AP PHYSICS B
SYLLABUS

Course Overview:
The School day consists primarily of nine 41 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.

Texts:
College Physics, Serway and Faughn; 2nd edition, Saunders College Publishing, Orlando, 1989.

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. They 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.

Note: a timeline for the 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 Machines*

The basic format for the write-up is below.

Lab Report Write-Up:

1. Title Page
2. Objective
3. Apparatus
4. Procedure
5. Diagram of Laboratory Setup
6. Data
7. Results/Sample Calculations
8. Conclusion

Title Page:	Title of Lab Due Date Name
Objective:	A brief explanation of the purpose of the lab
Apparatus:	A list of all instruments and materials needed for the lab
Procedure:	A detailed explanation of how the lab was completed
Diagram of Laboratory Set-up:	A drawing or drawings of how the experiment was set up.
Data:	This section will contain charts or tables of all the data from the lab.
Results/ Sample Calculations:	This section must contain one sample calculation from each part of the lab. If a graph is required for the lab, it must be found in this section. Analysis of any data will take place here. Also, any questions asked in the lab will be addressed here.
Conclusion:	The conclusion is the place to restate the results of the laboratory. It is also the place where possible errors are discussed. In this section, the percent error must be stated.

Projects/Competitions:
There are four major projects throughout the year…

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

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. Newtonian Mechanics……..... 35%
   A. Kinematics……..... 7%
      1. Introduction – Chapter 1
         a. Timeline: 1 week (8/28/06 – 9/1/06)
         b. Topics: Significant Figures, Conversion of Units, Order of Magnitude, Mathematical Notation, Coordinate Systems, Vectors and Scalers,
         c. Questions: 1, 6, 7
         d. Problems: 1, 3, 5, 16, 23, 25, 28, 30, 31, 35, 48
         e. Labs: Measurement of Inaccessible Heights and Distances

      2. Motion in 1 Dimension – Chapter 2A
         a. Timeline: 1 ½ weeks (9/5/06 – 9/15/06)
         b. Topics: Average Velocity, Instantaneous Velocity, Acceleration, One Dimensional Motion with Constant Acceleration, Freely Falling Bodies
         c. Questions: 1, 2, 3, 4, 6, 11, 14, 18
         d. Problems: 1, 3, 5, 7, 8, 10, 11,14,15, 16, 18, 19, 23, 25, 30, 42, 44, 46
         e. Labs: Acceleration of a Cart on an Airtrack, Determination of Acceleration Due to Gravity, Egg Drop

      3. Motion in 2 Dimensions – Chapter 2B
         a. Timeline: 1 week (9/18/06 – 9/22/06)
         b. Topics: Velocity and Acceleration in 2 Dimensions, Projectile Motion
         c. Questions: 1, 4
         d. Problems: 33, 34, 35, 36, 38, 53, 54, 58
         e. Labs: Determining the Initial Velocity of a Projectile, Comparing Angle of Launch with Range, Prediction of the Landing Point of a Projectile off a Horizontal Surface, Catapults

B. Newton's Laws of Motion……. 9%

1. Laws of Motion – Chapter 3
    a. Timeline: 1 week (9/25/06 – 9/29/06)
    b. Topics: Force, Newton's 1st Law, Newton's 2nd Law, Newton's 3rd Law, Friction
    c. Questions: 1, 2, 10, 15
    d. Problems: 5, 6, 7, 8, 10, 13, 14, 15, 20, 21, 22, 23, 26, 27, 29, 30, 33, 45, 51, 59, special
    e. Labs: Applied Force and Acceleration of a System on an Airtrack, Calculating the Coefficient of Friction

2. Objects in Equilibrium – Chapter 4
    a. Timeline: 1 week (10/2/06 – 10/6/06)
    b. Topics: 1st Condition for Equilibrium, Torque, 2nd Condition for Equilibrium, Center of Gravity
    c. Questions: 6, 9
    d. Problems: 1, 3, 5, 6, 7, 9, 10, 11, 13, 14, 16, 17, 19, 21, 22, 24, 29, 39, 40, 41, 48
    e. Labs: Finding the Equilibrant Force on a Force Board, Calculating the Center of Gravity, Constructing a 4 Tier Mobile in Equilibrium

C. Work, Energy and Power…… 5%

1. Work and Energy – Chapter 5
    a. Timeline: 1 ½ weeks (10/9/06 – 10/18/06)
    b. Topics: Work, Work-Energy Theorem, Gravitational Potential Energy, Conservative and Non-Conservative Forces, Conservation of Mechanical Energy, Non-conservative Forces and the Work-Energy Theorem, Power, Work Done by a Varying Force
    c. Questions: 6, 9, 19
    d. Problems: 1, 3, 5, 7, 10, 12, 14, 15, 17, 18, 21, 24, 25, 30, 37, 38, 39, 51, 52
    e. Labs: Conservation of Energy on an Air track (spring-mass system)
    Mousetrap Racers Competition

D. Systems of Particles, Linear Momentum……4%

1. Momentum and Collisions – Chapter 6
    a. Timeline: 1 ½ weeks (10/19/06 – 10/27/06)
    b. Topics: Momentum and Impulse, Conservation of Momentum, Elastic and Perfectly Inelastic Collisions, Glancing Collisions
    c. Questions: 2, 3, 4, 14, 19
    d. Problems: 1, 4, 6, 7, 10, 12, 12, 13, 14, 15, 16, 17, 18, 21, 22, 24, 26, 33, 48, 51, 52
    e. Labs: Perfectly Inelastic Collisions on an Airtrack, Elastic Collisions on an Airtrack, Glancing Collisions in Two Dimensions

E. Oscillations and Gravitation…… 6%

1. Circular Motion and Law of Gravity – Chapter 7
    a. Timeline: 1 week (10/30/06 – 11/3/06)
    b. Topics: Angular Velocity, Angular Acceleration, Rotational Motion Under Constant Angular Acceleration, Relationship Between Angular and Linear Quantities, Centripetal Acceleration, Centripetal Force, Newton's Law of Gravitation, Kepler's Laws
    c. Questions: 1, 4, 14
    d. Problems: 1, 3, 5, 6, 7, 11, 15, 17, 27, 28, 47, 58, special
    e. Labs: Centripetal Force and Centripetal Acceleration

F. Circular Motion and Rotation…….**.....** 4%

1. Rotational Dynamics – Chapter 8
    a. Timeline: 1 week (11/6 – 11/10/06)
    b. Topics: Torque vs. Angular Acceleration, Rotational Kinetic Energy, Angular Momentum
    c. Questions: 1, 9, 11, 15
    d. Problems: 1, 2, 3, 6, 8, 9, 13, 15, 21, 24, 26, 33, 45, 47
    e. Labs: ----------

II. Fluid Mechanics and Thermal Physics……. 15%

A. Fluid Mechanics……. 6%

1. Solids and Fluids – Chapter 9
    a. Timeline: 1 week (11/13/06 – 11/17/06)
    b. Topics: States of Matter, Elastic Properties of Solids, Density and Pressure, Buoyant Forces and Archimedes' Principle
    c. Questions: 13, 16, 20, 22
    d. Problems: 1, 2, 11, 13, 14, 22, 23, 24, 31
    e. Labs: Mousetrap Boats

2. Fluids in Motion – Chapter 10
    a. Timeline: 1 week (11/20/06 – 11/22/06)
    b. Topics: Fluid Dynamics, Bernoulli's Principle
    c. Questions: 1, 2, 4, 5, 7, 8, 10, 14
    d. Problems: 2, 7, 11
    e. Labs: Drag on a Golf Ball

B. Temperature and Heat……. 2%

1. Thermal Physics – Chapter 11
    a. Timeline: 1 week (11/28/06 – 12/1/06)
    b. Topics: Thermal Expansion of Solids and Liquids, Ideal Gases, Ideal Gas Law, Avagadro's Number, Kinetic Theory of Gases
    c. Questions: 2, 4, 6, 13, 19
    d. Problems: 1, 2, 4, 7, 8, 19, 21, 23, 45
    e. Labs: ----------

2. Heat – Chapter 12
    a. Timeline: 1 week (12/4/06 – 12/8/06)
    b. Topics: Heat Energy, Specific Heat, Latent Heat, Conduction, Convection, Radiation
    c. Questions: 5, 11, 12, 13
    d. Problems: 1, 2, 11, 12, 17, 18, 25, 26
    e. Labs: Specific Heat of a Metal

C. Kinetic Theory and Thermodynamics……. 7%
1. Laws of Thermodynamics – Chapter 13
    a. Timeline: 2 weeks (12/11/06 – 12/22/06)
    b. Topics: Work, Heat, First Law of Thermodynamics, Second Law of Thermodynamics, Carnot Engine
    c. Questions: 2, 9
    d. Problems: 1, 3, 4, 5, 7, 8, 18, 23, 24, 30, 40,
    e. Labs: ----------

III. Electricity and Magnetism……. 25%
A. Electrostatics…… 5%
1. Electric Forces and Electric Fields – Chapter 16
    a. Timeline: 3 days (1/3/07 – 1/5/07)
    b. Topics: Properties of Electric Charges, Insulators and Conductors, Coulomb's Law, Electric Fields, Electrostatic Equilibrium, Faraday's Ice Pail Experiment
    c. Questions: 2, 4, 5, 9, 10, 12
    d. Problems: 2, 8, 9, 11, 17, 18, 22, 23, 24, 27, 33, 34, 35, 46
    e. Labs: Electroscopes – Conduction and Induction, Electrophorus

B. Conductors and Capacitors ……. 4%
1. Electric Energy and Capacitance – Chapter 17
    a. Timeline: 1 week (1/8/07 – 1/12/07)
    b. Topics: Potential Difference, Electric Potential, Capacitance, Parallel Plate Capacitors, Combinations of Capacitors,
    c. Questions: 2, 5
    d. Problems: 1, 2, 4, 5, 12, 19, 21, 25, 26, 27, 28, 30, 31, 32, 36, 37, 39
    e. Labs: ----------

C. Electric Circuits……. 7%
1. Current and Resistance – Chapter 18
    a. Timeline: 1 week (1/15/07 – 1/18/07)
    b. Topics: Electric Current, Ohm's Law, Resistivity
    c. Questions: 3, 4, 9
    d. Problems: 7, 8, 9, 12, 21, 27, 28, 30, 32, 37, 39, 42, electric bill
    e. Labs: Ohm's Law – Calculating Unknown Resistance

2. Direct Current Circuits – Chapter 19
    a. Timeline: 2 weeks (1/22/07 – 2/2/07)
    b. Topics: Resistors in Series, Resistors in Parallel, Kirchhoff's Rules
    c. Questions: 1, 2, 3, 6, 8
    d. Problems: 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 27, 28, 29, 30, 39
    e. Labs: Series and Parallel Circuits, Combination Circuits

D. Magnetostatics…… 4%
1. Magnetism – Chapter 20
    a. Timeline: 1 week (2/5/07 – 2/9/07)
    b. Topics: Magnets, Magnetic Fields, Magnetic Force on a Current - Carrying Conductor, Torque on a Current Loop, Motion of a Charged Particle in a Magnetic Field, Magnetic Field of a Long, Straight Wire, Ampere's Law, Magnetic Field Between Two Parallel Conductors, Magnetic Field of a Current Loop, Magnetic Field of a Solenoid
    c. Questions: 11, 12, 13, 18
    d. Problems: 1, 2, 3, 5, 6, 9, 10, 12, 13, 17, 31, 32, 33, 34, 39, 41
    e. Labs: Magnetic Observations

E. Electromagnetism……. 5%
1. Induced Voltages and Inductance – Chapter 21
    a. Timeline: 1 week (2/12/07 – 2/16/07)
    b. Topics: Induced emf, Magnetic Flux, Faraday's Law, Lenz's Law, Generators, Motors
    c. Questions: 1, 2, 3, 9
    d. Problems: 1, 2, 7, 8, 11, 20, 21, 22, 23, 24
    e. Labs: Electric Motor

IV. Waves and Optics…… 15%
A. Wave Motion (Sound and Physical Optics)…….. 5%
1. Vibrations and Waves – Chapter 14
    a. Timeline: 1 week (2/19/07 – 2/23/07)
    b. Topics: Hooke's Law, Elastic Potential Energy, Pendulums, Wave Motion, Types of Waves, Frequency, Amplitude, Wavelength, Velocity of Waves on Strings, Superposition and Interference of Waves, Reflection of Waves
    c. Questions: 1, 2, 3, 9
    d. Problems: 2, 5, 8, 9, 11, 18, 25, 26, 27, 29, 30, 33
    e. Labs: Hooke's Law, Period of a Simple Pendulum

2. Sound – Chapter 15
    a. Timeline: 1 week (2/26/07 – 3/2/07)
    b. Topics: Sound Waves, Speed of Sound, Doppler Effect, Standing Waves, Resonance, Standing Waves in Air Columns, Beats, Quality of Sound
    c. Questions: 2, 3, 5, 15, 17, 18
    d. Problems: 1, 3, 4, 7, 9, 19, 20, 21, 22, 25, 30, 35, 37, 59
    e. Labs: Resonance, Pipe Organs (Closed Pipes), Guitars (Law of Strings)

B. Physical Optics…….. 5%
1. Electromagnetic Waves – Chapter 23
    a. Timeline: 2 days (3/5/07 – 3/6/07)
    b. Topics: Properties of Electromagnetic Waves, The Spectrum
    c. Questions: 1, 3, 4
    d. Problems: 13, 15, 17
    e. Labs: ----------

2. Wave Optics – Chapter 26
    a. Timeline: 3 days (3/7/07 – 3/9/07)
    b. Topics: Interference of Light, Diffraction
    c. Questions: 5
    d. Problems: 1, 3, 10, 13, 26, 31
    e. Labs: Single Slit Diffraction

C. Geometric Optics…… 5%
1. Reflection and Refraction of Light – Chapter 24
    a. Timeline: 1 week (3/12/07 – 3/16/07)
    b. Topics: Speed of Light, Huygen's Principle, Reflection and Refraction, Law of Reflection, Law of Refraction
    c. Questions: 1, 4
    d. Problems: 6, 8, 9, 11, 12, 18, 19
    e. Labs: Snell's Law

2. Mirrors and Lenses – Chapter 25
    a. Timeline: 1 ½ weeks (3/19 – 3/28/07)
    b. Topics: Plane Mirrors, Concave and Convex Mirrors (Spherical Mirrors), Images Formed by Refraction, Thin Lenses, Multiple Lens Systems
    c. Questions: 9
    d. Problems: 5, 7, 9, 11, 16, 29, 30, 35, 38, 47
    e. Labs: Finding Focal Lengths of Converging and Diverging Lenses

V. Atomic and Nuclear Physics…… 10%

A. Atomic Physics and Quantum Effect…… 7%

1. Quantum Physics – Chapter 29
   a. Timeline: 2 days (3/29/07 – 4/2/07)
   b. Topics: Planck's Hypothesis, Photoelectric Effect
   c. Questions: 3, 4
   d. Problems: 1, 2, 9, 10, 31, 32, 33
   e. Labs: Photoelectric Effect

2. Atomic Physics – Chapter 30
   a. Timeline: 3 days (4/3/07 – 4/5/07)
   b. Topics: Early Models of the Atom, Bohr Theory, De Broglie Waves
   c. Questions: 1, 3
   d. Problems: 1, 3, 5, 6
   e. Labs: ----------

B. Nuclear Physics…… 3%

1. Nuclear Physics – Chapter 32
   a. Timeline: 3 days (4/11/07 – 4/13/07)
   b. Topics: Radioactivity, The Decay Process, Nuclear Reactions
   c. Questions: 1, 2
   d. Problems: 1, 10, 19, 26
   e. Labs: ----------

End of the year schedule:

4/16 – 4/24	1st semester review: - multiple choice and free response packets
4/25 – 5/2	2nd semester review - multiple choice and free response packets
5/3	Amusement Park Physics Day Prep
5/4	Amusement Park Physics Day
5/7 – 5/11	Review of AP Exams from 1984, 1988, 1993, 2000
5/14	AP Exam
5/17	Final Exam
5/15 – 5/25	Rube Goldberg Machines