

AP Physics B Syllabus

Course Overview

The school day consists primarily of eight 42 minute periods. AP Physics classes meet 7 times a week. There are 2 double periods of class each week for an 84 minute block. AP Physics B is an algebra-based course in general Physics. Its syllabus is designed by the College Board. There are a wide range of topics covered in 2 semesters. Laboratory work is an important part of the class.

Classes

Classes consist of a 20-30 minute lecture. With the lecture there can be demonstrations, discrepant events, computer animations, and real-life situations. The remaining 10-15 minutes is set aside for students to begin the new problem set. Students often work in small groups of 2 or 3. The teacher can facilitate during this time.

Problem Assignments

Problems given come from the physics textbook, AP Review books, AP released Exams, teacher designed worksheets and real life scenarios.

Text

College Physics, Serway and Vuille; 8th Edition, Brooks/Cole, Belmont CA, 2009.

How to prepare for the AP Physics B Advanced Placement Examination, 2nd Edition, Wolf, Barrons Educational Series, Inc., New York 1999.

Evaluation

Tests – 40%

Quizzes – 10%

Homework – 25%

Labs/Projects/Competitions – 25%

Students are tested at the end of each unit and announced and surprise quizzes are given to check understanding throughout the year. Tests and quizzes are a mixture of AP problems, both multiple choice and free response, and teacher generated problems.

Labs

Labs are conducted throughout the year. Some units contain more lab opportunities than others, but every attempt is made when materials are available to perform the labs where they best fit the curriculum. All lab experiments are “hands-on” activities. Students will be prompted with a question or problem. On occasion, a demonstration will be done in class and data will be collected. Students will form a hypothesis and follow the scientific method. Some labs are open-ended, discovery type activities where students are given a variety of supplies and instruments and they must decide how to approach the problem. Students will keep a portfolio of lab reports.

Labs

Note: a timeline for labs follows in the course outline. All labs listed are student conducted. Italicized labs are competitions with the majority of the work done outside of class.

1. Measurement of Inaccessible Heights and Distances
2. Acceleration of a Cart on an Air Track
3. Determination of Acceleration Due to Gravity
4. Egg Drop
5. Determining the Initial Velocity of a Projectile
6. Comparing Angle of Launch with Range
7. Prediction of Landing Point off a Horizontal Surface
- 8. *Catapults***
9. Applied Force and Acceleration of a System on an Air Track
10. Calculating the Coefficient of Friction
11. Finding the Equilibrant Force on a Force Board
12. Calculating the Center of Gravity
13. Constructing a 4 Tier Mobile in Equilibrium
14. Conservation of Energy on an Air Track (spring-mass system)
- 15. *Mousetrap Racers***
16. Perfectly Inelastic Collisions on an Air Track
17. Elastic Collisions on an Air Track
18. Glancing Collisions in Two Dimensions
19. Centripetal Force and Centripetal Acceleration
- 20. *Mousetrap Boats***
21. Drag on a Golf Ball
22. Specific Heat of a Metal
23. Electroscopes – Conduction and Induction
24. Electrophorus
25. Ohm's Law – Calculating Unknown Resistance
26. Series and Parallel Circuits
27. Combination Circuits
28. Magnetic Observations
29. Electric Motor
30. Hooke's Law
31. Period of a Simple Pendulum
32. Resonance
33. Pipe Organs (Closed Pipes)
34. Guitars (Law of Strings)
35. Single Slit Diffraction
36. Snell's Law
37. Finding Focal Lengths of Converging and Diverging Lenses
38. Photoelectric Effect
- 39. *Rube Goldberg Machine***

Lab Report Format

The basic format for a lab report write-up contains the following sections. The lab reports will be turned in as a group with a single staple placed in the upper left corner of the packet. Late reports will have 10 points deducted for each day they are late.

Title Page:

This section should be placed on its own sheet of with the following information centered on the page.

Title of Lab
Due Date
Name of Group Members

Objective:

This section includes a **brief** explanation of the purpose of the lab. This section should answer the question: Why was this lab conducted?

Apparatus:

A numbered list of all instruments and materials needed for the lab

Procedure:

A detailed explanation of how the lab was completed. This section should be in chronological order with numbered steps. An individual reading this section should be able to duplicate your results by following these steps.

Diagram:

This section includes a drawing or drawings of how the experiment was set up. An individual reading the lab report should be able to set up the lab based upon this drawing. The diagram should include labels of all parts of the lab.

Data:

This section will contain charts or tables of all the data measured/obtain directly from within the lab. Descriptions should be included under all tables that explain what the tables include.

Evaluation of Data:

All calculated values should be presented in this section of the report in the form of a table or graph. Descriptions should be included under all tables and graphs that explain what the table or graph includes. This section also must contain one sample calculation for each type of calculation that was performed as part of the lab. Any questions asked within the lab will be addressed here.

Conclusion:

The conclusion is the place to restate the results of the laboratory. In this section a declaration of the findings should be **explained and defended** based on the data from the previous sections. The conclusion is also the place where the percent error must be stated and possible sources of error are discussed.

Projects & Competitions

There are four major projects throughout the year. . .

1. Catapults: Design and build a catapult to hit 3 targets place 2m, 4m, and 7m away from the catapult
2. Mousetrap Racecars: Design and build a car powered by a mousetrap which will travel the farthest distance.
3. Mousetrap Boats: Design and build a boat powered by a mousetrap which will travel the fastest.
4. Rube Goldberg Machines: Design and build a machine consisting of at least 7 different simple machines to accomplish a creative task assigned by the instructor.

These projects are meant to supplement the rigorous course material with an innovative approach to problem solving. Students are to work on these projects outside of the school day with the exception of the day of demonstration or competition. More time is allotted for the Rube Goldberg Machines since it is after the AP Physics Test.

Course Outline

The following is a course content outline with a suggested timeline. The percentages are those listed in the AP physics course description for the material covered on the AP exam.

I.	<u>Newtonian Mechanics</u>				35%
	A. Kinematics				7%
	1. Introduction	Chapter 1	(1 Week)		
	2. Motion in One Dimension	Chapter 2	(1.5 Weeks)		
	3. Vectors & 2-Dimensional Motion	Chapter 3	(1 Week)		
	B. Newton's Laws of Motion	Chapter 4	(2 Weeks)		9%
	C. Work, Energy, and Power	Chapter 5	(1.5 Weeks)		5%
	D. Momentum and Collisions	Chapter 6	(1.5 Weeks)		4%
	E. Rotational Motion and the law of Gravity	Chapter 7	(1 Week)		6%
	F. Rotational Equilibrium and Dynamics	Chapter 8	(1 Week)		4%
II.	<u>Fluid Mechanics and Thermal Physics</u>				15%
	A. Fluid Mechanics	Chapter 9	(1 Week)		6%
	B. Temperature and Heat	Chapter 10	(2 Weeks)		2%
	C. Kinetic Theory and Thermodynamics				7%
	1. Energy in Thermal Processes	Chapter 11	(1 Week)		
	2. The Laws of Thermodynamics	Chapter 12	(1 Week)		
III.	<u>Electricity and Magnetism</u>				25%
	A. Electrostatics	Chapter 15	(3 days)		5%

	B. Conductors and Capacitors	Chapter 16	(1 Week)	4%
	C. Electric Circuits			7%
	1. Current and Resistance	Chapter 17	(1 Week)	
	2. Direct-Current Circuits	Chapter 18	(2 Weeks)	
	D. Magnetism	Chapter 19	(1 Week)	4%
	E. Electromagnetism			5%
	1. Induced Voltages and Inductance	Chapter 20	(3 days)	
	2. AC Circuits	Chapter 21A	(2 days)	
IV.	<u>Waves and Optics</u>			15%
	A. Wave Motion			5%
	1. Vibrations and Waves	Chapter 13	(1 Week)	
	2. Sound	Chapter 14	(1 Week)	
	B. Physical Optics			5%
	1. Electromagnetic Waves	Chapter 21B	(2 Days)	
	2. Wave Optics	Chapter 24	(3 Days)	
	C. Geometric Optics			5%
	1. Reflection and Refraction of Light	Chapter 22	(1 Week)	
	2. Mirrors and Lenses	Chapter 23	(1.5 Weeks)	
V.	<u>Atomic and Nuclear Physics</u>			10%
	A. Atomic Physics and Quantum Effects			7%
	1. Quantum Physics	Chapter 27	(2 Days)	
	2. Atomic Physics	Chapter 28	(3 Days)	
	B. Nuclear Physics	Chapter 29	(3 Days)	3%
VI.	<u>End of Year</u>			
	A. April 15 – April 23	Semester 1 Review		
	B. April 24 – May 3	Semester 2 Review		
	C. May 6 – May 14	Released AP Exam Review		
	D. May 13	AP Exam		
	E. May 17	Final Exam		
	F. May 20 – End of Year	Rube Goldberg Machines		

Problem Sets

Chapter 1	Introduction	1, 4, 5, 7, 9, 10, 14, 16, 17, 18, 23, 25, 35, 36, 37, 38, 41, 42, 43, 44, 45, 46, 47
Chapter 2	Motion in One Dimension	2, 3, 5, 6, 7, 8, 9, 13, 24, 26, 27, 28, 37, 43, 45, 47, 49, 50, 51, 53, 54, 58, 59, 64, 65, 75
Chapter 3	Motion in Two Dimensions	1, 2, 3, 5, 7, 8, 10, 11, 13, 16, 19, 22, 25, 27, 29, 30, 31, 32, 48, 51, 54, 55, 57, 58, 65, 72, 73
Chapter 4	The Laws of Motion	2, 3, 5, 7, 10, 11, 12, 14, 15, 17, 19, 25, 26, 28, 30, 36, 38, 39, 40, 41, 42, 45, 48, 50, 51, 53, 54, 56, 57, 61, 67
Chapter 5	Energy	1, 2, 4, 6, 8, 9, 10, 13, 15, 17, 18, 19, 20, 24, 25, 32, 33, 34, 35, 36, 37, 43, 44, 45, 47, 48, 53, 54, 57, 59, 60, 68, 70
Chapter 6	Momentum and Collisions	2, 4, 5, 8, 12, 14, 15, 16, 17, 18, 21, 22, 24, 27, 30, 32, 33, 36, 37, 39, 40, 41, 42, 45, 46, 48, 49, 50, 51, 59, 63, 66, 77, 78
Chapter 7	Rotational Motion and Gravity	1, 2, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 17, 19, 23, 25, 27, 29, 31, 32, 35, 37, 49, 65
Chapter 8	Rotational Dynamics	1, 3, 4, 8, 9, 10, 11, 13, 19, 20, 21, 22, 23, 25, 31, 32, 33, 43, 44, 46, 52, 54, 60, 61, 62, 71, 74, 82, 88
Chapter 9	Solids and Fluids	7, 9, 16, 21, 41, 42, 44, 46, 49
Chapter 10	Thermal Physics	1, 2, 6, 7, 10, 12, 14, 15, 16, 18, 22, 29, 31, 32, 34, 35, 39, 40, 42, 45, 59, 60,
Chapter 11	Energy in Thermal Processes	2, 3, 7, 11, 16, 19, 22, 24, 25, 29, 34, 37, 38, 40, 44, 48, 64
Chapter 12	The Law of Thermodynamics	1, 2, 4, 5, 7, 9, 12, 17, 23, 29, 31, 36, 39, 43, 45, 48, 52
Chapter 13	Vibrations and Waves	1, 2, 4, 5, 8, 11, 12, 13, 17, 20, 25, 34, 39, 42, 43, 49, 50, 52, 56
Chapter 14	Sound	1, 3, 4, 5, 9, 12, 23, 24, 25, 26, 27, 33, 34, 38, 39, 48, 49, 51, 52, 53, 54, 57, 68
Chapter 15	Electric Forces and Fields	1, 10, 11, 12, 14, 17, 18, 20, 27, 30, 32
Chapter 16	Elec. Energy and Capacitance	1, 4, 5, 7, 11, 12, 13, 26, 27, 28, 33, 34, 35, 36, 37, 38, 39, 42, 44, 61
Chapter 17	Current and Resistance	10, 11, 13, 14, 15, 16, 17, 22, 25, 29, 33, 34, 35, 36, 38, 40, 44, 45, 54, 57
Chapter 18	DC Circuits	5, 6, 9, 10, 11, 13, 14, 15, 16, 17, 20, 21, 23, 25, 26, 27, 28, 29, 31, 37, 40
Chapter 19	Magnetism	1, 2, 3, 4, 6, 7, 13, 14, 15, 25, 26, 27, 34, 43, 44, 48, 59, 60, 61, 63
Chapter 20	Induced Volt. and Inductance	1, 2, 3, 9, 10, 19, 23, 24, 25, 27, 28, 29
Chapter 21	AC Circuits & EM Waves	1, 3, 4, 8, 19, 43, 44, 45, 46
Chapter 22	Reflection & Refraction of Light	1, 7, 8, 9, 10, 11, 13, 19, 24, 34, 35, 36, 44, 57
Chapter 23	Mirrors and Lenses	6, 7, 9, 10, 11, 15, 18, 19, 29, 30, 31, 33, 36, 41, 44, 51, 59
Chapter 24	Wave Optics	1, 38, 41, 43, 45, 51, 53
Chapter 27	Quantum Physics	TBD
Chapter 28	Atomic Physics	TBD
Chapter 29	Nuclear Physics	TBD