

PHYSICS I

LENGTH OF TIME: every day for one semester

GRADE LEVEL: 10-12

COURSE STANDARDS

Students will:

1. Take part in class discussions and small cooperative groups by asking and answering questions. PA Std 3.1, 3.2
2. Work cooperatively in groups to solve problems, make decisions, learn from peers, write and edit reports, and extend and apply their knowledge. PA Std 3.1, 3.2
3. Reinforce and extend their learning by completing homework assignments. PA Std 3.1, 3.2
4. Show evidence of the concepts presented in the course by explaining/solving new application problems not previously encountered. PA Std 3.1, 3.2
5. Solve problems involving application. PA Std 3.1, 3.2
6. Read and comprehend informational materials to develop their understanding of concepts and technology use. PA Std 3.1, 3.2
7. Demonstrate the rules of English through proper spelling and grammar in all written and oral communication.
8. Use mathematics to represent and solve problems. PA Std 3.1

RELATED PA ACADEMIC STANDARDS FOR SCIENCE AND TECHNOLOGY

- 3.1 Unifying Themes
 - B. Models
 - C. Patterns
 - D. Scale
 - E. Change
- 3.2 Inquiry and Design
 - A. Nature of Scientific Knowledge
 - B. Process Knowledge
 - C. Scientific Method
 - D. Problem Solving in Technology

PERFORMANCE ASSESSMENTS:

Students will demonstrate achievement of the standards by:

1. Making and converting measurements in SI (metric system). Course Standard 2,3,5,8
2. Producing mathematical solutions to conceptual problems. Course Standard 3,4,5,8
3. Creating and analyzing graphs. Course Standard 3,5
4. Experimentally measuring the acceleration of gravity. Course Standard 1,2,7,8
5. Writing reports to communicate process, collected data, and outcome. Course Standard 1,2,7,8

6. Identifying Newton's Laws of Motion from written and demonstrated situations. Course Standard 1,4,5
7. Deriving equations from actual experiments and "thought" experiments. Course Standard 1,4
8. Calculating the coefficient of friction for various surfaces. Course Standard 2,5,7,8
9. Computing an individual's reaction time. Course Standard 2,4,5
10. Comparing the actual and theoretical ranges of a projectile. Course Standard 2,4,5,7,8
11. Using course concepts to describe/explain new (previously-unseen) applications/phenomena. Course Standard 4
12. Designing and completing their own controlled experiment, such as what factors affect the period of a pendulum and explaining why. Course Standard 1,2,4,5,7,8
13. Determining the relationship between IMA, lifting strands, and efficiency of a pulley systems. Course Standard 1,2,5,8
14. Maintaining a class portfolio. Course Standard 1-8

DESCRIPTION OF COURSE:

In Physics I students will discover the laws and principles governing the interaction of matter and energy, and use these discoveries to predict future events in a variety of applications: kinematics (straight line motion), dynamics (forces' effects on objects), motion in two directions (projectile, circular, and pendulum motion), momentum, work and power, and energy. Students will observe, reason analytically, and do many mathematical calculations to successfully design and complete lab experiments, understand and explain concepts, apply concepts to "real life", and interpret and solve mathematical problems. Algebra and simple geometry are necessary for the successful completion of Physics I. A working knowledge of three trigonometric relationships (sine, cosine, and tangent) is also required, but will be taught in the course.

TITLES OF UNITS:

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|-----------------------------|---------|
| 1. Tools of the Trade | 2 weeks |
| 2. Kinematics | 3 weeks |
| 3. Dynamics | 3 weeks |
| 4. Vectors | 1 week |
| 5. Motion in Two Directions | 3 weeks |
| 6. Universal Gravitation | 1 week |
| 7. Momentum | 2 weeks |
| 8. Work and Power | 2 weeks |
| 9. Energy | 1 week |

SAMPLE INSTRUCTIONAL STRATEGIES:

1. Inductive/constructivist approach through activities, demonstrations, and labs
2. Cooperative group work.
3. Class discussion
4. Application of theory through lab activities, problem-solving, worksheets and model-building.

5. Math skills development through solving mathematical problems both in and out of class.
6. Teacher presentations
7. Individually-paced reading

MATERIALS:

1. Text: Physics - Principles and Problems; Zitzewitz, Elliott, Haase, Herzog, Nelson, Nelson, Schuler and Zorn; McGraw-Hill, 2005
2. Assorted physical supplies and equipment
3. Selected AV materials
4. Technology (e.g. Log-It sensors, lab equipment, calculators)
5. Computers and appropriate software

METHODS OF ASSISTANCE AND ENRICHMENT:

1. Opportunities for retesting
2. Opportunities for tutoring after school
3. Opportunities for extra credit (computational, video)
4. Additional readings
5. Career and application readings in text

PORTFOLIO DEVELOPMENT:

In order to document achievement in science, students may include in their school portfolio:

1. Reports from labs, projects, and activities
2. Notes, evaluations, and/or videos of presentations
3. Examples of extended learning and application (e.g. extra credit)

METHODS OF EVALUATION:

1. Reports from projects and labs
2. Objective tests
3. Essays
4. Homework completion
5. Class portfolio

INTEGRATED ACTIVITIES:

1. Concepts
 - Evidence, models, and explanations
 - Constancy, change, and measurement
 - Form and function
 - Systems, order, and organization
 - Communication and defending an argument with logic
2. Communication
 - Read and use a variety of methods to make sense of the texts

- Respond orally and in writing to information and ideas gained by reading, and use information and ideas to make decisions and solve problems
 - Write for a variety of purposes
 - Exchange information orally, ask and answer questions appropriately and promote effective communication and function in a group
3. Thinking/Problem Solving
- Use effective research and information management skills
 - Peer review of written documents
 - Drawing appropriate conclusions from data
 - Altering paradigms
 - Inferring messages from text
4. Application of Knowledge
- Use of computers and software
 - Traditional and computer-aided research
 - Written communications
 - Appropriate use of laboratory equipment and materials
5. Interpersonal Skills
- Demonstrate skills of communicating, negotiating, and cooperating with others in class and small group situations
 - Work together effectively with peers to edit and prepare written documents and projects