Radnor High School
Course Syllabus

AP Physics 1

Credits: 1.0 Credit, weighted
Grade Weighting: Yes
Prerequisites: Honors chemistry or Advanced Chemistry
Co-requisites: Honors Pre-calculus
Length: Year
Format: Meets Daily

Overall Description of Course

AP Physics 1 is an algebra-based course that provides a rigorous and thorough examination of physical concepts such as motion, forces, energy, and mechanical waves. It will also introduce students to electricity and magnetism. The course will focus on inquiry-based instruction that focus in on labs. These labs will help students develop models through making observation and discovering patterns of physical phenomena. It includes applications that give insight into the relevance of physics in our everyday world and provides a strong foundation for future study for AP Physics 2 or AP Physics C. Paced for the highly motivated science and math oriented student, the course develops critical thinking and problem solving skills through the use of lab activities and challenging problems.

Course Overview

Student Objectives:

1. To apply basic principles of physics to real-life applications
2. To enable students to understand and quantify the physical world
3. To prepare students to perform experiments
4. To prepare students to interpret the experiment results and communicate their understanding of the results.

Materials & Texts

MATERIALS

Scientific or graphing calculator, ruler and protractor

TEXT:
Wilson, Physics, 7th edition.

Chapters and Sections Covered

1. Measurement and Problem Solving
   - 1.2 SI Units
   - 1.3 Metric Prefixes/Scientific Notation
   - 1.4 Unit Analysis

- 1.5 Unit Conversion
- 1.6 Significant Figures
- 1.X Graph Types
- 1.XX Graphical Analysis

2. Kinematics: Description of Motion
   - 2.1 Speed, Distance, and Scalars
   - 2.2 Velocity, Displacement, and Vectors
   - 2.3 Acceleration
   - 2.4 Kinematic Equations (Constant Acceleration)
   - 2.5 Free Fall
   - 2.X Kinematics and Graphs
3. Motion in Two Dimensions
   - 3.1 Components of Vectors
   - 3.2 Vector Operations
   - 3.3 Projectile Motion
   - 3.4 Relative Velocity
   - 3.X Intro to Center of Mass
4. Force and Motion
   - 4.1 Concepts of Force and Net Force
   - 4.2 Inertia and Newton's First Law of Motion
   - 4.3 Newton's Second Law of Motion
   - 4.4 Newton's Third Law of Motion
   - 4.5 Free Body Diagrams and Translation Equilibrium
   - 4.6 Friction and Drag
   - 4.X Forces on an Incline Plane
5. Work and Energy
   - 5.1 Work Done by a Constant Force
   - 5.2 Work Done by a Variable Force
   - 5.3 Work Energy Theorem: Kinetic Energy
   - 5.4 Potential Energy
   - 5.5 Conservation of Energy
   - 5.6 Power
6. Linear Momentum and Collisions
   - 6.1 Linear Momentum
   - 6.2 Impulse
   - 6.3 Conservation of Linear Momentum
   - 6.4 Elastic and Inelastic Collisions
   - 6.5 Center of Mass
7. Circular Motion and Gravitation
   - 7.1 Angular Measure
   - 7.2 Angular Speed and Velocity
   - 7.3 Uniform Circular Motion and Centripetal Acceleration
   - 7.4 Angular Acceleration
   - 7.5 Newton's Law of Gravitation
   - 7.6 Kepler's Laws and Earth Satellites
8. Rotational Motion and Equilibrium
   - 8.1 Rigid Bodies, Translations, and Rotations
   - 8.2 Torque, Equilibrium, and Stability

8.3 Rotational Dynamics
8.4 Rotational Work and Kinetic Energy
8.5 Angular Momentum

13. Vibrations and Waves
    13.1 Simple Harmonic Motion
    13.2 Equations of Motion
    13.3 Wave Motion
    13.4 Wave Properties
    13.5 Standing Waves and Resonance
    13.6 Simple Pendulum
14. Sound
    14.1 Sound Waves
    14.2 Speed of Sound
    14.4 Sound Phenomena
    14.5 Doppler Effect
    14.6 Musical Instruments
15. Electric Charge, Forces, and Fields
    15.1 Electric Charge
    15.2 Electrostatic Charging
    15.3 Electric Force
    15.4 Electric Field
16. Electric Potential, Energy, and Capacitance
    16.1 Electric Potential Energy and Electric Potential Difference
    16.3 Capacitance
17. Electric Current and Resistance
    17.1 Batteries and Direct Current
    17.2 Current
    17.3 Resistance and Ohm's Law
    17.4 Electric Power
18. Basic Electric Circuits
    18.1 Resistance in Series, Parallel and Series-Parallel Combinations
    18.2 Multi-loop Circuits and Kirchhoff's Rules

Post-AP Exam

19. Magnetism
    19.1 Permanent Magnets
    19.2 Magnetic Field Strength
    19.3 Charged Particles in Magnetic Fields
    19.4 Magnetic Fields on Current Carrying Wires

Common Core Labs

1. Motion in One-Dimension
   - Motion of a Dune Buggy
   - Motion down an Incline Plane
   - Acceleration due to Gravity (Smart Timer)
   - Reaction Time Lab
2. Vectors
   - Map Exercise

Projectile Motion
Forces in Equilibrium

3. Motion and Forces
   - Newton's First Law
   - Newton's Second Law
   - Kinetic Friction

4. Work and Energy
   - Conservation of Energy
   - Hooke's Law
   - Power Lab

5. Linear Momentum
   - Conservation of Momentum/KE
   - Kinetic Energy in Collisions

6. Circular Motion
   - Circular Motion
   - (Conical Pendulum)
   - Kepler's Laws

7. Rotational Motion
   - Torque/Rotation
   - Mass of Meter Stick
   - Rotational Moment of Inertia

8. Waves
   - Period of Pendulum
   - Simple Harmonic Oscillator
   - Waves on a String

9. Sound
   - Speed of Sound

10. Static Electricity
    - Electric Fields
    - Measuring Voltage

11. Circuits
    - (Resistivity of Play-dough)
    - Ohm's Law
    - Series and Parallel Circuits
    - Power and Efficiency of Appliances
    - Design your Own Circuit

12. Magnetism
    - Create A better Motor

Big Ideas Covered

1. Objects and systems have properties such as mass and charge. Systems may have internal structure.
2. Fields existing in space can be used to explain interactions.
3. The interactions of an object with other objects can be described by forces.
4. Interactions between systems can result in changes in those systems.

5. Changes that occur as a result of interactions are constrained by conservation laws.
6. Waves can transfer energy and momentum from one location to another without the permanent transfer of mass and serve as a mathematical model for the description of other phenomena.

Science Practices Covered

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