Physical Science
2008-2009 Academic Year
Mr. Carriuolo

COURSE INFORMATION

This is, technically speaking, a course in physical science, but it is really more like a course that will cover many of the topics that make up the science known as physics. This course will prepare you to enter a course in chemistry next year by addressing some interdisciplinary topics between the two, especially as we approach the end of the course. In this course, we will study the following topics, in the order in which they appear below:

--An Introduction to Science
--Motion
--Forces
--Work and Energy
--Heat and Temperature
--Waves
--Sound and Light
--Electricity
--Lab Techniques
--Quantum Mechanics
--Atoms
--Nuclei
--The Periodic Table
--States of Matter

Our textbook for this course will be *Holt Physical Science*. While this book generally addresses the topics of this course well, we will sometimes skip topics in the book and will also sometimes address topics not explicitly covered in the book. Please see the end of this syllabus for a rough overview of what the above topics will entail in this course. In addition, the book does not offer a particularly large collection of homework questions, so I will often be writing homework questions for this course myself.

In physics, there are two primary types of things that we study: concepts and problem solving. Concepts are scientific ideas that we can easily discuss in words; they are useful in understanding what is happening in a given situation. Problem solving is about using math to find numerical answers to specific questions. Both are very important in physics. Unlike in the CONCEPTUAL physics class taken in the 8th Grade here at Linden Hall, here we will cover the above topics using some math (arithmetic and algebra). One of the goals of this course will be to help you learn how to solve problems. Another goal of this course, emphasized in the middle of the year, will be to help you learn lab techniques. For example, if you need to test a hypothesis, then how do you design an experiment to test it? What materials will you need? How will you use data analysis to

prove your hypothesis right or wrong? Both problem solving and lab techniques are essential skills for any future scientist to have.

You will have homework each night. I WILL NOT ACCEPT LATE HOMEWORK. Homework assignments will considerably affect your effort grade, but they will not influence your achievement grade.

We will perform several lab experiments in this course. Sometimes you will need to write a lab report. We will go over in class how these reports should be written. Lab reports will always be due after a weekend and will be returned to you after the following weekend. This way, you will have the time to write good reports, and I will have time to correct them thoughtfully.

Finally, there will be a test at the end of each unit. I try very hard to make my tests fair. If you know your stuff well, then you will probably do well; if you do not know your stuff well, then you will probably not do well.

Academic Honesty: It is your responsibility to do your own work. You may NOT work together with other students on anything that you hand in for this course (during class or outside of class) except for the lab reports, where you may work together, but you must still hand in your own lab report in the end. Copying another student's work is a serious offense and will result in an Honor Code violation. You may, however, study together in preparation for tests.

Grade Breakdown: The following is the grade breakdown for the Fall Trimester:

Tests: 45%
Lab Reports: 30%
Final Exam: 25%

Grade breakdowns for later trimesters will be announced at the beginning of each semester.

Finally, please feel free at any time to see me for extra help. I am free during B, C, and X Blocks, and I will usually be available all five school days each week during the afternoon academic help period. You might also be able to catch me at breakfast for a quick question or two. If you can't find me in person, then feel free to send me an email at mcarriuolo@lindenhall.org. (Be careful to check your spelling. . . .) If you'd like to have a conversation rather than interacting over email, then you may call my cell phone number, (401) 338-0572. Please do not call me after 10:00 P.M. (it's a general rule of politeness) or before 7:00 A.M.

Week	Topics	Chapters in *Holt Physical Science* Text
August 26-29	Introduction, About Science, SI Units	1.1, 1.2
September 2-5	More Units, Basic Data Analysis	1.2, 1.3
September 8-12	Basic Data Analysis, Test	1.3
September 15-19	Measuring Motion, Acceleration	11.1, 11.2
September 22-26	Acceleration, Motion and Force	11.2, 11.3
September 29 - October 3	Test, Newton's Laws of Motion	12.1, 12.3
October 6-10	Gravity, Momentum	12.2, 12.3
October 13-17	Test, Work, Power	13.1
October 20-24	Pulleys, Energy	13.2, 13.3
October 27-31	Conservation of Energy, Efficiency	13.4
November 3-7	Modern Sources of Energy, Test, Review	
November 10-14	Review, Exams	
November 17-21	Temperature, Heat	14.1, 14.2
December 1-5	Heat Transfer, Laws of Thermodynamics	14.2, 14.3
December 8-12	Heat Engines, Test, Waves	14.3, 15.1
December 15-19	Waves, Sound	15.2, 15.3, 16.1
January 6-9	Light, Reflection	16.2, 16.3
January 12-16	Light, Refraction, Optics, Test	16.4
January 19-23	Electricity, Quiz	17.1, 17.2

Week	Topics	Chapters in *Holt Physical Science* Text
January 26-30	Lab Techniques	
February 2-6	Lab Techniques	
February 9-13	Lab Techniques	
February 16-20	Quantum Mechanics	
February 23-27	Atomic Models	4.1, 4.3
March 2-6	Test, Nuclear Structure, Radioactivity	4.2, 10.1
March 9-13	Radioactivity, Fission, Fusion	10.1, 10.2
March 16-18	Test	
March 30 - April 3	Periodic Table, Quantum Numbers	5.1
April 6-9	Orbitals, Electron Configurations	5.2
April 14-17	Review for Test, Test, Solids	
April 20-24	Solids, Liquids	3.3
April 27 - May 1	Liquids, Gases	3.3, 3.4, 3.1
May 4-8	Changes of State, Test	3.2
May 11-15	Review for Final Exam	

Rough Topical Outline

I. An Introduction to Science
- A. Scientific Method (Theories, Laws, etc.)
- B. SI Units
  1. Relative Size/Scale
  2. Unit Conversions/Conversion Factors
- C. Data Analysis
  1. Taking Measurements
  2. Graphing Data

- 3. Scientific Notation
- 4. Significant Figures

II. Motion
- A. Displacement v. Distance
- B. Velocity v. Speed
- C. Acceleration

III. Forces
- A. Newton's First Law of Motion: Inertia
- B. Newton's Second Law of Motion: Force, Mass, and Acceleration
- C. Newton's Third Law of Motion
- D. Gravitational Force and Acceleration
- E. Friction
- F. Momentum and Its Conservation

IV. Work and Energy
- A. Work
- B. Power
- C. Machines and Their Efficiency
- D. Energy
  - 1. Kinetic Energy
  - 2. Gravitational Potential Energy
    - a. Frictionless Inclined Planes
    - b. Roller Coasters
- E. Sources of Energy
  - 1. Fossil Fuels
  - 2. Nuclear
  - 3. Geothermal
  - 4. Hydroelectric
  - 5. Wind
  - 6. Solar

V. Heat and Temperature
- A. Connection Between Temperature and Kinetic Energy
- B. Temperature Conversions
- C. Specific Heat
- D. Heat Transfer
  - 1. Conduction
  - 2. Convection
  - 3. Radiation
- E. The Laws of Thermodynamics
- F. Entropy
- G. Heat Engines and Refrigerators

VI. Waves
- A. Oscillation/Vibration
- B. Types of Waves
- C. Wave Properties
  - 1. Period and Frequency
  - 2. Wavelength

- 3. Wave Speed
- 4. Amplitude
- D. Interference
- E. Standing Waves

VII. Sound and Light
- A. Pitch
- B. Loudness
- C. Musical Instruments
- D. Electromagnetic Spectrum
- E. Optics
  - 1. Reflection
  - 2. Refraction
  - 3. Diffraction
  - 4. Optical Instruments
    - a. Mirrors
    - b. Lenses
    - c. Prisms

VIII. Electricity
- A. Electric Charge
- B. Static Cling/Induction
- C. Electric Force
- D. Electric Potential and Electric Potential Energy

IX. Lab Techniques
- A. Designing an Experiment to Test an Idea
  - 1. Purpose
  - 2. Materials
  - 3. Procedure
  - 4. Data Collection and Analysis
  - 5. Conclusion
- B. Error Analysis
  - 1. Accuracy v. Precision
  - 2. Standard Deviation and Variance
  - 3. Combining Uncertainties
  - 4. Error Bars
- C. Independent Lab Project

X. Quantum Mechanics
- A. Quanta
- B. Wave-Particle Duality
  - 1. Photons and the Photoelectric Effect
  - 2. de Broglie Wavelengths of Electrons
- C. Heisenberg Uncertainty Principle
- D. Principle of Correspondence

XI. Atoms
- A. Models of the Atom
  - 1. Dalton’s Model
  - 2. Thomson’s Model

        3. Rutherford's Model
        4. Bohr's Model
        5. Schrodinger's Model
    B. Electron Transitions and Light Emission
    C. Fluorescence
XII. Nuclei
    A. Nuclear Composition
    B. Isotopes
    C. Radioactive Decay (Alpha, Beta, Gamma)
    D. Nuclear Stability
    E. Nuclear Fission
    F. Nuclear Fusion
    G. Energy-Mass Equivalence
XIII. The Periodic Table
    A. Periodicity
    B. Quantum Numbers (Principal, Angular, Magnetic, Spin)
    C. Pauli Exclusion Principle
        1. Fermions
        2. Bosons
    D. Orbital Notation
    E. Electron Configurations
XIV. States of Matter
    A. Solids
        1. Crystalline Structure
        2. Density
        3. Hooke's Law
    B. Liquids
        1. Pressure
        2. Buoyancy
        3. Pascal's Principle
        4. Bernoulli's Principle
    C. Gases
        1. Kinetic Molecular Theory
        2. Gas Laws (Boyle's, Charles's, Gay-Lussac's)
    D. Changes of State