken down into their component parts and restated as "scoring components". Reviewers will look for evidence that each scoring component is included in your course.

Key Terms To ensure the clarity of certain terms or expressions that may have multiple meanings, each of these terms is clearly defined.

Evaluation Guidelines These are the exact guidelines used by reviewers as they evaluate the evidence in your syllabus. Use these to interpret any requirement you may find ambiguous.

Important Considerations Aligned with the Evaluation Guidelines, these statements provide advice on the type of evidence your syllabus should include.

Reference As appropriate, references to specific sections of the official AP Course Description or other pertinent publications are included here.

Samples of Evidence For each scoring component, three separate samples of evidence are provided. These statements provide either verbatim samples from actual authorized syllabi or clear descriptions of what acceptable evidence should look like.

<table>
<tr><td>Curricular Requirements</td><td colspan="3">Scoring Components, Key Terms, Evaluation Guidelines, Important Considerations, References and Samples of Evidence</td></tr>
<tr><td rowspan="6">Curricular Requirement 1:
The course provides instruction in each of the following five content areas outlined in the Course Description:
Newtonian mechanics</td><td colspan="3">Scoring Component 1*: The course provides instruction in Newtonian Mechanics: kinematics.</td></tr>
<tr><td colspan="3">*Note Each Curricular Requirement may be subdivided into two or more distinct Scoring Components.</td></tr>
<tr><td>Key Term(s)</td><td>Evaluation Guideline(s)</td><td>Important Consideration(s)</td></tr>
<tr><td>All terminology in the Scoring Component is clear. No clarification is needed.</td><td>Scoring Component is clear and explicit. No Evaluation Guideline is needed.</td><td>Evidence can be demonstrated through an explicit listing of the subtopics that come under the topic heading “kinematics.”

Relevant subtopics include motion in one and two dimensions.

This component may be demonstrated through lectures, tutorials, lab exercises and demonstrations.</td></tr>
<tr><td colspan="3">Samples of Evidence</td></tr>
<tr><td>Sample 1</td><td>Sample 2</td><td>Sample 3</td></tr>
<tr><td>The syllabus indicates instruction in derivation of equations of motion and numerical calculations using equations of motion.</td><td>The laboratory section of the syllabus includes the projectile motion lab.</td><td>The laboratory section of the syllabus includes the measurement of g (accelerations of gravity) lab.</td></tr>
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Curricular Requirement 1 (continued): The course provides instruction in each of the following five content areas outlined in the Course Description: Newtonian mechanics	**Scoring Component 2: The course provides instruction in Newtonian Mechanics: Newton's Laws.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	All terminology in the Scoring Component is clear. No clarification is needed.	Scoring Component is clear and explicit. No Evaluation Guideline is needed.	Evidence can be demonstrated through an explicit listing of the subtopics that come under this topic heading; "Newton's Law of Motion." This scoring component can be demonstrated through lectures, tutorials, lab exercises and demonstrations.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The syllabus indicates instruction in free body diagrams.	The laboratory section of the syllabus includes Newton's Second Law lab (acceleration of a cart).	The laboratory section of the syllabus includes a lab in which students determine the coefficients of friction.

Curricular Requirement 1 (continued): The course provides instruction in each of the following five content areas outlined in the Course Description: Newtonian mechanics	**Scoring Component 3: The course provides instruction in Newtonian Mechanics: work, energy and power.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	All terminology in the Scoring Component is clear. No clarification is needed.	Scoring Component is clear and explicit. No Evaluation Guideline is needed.	Evidence can be demonstrated through an explicit listing of the subtopics that come under this topic heading; work and energy. If the syllabus includes one of the following subtopics, evidence is sufficient; work and work-energy theorem, forces and potential energy, conservation of energy and power. Evidence can be demonstrated through lectures, tutorials, lab exercises and demonstrations that are related to work, energy and power.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The syllabus indicates instruction in work done by constant or non-constant forces.	The syllabus indicates instruction in energy conservation with and without friction	The syllabus indicates instruction in potential energy of gravitational systems or spring systems.

Curricular Requirement 1 (continued): The course provides instruction in each of the following five content areas outlined in the Course Description: Newtonian mechanics	**Scoring Component 4: The course provides instruction in Newtonian Mechanics: Systems of particles and linear momentum.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	All terminology in the Scoring Component is clear. No clarification is needed.	Scoring Component is clear and explicit. No Evaluation Guideline is needed.	Evidence can be demonstrated through an explicit listing of the subtopics that come under the topic heading “systems of particles and linear momentum.” Evidence can be illustrated through one of the following subtopics: impulse and momentum, conservation of linear momentum, and collisions. Evidence of systems particles and linear momentum can be demonstrated through lectures, tutorials, lab exercises and demonstrations.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The laboratory section of the syllabus includes the collision carts lab.	The laboratory section of the syllabus includes the ballistic pendulum lab.	The syllabus indicates instruction in elastic and inelastic collisions.

Curricular Requirement 1 (continued): The course provides instruction in each of the following five content areas outlined in the Course Description: Newtonian mechanics	**Scoring Component 5: The course provides instruction in Newtonian Mechanics: circular motion and rotation.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	All terminology in the Scoring Component is clear. No clarification is needed.	Scoring Component is clear and explicit. No Evaluation Guideline is needed.	Evidence can be illustrated through an explicit listing of the subtopics that come under the topic heading “circular motion and rotation.” Evidence can be demonstrated in the syllabus by including subtopics such as; uniform circular motions, torque and equilibrium. Evidence of circular motion and rotation may be demonstrated through lectures, tutorials, lab exercises and demonstrations.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The syllabus indicates instruction in rotational dynamics.	The syllabus indicates instruction in centripetal acceleration or force.	The laboratory section of the syllabus includes the levers and beam balances lab.

Curricular Requirement 1 (continued): The course provides instruction in each of the following five content areas outlined in the Course Description: Newtonian mechanics	**Scoring Component 6: The course provides instruction in Newtonian Mechanics: oscillations and gravitation.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	All terminology in the Scoring Component is clear. No clarification is needed.	Scoring Component is clear and explicit. No Evaluation Guideline is needed.	Evidence can be demonstrated through an explicit listing of the subtopics that come under the topic heading "oscillations and gravitation." Evidence can be illustrated through the following subtopics: simple harmonic motion, mass/spring systems, simple pendulum, Newton's Law of Gravitation, and circular orbits. This component may be demonstrated through lectures, tutorials, lab exercises and demonstrations.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The laboratory section of the syllabus includes the mass on a spring or pendulum lab.	The laboratory section of the syllabus includes the inertial balance lab.	The syllabus indicates instruction in energy and simple harmonic motion.

Curricular Requirement 2: The course provides instruction in each of the following five content areas outlined in the Course Description: Newtonian mechanics Fluid mechanics and thermal physics	**Scoring Component 7: The course provides instruction in fluid mechanics.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	All terminology in the Scoring Component is clear. No clarification is needed.	Scoring Component is clear and explicit. No Evaluation Guideline is needed.	Evidence can be demonstrated through an explicit listing of the subtopics that come under the topic heading "fluid mechanics." Evidence can be illustrated through the following subtopics: hydrostatic pressure, buoyancy, fluid flow, and Bernoulli's equation. This component may be demonstrated through lectures, tutorials, lab exercises and demonstrations.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The syllabus indicates instruction in fluids at rest and in motion.	The syllabus indicates instruction in flow rate of fluids.	The laboratory section of the syllabus includes the Archimedes principle lab.

Curricular Requirement 2 (continued): The course provides instruction in each of the following five content areas outlined in the Course Description: Fluid mechanics and thermal physics	**Scoring Component 8: The course provides instruction in thermal physics.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	All terminology in the Scoring Component is clear. No clarification is needed.	Scoring Component is clear and explicit. No Evaluation Guideline is needed.	Evidence can be demonstrated through an explicit listing of the subtopics that come under the topic heading "thermal physics." Evidence can be illustrated through the following subtopics: heat and temperature, ideal gases, and 1st and 2nd Laws of Thermodynamics. This component may be demonstrated through lectures, tutorials, lab exercises and demonstrations.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The laboratory section of the syllabus includes the specific heat/ calorimetry lab.	The laboratory section of the syllabus includes the thermal expansion lab.	The syllabus indicates instruction in the Ideal Gas law.

<table>
<tr><td rowspan="6">Curricular Requirement 3:
The course provides instruction in each of the following five content areas outlined in the Course Description:
Electricity and magnetism</td><td colspan="3">Scoring Component 9: The course provides instruction in electricity and magnetism: electrostatics.</td></tr>
<tr><td>Key Term(s)</td><td>Evaluation Guideline(s)</td><td>Important Consideration(s)</td></tr>
<tr><td>All terminology in the Scoring Component is clear. No clarification is needed.</td><td>Scoring Component is clear and explicit. No Evaluation Guideline is needed.</td><td>Evidence can be demonstrated through an explicit listing of the subtopics that come under the topic heading "electrostatics.”

Evidence can be illustrated through the following subtopics: Coulomb's Law, electric fields and electric potentials.

This component may be demonstrated through lectures, tutorials, lab exercises and demonstrations.</td></tr>
<tr><td colspan="3">Samples of Evidence</td></tr>
<tr><td>Sample 1</td><td>Sample 2</td><td>Sample 3</td></tr>
<tr><td>The instructor performs the Van de Graaf generator demonstration.</td><td>The instructor performs the Electroscope demonstration.</td><td>The laboratory section of the syllabus includes the electric field mapping lab.</td></tr>
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Curricular Requirement 3 (continued): The course provides instruction in each of the following five content areas outlined in the Course Description: Electricity and magnetism	**Scoring Component 10: The course provides instruction in electricity and magnetism: conductors and capacitors.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	All terminology in the Scoring Component is clear. No clarification is needed.	Scoring Component is clear and explicit. No Evaluation Guideline is needed.	Evidence can be demonstrated through an explicit listing of the subtopics that come under the topic heading "conductors and capacitors." Evidence can be illustrated through the following subtopics: electrostatics with conductors, and capacitance. This component may be demonstrated through lectures, tutorials, lab exercises and demonstrations.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The instructor performs the book capacitor demonstration.	The syllabus indicates instruction in electric shielding.	The syllabus indicates instruction in dielectrics and capacitance.

Curricular Requirement 3 (continued): The course provides instruction in each of the following five content areas outlined in the Course Description: Electricity and magnetism	**Scoring Component 11: The course provides instruction in electricity and magnetism: electric circuits.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	All terminology in the Scoring Component is clear. No clarification is needed.	Scoring Component is clear and explicit. No Evaluation Guideline is needed.	Evidence can be demonstrated through an explicit listing of the subtopics that come under the topic heading "electric circuits." Evidence can be illustrated through the following subtopics: current, resistance, and power, DC circuits with resistors and capacitors. This component may be demonstrated through lectures, tutorials, lab exercises and demonstrations
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The laboratory section of the syllabus includes the capacitors and series and parallel lab.	The syllabus indicates instruction in Ohm's Law.	The laboratory section of the syllabus includes the resistors and series and parallel lab.

Curricular Requirement 3 (continued): The course provides instruction in each of the following five content areas outlined in the Course Description: Electricity and magnetism	**Scoring Component 12: The course provides instruction in electricity and magnetism: magnetic fields.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	All terminology in the Scoring Component is clear. No clarification is needed.	Scoring Component is clear and explicit. No Evaluation Guideline is needed.	Evidence can be demonstrated through an explicit listing of the subtopics that come under the topic heading "magnetic fields." Evidence can be illustrated through the following subtopics: force on a moving charge and current carrying wires, and fields of current carrying wires. This component may be demonstrated through lectures, tutorials, lab exercises and demonstrations.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The laboratory section of the syllabus includes the standard current balance lab	The syllabus indicates instruction in the mass spectrometer.	The syllabus indicates instruction in the simple electric motor.

Curricular Requirement 3 (continued): The course provides instruction in each of the following five content areas outlined in the Course Description: Electricity and magnetism	**Scoring Component 13: he course provides instruction in electricity and magnetism: electromagnetism.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	All terminology in the Scoring Component is clear. No clarification is needed.	Scoring Component is clear and explicit. No Evaluation Guideline is needed.	Evidence can be demonstrated through an explicit listing of the subtopics that come under the topic heading "electromagnetism." Evidence can be illustrated through the following subtopics: electromagnetic induction, Faraday's Law and Lenz's Law. This component may be demonstrated through lectures, tutorials, lab exercises and demonstrations.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The laboratory section of the syllabus includes the transformer lab.	The syllabus indicates instruction in the electric generator.	The laboratory section of the syllabus includes the induction lab.

Curricular Requirement 4: The course provides instruction in each of the following five content areas outlined in the Course Description: Waves and optics	**Scoring Component 14: The course provides instruction in waves and optics: wave motion.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	All terminology in the Scoring Component is clear. No clarification is needed.	Scoring Component is clear and explicit. No Evaluation Guideline is needed.	Evidence can be demonstrated through an explicit listing of the subtopics that come under the topic heading "waves and optics: wave motion." Evidence can be illustrated through the following subtopics: traveling waves and wave propagation, superposition and standing waves. This component may be demonstrated through lectures, tutorials, lab exercises and demonstrations.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The laboratory section of the syllabus includes the standing waves on a string lab.	The laboratory section of the syllabus includes the resonance tube lab.	The instructor performs the tuning forks beats demonstration.

Curricular Requirement 4 (continued): The course provides instruction in each of the following five content areas outlined in the Course Description: Waves and optics	**Scoring Component 15: The course provides instruction in waves and optics: geometrical optics.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	All terminology in the Scoring Component is clear. No clarification is needed.	Scoring Component is clear and explicit. No Evaluation Guideline is needed.	Evidence can be demonstrated through an explicit listing of the subtopics that come under the topic heading "waves and optics: geometrical optics." Evidence can be illustrated through the following subtopics: reflection and refraction, mirrors and lenses. This component may be demonstrated through lectures, tutorials, lab exercises and demonstrations.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The laboratory section of the syllabus includes the Snell's law or index of refraction lab.	The laboratory section of the syllabus includes the thin lens with optical bench lab.	The syllabus indicates instruction in ray tracing.

Curricular Requirement 4 (continued): The course provides instruction in each of the following five content areas outlined in the Course Description: Waves and optics	**Scoring Component 16: The course provides instruction in waves and optics: physical optics.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	All terminology in the Scoring Component is clear. No clarification is needed.	Scoring Component is clear and explicit. No Evaluation Guideline is needed.	Evidence can be demonstrated through an explicit listing of the subtopics that come under the topic heading "waves and optics: physical optics." Evidence can be illustrated through the following subtopics: interference and diffraction, dispersion, and the EM spectrum. This component may be demonstrated through lectures, tutorials, lab exercises and demonstrations.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The instructor performs the ripple tank demonstration.	The instructor performs the Newton's rings demonstration.	The instructor performs the spectroscopy demonstration.

Curricular Requirement 5: The course provides instruction in each of the following five content areas outlined in the Course Description: Atomic and nuclear physics	**Scoring Component 17: The course provides instruction in atomic physics.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	All terminology in the Scoring Component is clear. No clarification is needed.	Scoring Component is clear and explicit. No Evaluation Guideline is needed.	Evidence can be demonstrated through an explicit listing of the subtopics that come under the topic heading "atomic physics." Evidence can be illustrated through the following subtopics: photons, photoelectric effect, Compton scattering and x-rays. This component may be demonstrated through lectures, tutorials, lab exercises and demonstrations.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The instructor performs the photoelectric effect demonstration or computer simulation	The instructor performs the spectroscopy demonstration.	The instructor performs the fluorescence demonstration with black light.

Curricular Requirement 5 (continued): The course provides instruction in each of the following five content areas outlined in the Course Description: Atomic and nuclear physics	**Scoring Component 18: The course provides instruction in nuclear physics.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	All terminology in the Scoring Component is clear. No clarification is needed.	Scoring Component is clear and explicit. No Evaluation Guideline is needed.	Evidence can be demonstrated through an explicit listing of the subtopics that come under the topic heading "nuclear physics." Evidence can be illustrated through the following subtopics: nuclear reactions and mass-energy equivalence. This component may be demonstrated through lectures, tutorials, lab exercises and demonstrations.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The instructor demonstrates half life simulation.	The syllabus indicates instruction in alpha, beta, and gamma decay.	The syllabus indicates instruction in fission and fusion.

Curricular Requirement 6: The course utilizes guided inquiry and student-centered learning to foster the development of critical thinking skills.	**Scoring Component 19: The course utilizes guided inquiry and student-centered learning to foster the development of critical thinking skills.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	Guided inquiry: Students are guided by the instructor to make discoveries and develop knowledge about topics/questions presented by the teacher. Students develop the strategies and methods for investigating/understanding the topic/question. Some examples of guided inquiry are: Students are able to describe objects and events, are encouraged to ask questions, construct explanations based on hands-on investigations, test those explanations against scientific knowledge, and communicate their ideas to not only their teacher but to their peers. **Student-centered learning:** Students are actively engaged in the learning process, not exclusively passive receivers of information from the instructor. A variety of learning styles are accommodated by the pedagogies employed.	The syllabus must include some description of how students will meet these objectives. Evidence for the component may include: discussion of pedagogy, descriptions of homework assignments, demonstrations, computer-based discussion boards, or lab activities with open-ended questions.	Evidence should be demonstrated through some description of how students will meet these objectives. Some discussion of pedagogy is often helpful in meeting this scoring component. For example, evidence of this scoring component might be included in descriptions of homework assignments, demonstrations, and computer-based discussion boards, lab activities with open-ended questions, class discussion, inquiries, or peer instruction. See example 1. The syllabus should demonstrate evidence either by mentioning that an activity utilizes "guided inquiry" or by describing a situation in which students are led through an inquiry-based exercise.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	By designing a hands-on investigation to answer a scientific question, students are required to confront a problem and solve it in an active, cooperative learning setting.	Students work in groups on pencil-and-paper to solve real world problems. For example, students determine combinations of appliances that may be used simultaneously without tripping a circuit breaker.	Students are asked to make a prediction about a physical system. The instructor then demonstrates the system for the class and then leads the class in discussion.

Curricular Requirement 7: The course includes a laboratory component comparable to college-level physics laboratories, with a minimum of 12 student-conducted laboratory investigations representing a variety of topics covered in the course. A hands-on laboratory component is required. Each student should complete a lab notebook or portfolio of lab reports.	**Scoring Component 20: The course includes a laboratory component with a minimum of 12 laboratory investigations.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	Laboratory: Components of a laboratory include, but are not limited to, generating and exploring answers to experimental questions, gathering data and making observations, drawing and evaluating conclusions, and thinking and communicating effectively about science.	The title and frequency (# of labs), with a minimum of 12 labs, must be evident for the component to be satisfied. See page 8 of the AP Physics Course Description for a list of skills students should be developing through the lab experience.	Evidence for this component is often found in a single listing of all laboratory experiments, but may also be distributed throughout the course schedule/calendar.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The syllabus lists, Laboratory Experiments: 1. Motion in One-Dimension Objective: To analyze the motion of objects moving at constant speed and at uniform accelerated motion. Data should be collected to produce a graph of x versus t and use the graph to plot a v versus t graph for each object. Equipment: A video camera to record the motion of various objects: a bowling ball rolling on a carpet and a dynamics car on a track, LoggerPro3 to perform video analysis. Type of Lab: Open-ended Allotted time: 90 min	The syllabus lists, Laboratory Experiments: Vector Addition Objective: To compare the experimental value of a resultant of several vectors to the values obtained through graphical and analytical methods. Equipment: A force table set Type of Lab: Open-ended Allotted time: 30 min	The syllabus lists, Laboratory Experiments: Photoelectric Effect Objectives: Using a simulation, collect data to create a graph that will allow you to find the value of Planck's constant for three different metals. Equipment: Photoelectric effect simulation: http://www.walter-fendt.de/ph11e/photoeffect.htm Type of Lab: Virtual lab Allotted time: 50 min

Curricular Requirement 7 (continued): The course includes a laboratory component comparable to college-level physics laboratories, with a minimum of 12 student-conducted laboratory investigations representing a variety of topics covered in the course. A hands-on laboratory component is required. Each student should complete a lab notebook or portfolio of lab reports.	**Scoring Component 21: The course includes a laboratory component with college-level laboratory investigations.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	College level: In order for a laboratory to be considered college level, the equipment and time allotted should be similar to that in a college course. (reference: AP Physics, apcentral.collegeboard.com – see page 8 of course description, "Implementation and Recommendations") **Laboratory:** Components of a laboratory include, but are not limited to, generating and exploring answers to experimental questions, gathering data and making observations, drawing and evaluating conclusions, and thinking and communicating effectively about science.	The title and frequency (# of labs), with a minimum of 12 labs, must be evident for the component to be satisfied.	Lab investigations should involve more than merely collecting data to verify formulas presented in class. Evidence of this may be found in detailed descriptions of individual labs, level of sophistication of data and error analysis, description/identification of utilized equipment, indication of length of time devoted to conducting of the experiment. If the lab selection includes only titles of lab investigations, it may be difficult to judge whether the lab is college-level. If the laboratory investigation is not a "standard" experiment, then it would be useful for the reviewer if a brief description of the investigation were included in the syllabus.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The syllabus states, "Students conduct the lab on variables affecting the period of a pendulum."	The syllabus states, "8 of the 12 lab investigations described in the class schedule will be performed over 16, 50-minute class periods. 4 of the investigations will be performed in double time blocks after school."	An example of a student-designed experiment would be: "Students will design and experiment to determine which variables affect the period of a simple pendulum."

Curricular Requirement 7 (continued): The course includes a laboratory component comparable to college-level physics laboratories, with a minimum of 12 student-conducted laboratory investigations representing a variety of topics covered in the course. A hands-on laboratory component is required. Each student should complete a lab notebook or portfolio of lab reports.	**Scoring Component 22: The course includes a laboratory component with hands-on laboratory investigations.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
	Hands-on: A hands-on lab is an interactive experience during which students directly observe and manipulate physical objects, materials, organisms, or phenomena in order to fulfill the objectives of a laboratory experience. **Laboratory:** Components of a laboratory include, but are not limited to, generating and exploring answers to experimental questions, gathering data and making observations, drawing and evaluating conclusions, and thinking and communicating effectively about science.	The title and frequency (# of labs), with a minimum of 12 labs, must be evident for the component to be satisfied.	Scoring Component is clear and explicit. No Important Considerations are needed.
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The laboratory section of the syllabus includes a statement that students collect and analyze data.	The laboratory section of the syllabus includes a statement that all labs performed are hands-on labs.	The laboratory section of the syllabus states the type of each lab experience (whether hands-on, virtual, or demonstration) and there are at least 12 hands on labs included.

Curricular Requirement 7 (continued): The course includes a laboratory component comparable to college-level physics laboratories, with a minimum of 12 student-conducted laboratory investigations representing a variety of topics covered in the course. A hands-on laboratory component is required. Each student should complete a lab notebook or portfolio of lab reports.	**Scoring Component 23: Each student should complete a lab notebook or portfolio of lab reports.**		
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)
		The title and frequency (# of labs), with a minimum of 12 labs, must be evident for the component to be satisfied	Evidence for this is often found in the breakdown of the course grade. For example, a percentage of the grade may be indicated for “lab reports” or “lab portfolio.”
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
	The syllabus states, “Each experiment requires a written report, kept in an organized lab notebook. The following is a list of our labs, most of which we will do during the school year before the AP Exam.”	The syllabus provides the allotted time given is for conducting the experiment and recording the pertinent data. The syllabus states, “The students perform the data analysis and complete the lab report at home. Reports are collected in a lab notebook.”	The syllabus states, “Students will be required to keep a lab notebook containing all of their lab reports.”