

## I-TV Physics Syllabus

Course Title: Physics

Teacher: Don Arni

Originating School: Glasgow Schools

Duration: Year-long

**Course Description:** Physics is the study of matter and energy. In this course students will study the concepts of matter and energy, how these concepts relate to the present and how these concepts were developed from earlier ideas, (thus becoming aware of the methods by which scientific understanding evolves, as well as the history of physics). Students will also explore many of the quantitative relationships that exist concerning matter and energy and use these relationships to explain phenomena, predict events, and solve problems. Discussions will range from the physics encountered in daily life to the cutting-edge physics found in current journals. Topics studied include the scientific method, measurement, classical mechanics, heat and structure of matter, wave motion, sound, light, electricity, electromagnetism, quantum theory, and nuclear physics. This course compares to most college noncalculus based introductory courses in scope and difficulty and should prepare any student interested in a technical career to enter directly into the college physics courses that are calculus based (assuming the proper mathematical background is attained).

**Course Prerequisites:** As a minimum students should have satisfactorily completed a course in Geometry. It is preferred that the student is currently enrolled in Algebra II or a Precalculus course. Students currently enrolled in Geometry may enroll in this course upon the recommendation of their mathematics teacher (based upon evidence of strong mathematical ability) or if they have satisfactorily completed a course in Chemistry.

**Expectations:** Students should be reading at their grade level and should expect to do most of the assigned reading outside of class. Students should expect to read a chapter every one to two weeks and have at least one written assignment each week. Reading must be done before classroom discussion of each chapter and written assignments must be completed and submitted by the assigned dates. Students should expect four to eight major or minor lab reports to be written during the year. Students will also be required to read and report on one book per quarter (these books will come from a supplemental reading list or must be okayed by the instructor).

**Course Outline:** The course outline and objectives are listed separate from this syllabus.

**Textbook:** Giancoli, Douglas C. PHYSICS PRINCIPLES WITH APPLICATIONS. Third Edition. Prentice Hall. Copyright 1991.

**Equipment Required:** Students will need to acquire a scientific calculator.

**Lab Requirements:** Labs and demonstrations will be performed at the originating school; however, students at the remote sites (under proper supervision) may set up and conduct labs to collect their own data. When it is not feasible for students at the remote sites to conduct a lab, they will observe and collect data through I-TV. While hand-on experience is best, students should not try to conduct labs at their own school without proper safety precautions and supervision.

## PHYSICS COURSE OUTLINE

The following outline is rather ambitious. The first two or three units may be completed in the first semester and hopefully the other topics will all be completed during the second semester. The actual number of units that can be completed, though, will depend on the overall strength of the class. If time runs short, selected topics will be given an overview to at least give students exposure to them.

- I. Introduction to Physics and The Scientific Method
  - A. Physics and Methods of Science
  - B. Measurements of Length and Time
  - C. Measurements of Mass and Weight
- II. Force, Motion and Energy (Mechanics both Kinematics and Dynamics)
  - A. Vectors, Force and Motion
  - B. Straight Line Motion
  - C. 2-Dimensional Motion
  - D. Laws of Motion
  - E. Circular Motion
  - F. Relativity
  - G. Statics
  - H. Momentum and The Principle of The Conservation of Momentum
  - I. Law of Gravitation and Planetary Motion
  - J. Work
  - K. Energy and the Principle of The Conservation of Energy
- III. Heat and the Structure of Matter (Thermodynamics)
  - A. Measuring Temperature and Heat
  - B. Heat as Energy
  - C. Heat and Molecular Motion
  - D. Kinetic Theory of Gases
- IV. Wave Motion, Sound and Light
  - A. Transfer of Energy by Waves
  - B. Nature of Light
  - C. Reflection and Refraction
  - D. Mirrors, Lenses, and Other Optical Instruments
  - E. Interference and Diffraction

V. Electricity

- A. Electricity and the Nature of Matter (Static Electricity)
- B. Natural Unit of Electricity
- C. Coulomb's Law and Electric Fields
- D. Electric Circuits
  - 1. Series
  - 2. Parallel

VI. Electromagnetism

- A. Magnetism and Magnetic Fields
- B. Forces Produced by Magnetic Fields
- C. Electromagnetic Induction
- D. Electromagnetic Waves

VII. Quantum Theory and Nuclear Physics

- A. Quantum Theory of Light and Matter
- B. Discovery of the Atomic Nucleus
- C. Model of the Atom
- D. Applications of Quantum Theory
- E. Atomic Nucleus
  - 1. Fission
  - 2. Fusion
- F. Nuclear Instruments and Particle Physics

## ITV PHYSICS MANAGEMENT PLAN

Classroom Goal: A classroom setting that promotes learning and personal growth in an environment that is clean, orderly, friendly, and comfortable for everyone.

### Classroom Do's:

1. Help others in positive ways, not in ways that cause them to depend on you.
2. Ask questions if you are unsure or don't understand something in class.
3. Participate in class activities and discussions; learning is active, not passive.
4. Let me know if you have problems or concerns with class work. I can't help you if you don't talk to me.
5. Share your ideas; each member of the class is important, no matter where you are located.

### Classroom Don't's:

1. Private conversations during instruction time.
2. Profanity in words or in gestures.
3. Intimidating or making fun of anyone else in the class.
4. Copying another student's work.
5. Damaging furniture or equipment.
6. Sleeping, eating, or drinking in class.

### Class Expectations:

1. Turn in homework on time. Full credit will only be assured on work turned in on time; if getting work in on time is impossible due to uncontrollable circumstances, talk to me in advance.
2. Be responsible for make-up work when you are absent for any reason.
3. Be in the classroom when the tardy bell rings or have an excuse from the office.
4. Bring necessary materials to class every day. If you have to return to your locker for materials, you will be counted tardy for class. You will need your textbook, assignments, scientific calculator, notebook, loose leaf paper for assignments, #2 pencils (your work must be dark enough to fax, if necessary).
5. You are ultimately responsible for your own learning. Be certain to give your class work your best effort and attention.

### Make-up Work:

1. You will have two days for each day you miss to get make-up work in. I will try to remind you, but it is primarily your responsibility to make up missed work.
2. Any work missed because of unexcused absences cannot be made up.

Grading Scale: Grades will be based on a combination of homework assignments, labs, quizzes, outside reading, and unit tests. The following scale will be used:

A	95-100	C+	77-79
A-	90-94	C	73-76
B+	87-89	C-	70-72
B	83-86	D+	67-69
B-	80-82	D	63-66
		D-	60-62
		F	0-59

## Physics Objectives

The student will be able to:

1. Define and give examples of matter and energy
2. Exhibit an understanding of scientific method through explanation and laboratory demonstration
3. Measure length, time, mass, and weight
4. Calculate density
5. Express quantities in proper units and work with them mathematically
6. Identify mass and weight as properties of all matter and explain the difference
7. Identify vector and scalar quantities
8. Represent forces and motion by vectors
9. Calculate resultants and components of vectors
10. Solve straight line and 2-dimensional motion problems, including projectile problems
11. Solve problems using Newton's 3 laws of motion
12. Solve circular motion problems
13. Solve statics problems
14. Explain Einstein's Theory of Relativity and solve related problems
15. Apply the Law of Gravitation in explaining the motion of planets, satellites and falling bodies
16. Define and calculate work and power
17. Solve problems using the Law of Conservation of Momentum
18. Solve problems using the Law of Conservation of Angular Momentum
19. Identify various forms of energy
20. Solve problems using the Law of Conservation of Energy
21. Explain the difference between temperature and heat and how to measure each
22. Solve problems using the conservation of heat energy
23. Explain the 2 laws of thermodynamics and identify applications of each
24. Explain heat's effect on molecular motion
25. Describe the nature of molecular motion in different states of matter and identify the particles of matter
26. Explain the behavior of gases and solve problems using The General Gas Laws
27. Define and explain the nature of wave motion
28. Identify and explain phenomena characteristic of wave motion
29. Solve problems concerning The Doppler Effect
30. Identify light as a form of energy and explain its properties and behavior
31. Apply wave theory to reflection and refraction
32. Explain how mirrors and lenses form images and how they are used in other optical instruments
33. Explain the existence of static electricity

34. Explain how bodies acquire electric charges and how to detect and identify charges
35. Explain conduction and solve problems using the conservation of electric charge
36. Apply Coulomb's Law and electric fields to problem solving
37. Solve electric circuit problems using Ohm's and Kirchoff's laws
38. Explain the differences between parallel and series circuits and solve problems concerning each
39. Explain the properties of magnets and magnetic fields
40. Explain the theory of magnetism
41. Identify applications of magnetic forces
42. Explain electromagnetic induction
43. Identify properties and applications of electromagnetic waves
44. Explain the quantum theory of light and matter and solve application problems
45. Explain various atom models
46. Identify various radioactive rays and particles and explain radioactive decay
47. Define fission and fusion reactions and give examples of each
48. Identify various nuclear instruments and explain their underlying principles