



## ADVANCED PLACEMENT PHYSICS B

*Counselors are available to assist parents and students with course selections and career planning. Parents may arrange to meet the counselor by calling the school's guidance department.*

### COURSE DESCRIPTION

Advanced Placement Physics B is a college-level course that examines the principles of physics in detail. This course is designed in accord with the requirements of the College Board. Students are expected to take the Advanced Placement Physics B Examination at the end of the course.

### COURSE GOALS

- Develop an in-depth understanding of the concepts, principles, and processes of physics and applying these principles in the solution of problems
- Develop an understanding of the means by which information about physics is collected, how it is recorded and interpreted, how hypotheses are formulated from available data, and how further predictions are made
- Develop the ability to think clearly and to express ideas orally and in writing with clarity and logic
- Develop an understanding that science is a human endeavor with social consequences

### PREREQUISITE

Algebra II/Trigonometry

### OPTIONS FOR NEXT COURSE

Advanced Placement Environmental Science (Biology and Chemistry prerequisite)

Advanced Placement Biology (Biology and Chemistry prerequisite)

Advanced Placement Chemistry (Chemistry prerequisite)

Earth Science

Biology

Chemistry (Algebra II prerequisite or co-requisite)

Oceanography (Earth Science prerequisite)

### REQUIRED STUDENT TEXTBOOK

*College Physics – A Strategic Approach*, Knight, Jones, Field (Pearson Prentice Hall, 2007)

### MINIMUM REQUIREMENTS

- Demonstrate knowledge and understanding of all core objectives through laboratory investigations, projects, oral and/or written tests, quizzes, and reports
- Read and study assigned chapters in the textbook
- Participate in the laboratory activities, prepare written laboratory reports, and adhere to all safety procedures
- Read science journals, magazines, and books to expand the ideas and topics presented in class
- Attend the extended class or laboratory sessions scheduled each week

**The Knowledge, Skills, and Attitudes That Comprise the Advanced Placement Physics B Course are Summarized as Follows From the Prescribed Curriculum:**

**Mechanics**

- Kinematics including vectors, vector algebra, components of vectors, coordinate systems, displacement, velocity, acceleration, motion in one and two dimensions, and projectile motion
- Newton's laws of motion including friction and centripetal force, static equilibrium (1st law), dynamics of a single particle (2nd law), and systems of two or more bodies (3rd law)
- Work, energy, power including work and work-energy theorem, conservative forces, potential and kinetic energy, conservation of energy, and power
- Systems of particles, linear momentum including center of mass, impulse and momentum, conservation of linear momentum, and collisions
- Circular Motion and Rotation including uniform circular motion, angular momentum and its conservation, torque and rotational statics, and rotational kinematics and dynamics
- Oscillations and gravitation including simple harmonic motion, mass on a spring, pendulum and other oscillations, Newton's law of gravity, and orbits of planets and satellites

**Thermal Physics**

- Temperature and heat including mechanical equivalent of heat, specific and latent heat, heat transfer and thermal expansion
- Kinetic theory and thermodynamics including ideal gas laws and the kinetic model of heat
- Ideal gas law including the laws of thermodynamics

**Electricity and Magnetism**

- Electrostatics including charge, field, electric potential, Coulomb's law and field, and potential of point charges, and Gauss' law
- Conductors, capacitors, dielectrics including electrostatics with conductors and capacitors
- Electric circuits including current, resistance, power, steady-state direct current circuits with batteries and resistors, capacitors in circuits, and transients in RC circuits
- Magnetostatics including forces on moving charges in magnetic fields, forces on current-carrying wires in magnetic fields, and Ampere's law
- Electromagnetism including electromagnetic induction, inductance, and Maxwell's equation

**Modern Physics**

- Atomic physics and quantum effects including alpha particle scattering and the Rutherford model of the atom, photons and the photoelectric effect, Bohr model of the atom, and wave-particle duality
- Nuclear physics including radioactivity and half-life and nuclear reactions

**Miscellaneous** (identification of vectors and scalars, vector mathematics, graphical presentation of data, graphs of functions, questions that overlap several major topical areas, history of physics, and so forth)

**Core Areas for Laboratory Skills and Experiences**

Laboratory experience is an important part of physics education. In the laboratory, the validity of idealized situations presented in the textbooks can be questioned. It is there that the student meets nature as it is rather than in idealized form. The laboratory experience should help students understand the basic principles of physics being considered.

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| <ul style="list-style-type: none"><li>• Mechanics<ul style="list-style-type: none"><li>- Measurements</li><li>- Static equilibrium</li><li>- Projectile motion</li><li>- Linear momentum</li><li>- Angular momentum</li><li>- Simple harmonic motion</li></ul></li></ul> | <ul style="list-style-type: none"><li>• Heat, kinetic theory, and thermodynamics<ul style="list-style-type: none"><li>- Heat of vaporization</li></ul></li><li>• Waves and optics<ul style="list-style-type: none"><li>- Speed of sound</li><li>- Compound lenses</li><li>- Diffraction and interference</li></ul></li><li>• Electricity and magnetism</li></ul> | <ul style="list-style-type: none"><li>- DC circuits</li><li>- Wheatstone Bridge</li><li>- Magnetic fields</li><li>- Capacitors</li><li>• Modern physics<ul style="list-style-type: none"><li>- Analysis of spectral lines of hydrogen</li></ul></li><li>• Experimental design and projects</li></ul> |
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**NOTE:** *Students should keep a record of their laboratory work so they will be in a position to validate their AP Physics B course as equivalent to the corresponding college course. Most college placement policies presume that students have had laboratory experience.*



# VIRGINIA BEACH CITY PUBLIC SCHOOLS

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## Mission Statement

*The Virginia Beach City Public Schools, in partnership with the entire community, will empower every student to become a life-long learner who is a responsible, productive and engaged citizen within the global community.*

Dr. James G. Merrill, Superintendent

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