

Meridian Technical Charter High School
3800 North Locust Grove
Meridian, Idaho 83646

School Year 2008-2009

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Course Title: Conceptual Physics Semesters I & II

Course Description: Conceptual Physics is a first year high school physics course which focuses upon the conceptual and the mathematical nature of physics. The course covers the general principles and concepts of physics and allows practice in laboratory procedures. Areas are covered in depth with a problem solving approach for all career pathways, including graphic arts, networking, programming, electronics technology and pre-engineering. The course hits on the classical physics topics such as mechanics, properties of matter, heat, sound and light, electricity and magnetism, and nuclear physics. Physics is the most basic and exciting of all sciences in that it deals with the principles that tell us how and why our world works. It will provide excellent training and preparation for music, art, humanities, and career students at the vocational and university level, who want a deeper understanding of their subjects.

Semester I topics include:

Unit I: The Physics of Everyday Things (Review) Chapter 1 “About Science “

- A. Introduction to Physics
- B. Scientific Method
- C. Mathematics Assessment
 - 1. Scientific Notation
 - 2. Metric Units
- D. Recording Measurements
- E. Dimensional Analysis
 - 1. Unit Conversions
 - a. Metric
 - b. Standard
 - 2. Analyzing Data
- F. Lab Notebook Format

Unit II: Properties of Matter

- A. Atoms
- B. Elements
- C. Molecules
- D. Compounds
- E. Ions
- F. Atomic Nucleus
 - 1. Protons
 - 2. Neutrons
- G. Orbits
 - 1. Energy Levels
 - 2. Outer Electrons
 - 3. Charged Ions

Chapter 17 “The Atomic Nature of Matter”

Unit I: Mechanics

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|-------------------------------------|--|
| A. Understand Motion | Chapter 2 “Linear Motion” |
| B. Vectors and Scalar Quantities | Chapter 3 “Projectile Motion” |
| C. Distance and Displacement | Chapter 4 “Newton’s 1 st Law” |
| D. Speed and Velocity | Inertia |
| E. Acceleration | Chapter 5 “Newton’s 2 nd Law” |
| F. Newton’s Laws of Motion | $F=MA$ |
| G. Newton’s Law of Gravity | Chapter 6 “Newton’s 3 rd Law” |
| H. Pendulum | Action/Reaction |
| I. Momentum | Chapter 7 “Momentum” |
| 1. Impulse | |
| 2. Collisions | |
| 3. Laws of Conservation of momentum | |
| J. Universal Gravitation | Chapter 12 “Universal Gravitation” |

Unit IV: Sound and Light

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|--------------------------|--------------------|
| A. Concepts of Light | Chapter 27 “Light” |
| B. Electromagnetic Waves | |
| C. Speed | |
| D. Materials | |
| 1. Opaque | |
| 2. Transparent | |
| E. Shadows | |
| F. Polarization | |
| G. Color Spectrum | Chapter 28 “Color” |
| H. Color | |
| 1. Reflection | |
| 2. Transmission | |
| 3. Addition | |
| 4. Subtraction | |
| 5. Mixing | |
| I. Sunlight | |
| J. Complementary Colors | |
| K. Colored Pigments | |
| L. Atomic Spectra | |
| M. Origin of Sound | |
| N. Sound | Chapter 26 “Sound” |
| 1. Media | |
| 2. Air | |
| 3. Speed | |
| 4. Loudness | |
| O. Forced Vibrations | |
| P. Natural Frequency | |
| 1. Resonance | |
| 2. Interference | |

Unit V: Electricity and Magnetism

- A. Electrostatics Chapter 32 “Electrostatics”
 - 1. Coulomb’s Law
 - 2. Gauss’s Law
- B. Current and Potential Difference
 - 1. Current
 - 2. Electrical Potential Difference
 - 3. Ohm’s Law
 - 4. Electromagnetic Induction
- C. Electric Circuits Chapter 34 “Electric Current”
 - 1. Series
 - 2. Parallel
 - 3. Kirchhoff’s Laws
- D. Electric Power and Energy
- E. Magnetic Fields Chapter 35 “Electric Circuits”
 - 1. Electromagnetism
 - a. Faraday’s Law
 - b. Lenz’s Law
 - c. Maxwell’s Equations
 - 2. AC Current

Semester I Planned Chapter Sequence: Chapters 1 and 17: Chapter 32: Chapter 2:
Chapter 3: Chapter 34: Chapters 4, 5, and 6: Chapter 12: Chapter 35: Chapter 27: Chapter 28:
Chapter 26: Chapter 7:

End 1st Semester

Semester II topics include:

Unit I: Mechanics

- A. Work Chapter 8 “Energy”
- B. Power
- C. Kinetic Energy
- D. Gravitational Potential Energy
- E. Circular Motion and Rotation Chapter 9 “Circular Motion”
 - 1. Torque
 - 2. Rotational Kinematics Chapter 11 “Rotational Mechanics”
 - 3. Angular Momentum

Unit II: Properties of Matter

- A. Atmosphere
- B. Atmospheric Pressure
- C. Barometers
 - 1. Simple
 - 2. Aneroid
- D. Boyle's Law
- E. Archimedes' Principle
- F. Bernoulli's Principle
- G. Charles Law
- H. Universal Gas Law

Chapter 20 "Gases"

Unit III: Heat

- A. Thermodynamics
 - 1. 1st Law
 - 2. 2nd Law
- B. Absolute Zero
- C. Temperature

Chapter 24 "Thermodynamics"

Unit IV: Sound and Light

- A. Waves
 - 1. Motion
 - 2. Speed
 - 3. Transverse
 - 4. Longitudinal
 - 5. Standing
 - 6. Bow
 - 7. Shock
- B. Doppler Effect
- C. Vibration of a Pendulum

Chapter 25 "Vibrations and Light"

Unit V: Electricity and Magnetism

- A. Electron Devices
 - 1. P Material
 - 2. N Material
 - 3. Transistors
 - 4. Diodes
- B. Integrated Circuits
- C. Microchips
- D. Magnetic Fields
 - 1. Electromagnetism
 - a. Faraday's Law
 - b. Lenz's Law
 - c. Maxwell's Equations
 - 2. Electrostatics
 - a. Coulomb's Law
 - b. Gauss's Law
- E. Motors and Generators

Chapter 29 "Solid State Electronics"*

Chapter 12 "Digital Electronics"#

Chapter 36 "Magnetism"

Chapter 37 "Electromagnetic Induction"

Unit VI: Atomic and Nuclear Physics

- A. Atomic Physics and Quantum Effects Chapter 39 “The Atomic Nucleus and Radioactivity”
 - 1. Photons and Photoelectric Effect
 - 2. Atomic Energy Levels Chapter 40 “Nuclear Fission and Fusion”
 - 3. Wave Particle Duality
- B. Nuclear Physics
 - 1. Nuclear Reactions (Including Conservation of Mass Number and Change)
 - a. Nuclear Fission
 - b. Nuclear Fusion
 - 2. Mass-Energy Equivalence

Semester II Planned Chapter Sequence: Chapter 8: Solid State Electronics: Chapter 39: Chapter 40: Chapter 36: Chapter 37: Chapter 20: Chapter 24: Chapter 9: Chapter 11: Chapter 25:

End of 2nd Semester

Course Focus

Physics and mathematics compliment each other but are each unique in their own right. Mathematics is primarily a left brain activity which focuses on the mechanics of solving equations. Physics uses the left brain activity of mathematics but adds the right brain activities of being able to visualize problems and think creatively in general concepts.

This course presents, State of Idaho, approved comprehensive curriculum, aligned with State Standards. Course focuses of Conceptual Physics are several-fold.

- Inspire students to appreciate the beauty of the behavior of nature.
- Improve students’ mathematical, analytical, and problem-solving skills.
- Improve students’ science laboratory skills.
- Prepare students to excel on standardized exams.
- Prepare students to be successful in their studies at the vocational or university level.

Conceptual Physics is a competency and project based course. There is no extra credit offered. A cumulative final competency exam will be given at the end of each semester.

Text

Physics – Conceptual Physics...Third Edition.....Scott Foresman - Addison Wesley....Paul G Hewitt...Text...ISBN 0-201-33288-4

Additional References

Physics – Principles and Problems...Third Edition...Glencoe/McGraw-Hill
Paul Zitzewitz...Text...ISBN 0-02-825473-2 *

Electronics-Practical Electronics for Inventors...Second Edition...McGraw-Hill
Paul Scherz...Text...ISBN 0-07-058078-2 #

Textbook Internet:

<http://www.cpsurf.com>

<http://www.physics.nist.gov>

<http://www.webelements.com>

Student Contributions

Each student should spend at least 5 hours per week preparing for class and laboratory exercises. A course syllabus is provided. All students are expected to successfully complete course projects, which include Principles of Technology, a Skills USA competition, [Mandatory for all Juniors] and TEAMS, Tests of Engineering Skills Mathematics and Science, [Mandatory for all Junior Honors Physics] both in the 2nd semester. Students generally work independently, but are encouraged to work together during problem-solving, hands-on projects, and laboratory investigation sessions. Academic Honesty is paramount. Students will be required to furnish any one of a variety of scientific calculators for both classroom and laboratory calculations.

Course Evaluation

Course grades: 92.5% - 100% A; 82.5% - 92.4% B; 73.5% - 82.4% C; below 73.4% WP; if a student does not pass the course competencies exam, (two tries); a maximum grade for the course is 50% F.

Course Schedule

The class meets Monday through Friday for 74 minutes/day. (6.2 hours/week)