

Physics offers a curriculum that emphasizes students' understanding of fundamental physics concepts while helping them acquire tools to be conversant in a society highly influenced by science and technology.

The course provides students with opportunities to learn and practice critical scientific skills within the context of relevant scientific questions. Topics include the nature of science, math for physics, energy, kinematics, force and motion, momentum, gravitation, chemistry for physics, thermodynamics, electricity, magnetism, waves, nuclear physics, quantum physics, and cosmology.

Scientific inquiry skills are embedded in the direct instruction, wherein students learn to ask scientific questions, form and test hypotheses, and use logic and evidence to draw conclusions about the concepts. Lab activities reinforce critical thinking, writing, and communication skills and help students develop a deeper understanding of the nature of science.

Throughout this course, students are given opportunities to understand how physics concepts are applied in technology and engineering. Practice activities provide additional opportunities for students to apply learned concepts and practice their writing skills. Exploration activities challenge Honors students to deconstruct scientific claims, analyze scientific articles, and suggest follow-up experiments or topics for further research. Finally, Project activities allow Honors students to use scientific process skills to delve deeper into topics.

This course is built to state standards, the American Association for the Advancement of Science (AAAS) Project 2061 benchmarks, and the National Science Education Standards (NSES).

Length: Two semesters

## UNIT 1: INTRODUCTION TO PHYSICS

### LESSON 1: THE PROCESS OF SCIENCE

#### Study: The Nature of Physics

Learn what is and is not science; what the study of physics is; tools used by scientists; and the role of science in society.

Duration: 0 hrs 45 mins Scoring: 0 points

#### Quiz: The Nature of Physics

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

#### Study: Scientific Methods

Learn about designing and performing experiments and collecting data.

Duration: 0 hrs 45 mins Scoring: 0 points

#### Quiz: Scientific Methods

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

#### Explore: Reliable Internet Sources

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

### LESSON 2: MATH IN PHYSICS

#### Study: Algebra in Physics

Review basic algebra skills.

Duration: 0 hrs 45 mins Scoring: 0 points

#### Quiz: Algebra in Physics

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

### **Study: Units and Measurement**

Review the usefulness of using units in scientific measurement; learn about significant figures and measurement error; learn about SI units; convert between units.

Duration: 0 hrs 45 mins Scoring: 0 points

### **Quiz: Units and Measurement**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

### **Study: Graphing**

Learn about different types of graphs and their suitability for sets of data; learn how to graph data as well as interpolate and extrapolate data based on a graph.

Duration: 0 hrs 45 mins Scoring: 0 points

### **Quiz: Graphing**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

### **Explore: Reading Graphs in Scientific Literature**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

## **LESSON 3: MATH FOR MOTION**

### **Study: Introduction to Vectors**

Learn the difference between scalar and vector quantities and how to use vectors appropriately.

Duration: 0 hrs 45 mins Scoring: 0 points

### **Quiz: Introduction to Vectors**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

### **Study: Vector Operations**

Learn how to add vector quantities by resolving into their components.

Duration: 0 hrs 45 mins Scoring: 0 points

### **Quiz: Vector Operations**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

### **Study: Trigonometry**

Learn how trigonometry is applied to physics problems involving angles.

Duration: 0 hrs 45 mins Scoring: 0 points

### **Quiz: Trigonometry**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

## **LESSON 4: DOING SCIENCE: INTRODUCTION TO PHYSICS**

### **Project: Semester 1 Honors Physics Project, Part 1**

Students choose their project.

Duration: 0 hrs 30 mins Scoring: 20 points

### **Study: Physics and the World**

Learn about the process of scientific inquiry.

Duration: 0 hrs 40 mins Scoring: 0 points

**Quiz: Physics and the World**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Lab: Measuring and Estimating**

Use scientific methods and skills to perform a lab experiment.

Duration: 1 hr 30 mins Scoring: 50 points

**Discuss: Measuring and Estimating Lab**

Discuss the results of your lab.

Duration: 0 hrs 20 mins Scoring: 15 points

**LESSON 5: INTRODUCTION TO PHYSICS WRAP-UP****Practice: Introduction to Physics**

Practice problem-solving skills related to concepts in the lesson.

Duration: 1 hr 15 mins Scoring: 40 points

**Review: Unit Review**

Prepare for the unit test by reviewing key concepts and skills.

Duration: 0 hrs 30 mins Scoring: 0 points

**Test (CS): Computer-Scored Unit Test**

Take a computer-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

**Test (TS): Teacher-Scored Unit Test**

Take a teacher-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

**UNIT 2: ENERGY****LESSON 1: ENERGY AND FORCES****Study: Types of Energy**

Learn about different types of energy and examples of each type.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Types of Energy**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: Forces**

Learn about the four fundamental forces and how the strengths of the different forces vary with distance.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Forces**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Explore: Forces Within the Nucleus**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

**LESSON 2: CONSERVATION OF ENERGY****Study: Calculating Energy**

Learn how to calculate the kinetic energy of a moving object and the potential energy of a system; learn how temperature is related to the kinetic energy of molecules.

Duration: 0 hrs 45 mins Scoring: 0 points

### **Quiz: Calculating Energy**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

### **Study: Conservation of Energy**

Learn how energy transforms and is conserved in simple and complex systems; learn how to perform calculations that illustrate the law of conservation of energy.

Duration: 0 hrs 45 mins Scoring: 0 points

### **Quiz: Conservation of Energy**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

## **LESSON 3: USEFUL ENERGY**

### **Study: Work and Power**

Learn how to differentiate between energy and work and between work and power; learn how to calculate work done and power produced in simple systems.

Duration: 0 hrs 45 mins Scoring: 0 points

### **Quiz: Work and Power**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

### **Study: Machines and Efficiency**

Learn about different types of simple machines and their mechanical advantages; learn how to calculate work done by simple machines.

Duration: 0 hrs 45 mins Scoring: 0 points

### **Quiz: Machines and Efficiency**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

### **Study: Energy and Sustainability**

Learn about the advantages and disadvantages of different energy sources; learn how to apply scientific reasoning to analyze socially relevant energy issues.

Duration: 0 hrs 45 mins Scoring: 0 points

### **Quiz: Energy and Sustainability**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

### **Explore: The Dream of Perpetual Motion**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

## **LESSON 4: DOING SCIENCE: ENERGY**

### **Project: Semester 1 Honors Physics Project, Part 2**

Students submit research for their project.

Duration: 0 hrs 30 mins Scoring: 20 points

### **Study: Physics Experiments**

Learn about the process of scientific inquiry.

Duration: 0 hrs 40 mins Scoring: 0 points

### **Quiz: Physics Experiments**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Lab: Conservation of Energy**

Use scientific methods and skills to perform a lab experiment.

Duration: 1 hr 30 mins Scoring: 50 points

**Discuss: Conservation of Energy Lab**

Discuss the results of your lab.

Duration: 0 hrs 20 mins Scoring: 15 points

**LESSON 5: ENERGY WRAP-UP****Practice: Energy**

Practice problem-solving skills related to concepts in the lesson.

Duration: 1 hr 15 mins Scoring: 40 points

**Review: Unit Review**

Prepare for the unit test by reviewing key concepts and skills.

Duration: 0 hrs 30 mins Scoring: 0 points

**Test (CS): Computer-Scored Unit Test**

Take a computer-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

**Test (TS): Teacher-Scored Unit Test**

Take a teacher-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

**UNIT 3: KINEMATICS****LESSON 1: DISPLACEMENT, VELOCITY, AND ACCELERATION****Study: Displacement and Velocity**

Learn how to solve problems involving distance; speed; time; and velocity; learn how to draw and interpret a position-time graph.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Displacement and Velocity**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: Acceleration**

Learn how to solve problems involving acceleration; learn how acceleration relates to velocity; to displacement; and to time.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Acceleration**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: Free Fall**

Learn how to solve problems involving the force of gravity acting on an object.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Free Fall**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Explore: Measuring Gravity**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

**LESSON 2: NONLINEAR MOTION**

**Study: Projectile Motion**

Learn how to solve problems involving two-dimensional trajectories.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Projectile Motion**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: Circular Motion**

Learn how to solve problems involving circular motion.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Circular Motion**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: Relative Motion**

Learn about frames of reference; learn how to solve motion problems using a variety of frames of reference.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Relative Motion**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Explore: Punkin Chunkin**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

**LESSON 3: DOING SCIENCE: KINEMATICS****Project: Semester 1 Honors Physics Project, Part 3**

Students submit a plan for their project.

Duration: 1 hr 40 mins Scoring: 20 points

**Study: Organizing and Analyzing Experimental Results**

Learn about the process of scientific inquiry.

Duration: 0 hrs 40 mins Scoring: 0 points

**Quiz: Organizing and Analyzing Experimental Results**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Lab: Kinematics**

Use scientific methods and skills to perform a lab experiment.

Duration: 1 hr 30 mins Scoring: 50 points

**Discuss: Kinematics Lab**

Discuss the results of your lab.

Duration: 0 hrs 20 mins Scoring: 15 points

**LESSON 4: KINEMATICS WRAP-UP****Practice: Kinematics**

Practice problem-solving skills related to concepts in the lesson.

Duration: 1 hr 15 mins Scoring: 40 points

**Review: Unit Review**

Prepare for the unit test by reviewing key concepts and skills.

Duration: 0 hrs 30 mins Scoring: 0 points

**Test (CS): Computer-Scored Unit Test**

Take a computer-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

**Test (TS): Teacher-Scored Unit Test**

Take a teacher-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

## UNIT 4: DYNAMICS

### LESSON 1: FORCE AND MOTION

**Study: Newton's Laws**

Learn how Newton's laws can be applied to everyday situations.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Newton's Laws**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: Force Problems**

Learn how to construct and interpret free-body diagrams for situations involving both balanced and unbalanced forces.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Force Problems**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Explore: Voyager Space Probes**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

### LESSON 2: CALCULATIONS WITH FORCES

**Study: Free-Body Diagrams**

Learn how to solve problems using Newton's second law and how to do calculations involving force and work.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Free-Body Diagrams**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: Multiple Forces**

Learn how to determine the change of motion of an object acted on by multiple forces; how to solve two-dimensional problems involving balanced forces; and how to calculate the net force on an object.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Multiple Forces**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: Friction**

Learn how to differentiate between static and kinetic friction and how to solve problems involving frictional forces.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Friction**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Explore: Driving Safety and Friction Coefficients**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

### LESSON 3: DOING SCIENCE: DYNAMICS

#### **Project: Semester 1 Honors Physics Project, Part 4**

Students submit their completed project.

Duration: 0 hrs 45 mins Scoring: 140 points

#### **Study: Errors in Experiments**

Learn about the process of scientific inquiry.

Duration: 0 hrs 40 mins Scoring: 0 points

#### **Quiz: Errors in Experiments**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

#### **Lab: Force of Friction**

Use scientific methods and skills to perform a lab experiment.

Duration: 1 hr 30 mins Scoring: 50 points

#### **Discuss: Force of Friction Lab**

Discuss the results of your lab.

Duration: 0 hrs 20 mins Scoring: 15 points

### LESSON 4: DYNAMICS WRAP-UP

#### **Practice: Dynamics**

Practice problem-solving skills related to concepts in the lesson.

Duration: 1 hr 15 mins Scoring: 40 points

#### **Review: Unit Review**

Prepare for the unit test by reviewing key concepts and skills.

Duration: 0 hrs 30 mins Scoring: 0 points

#### **Test (CS): Computer-Scored Unit Test**

Take a computer-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

#### **Test (TS): Teacher-Scored Unit Test**

Take a teacher-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

## UNIT 5: MOMENTUM AND GRAVITATION

### LESSON 1: MOMENTUM

#### **Study: Momentum**

Learn how to differentiate between force and energy and between energy and momentum; learn how to calculate the momentum of a mechanical system.

Duration: 0 hrs 45 mins Scoring: 0 points

#### **Quiz: Momentum**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

#### **Study: Conservation of Momentum**

Learn how to solve problems involving conservation of momentum and elastic/inelastic collision situations.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Conservation of Momentum**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Explore: Breaking Boards**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

**LESSON 2: HARMONIC MOTION****Study: Harmonic Motion**

Learn how to apply the law of conservation of energy to situations involving harmonic motion and how to perform calculations involving Hooke's law.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Harmonic Motion**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Explore: Clocks: Pendulum and Atomic**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

**LESSON 3: PLANETARY PHYSICS****Study: Orbits**

Learn how to describe the motion of satellites and planets and how to solve problems involving the gravitational force between two objects.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Orbits**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Explore: Satellite Motion**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

**LESSON 4: DOING SCIENCE: MOMENTUM AND GRAVITATION****Study: Evaluating Scientific Conclusions**

Learn about the process of scientific inquiry.

Duration: 0 hrs 40 mins Scoring: 0 points

**Quiz: The Scientific Community**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Lab: Simple Harmonic Motion**

Use scientific methods and skills to perform a lab experiment.

Duration: 1 hr 30 mins Scoring: 50 points

**Discuss: Simple Harmonic Motion Lab**

Discuss the results of your lab.

Duration: 0 hrs 20 mins Scoring: 15 points

**LESSON 5: MOMENTUM AND GRAVITATION WRAP-UP****Practice: Momentum and Gravitation**

Practice problem-solving skills related to concepts in the lesson.

Duration: 1 hr 15 mins Scoring: 40 points

### **Review: Unit Review**

Prepare for the unit test by reviewing key concepts and skills.

Duration: 0 hrs 30 mins Scoring: 0 points

### **Test (CS): Computer-Scored Unit Test**

Take a computer-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

### **Test (TS): Teacher-Scored Unit Test**

Take a teacher-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

## **UNIT 6: SEMESTER 1 REVIEW AND EXAM**

### **LESSON 1: SEMESTER 1 REVIEW AND EXAM**

#### **Review: Semester 1**

Prepare for the final exam by reviewing key concepts and skills.

Duration: 1 hr Scoring: 0 points

#### **Exam: Semester 1**

Take a computer-scored exam to demonstrate your mastery of concepts and skills covered in Semester 1.

Duration: 1 hr Scoring: 100 points

#### **Final Exam: Physics Semester 1**

Take a teacher-scored exam to demonstrate your mastery of concepts and skills covered in Physics Semester 2.

Duration: 1 hr Scoring: 100 points

## **UNIT 7: CHEMICAL PHYSICS**

### **LESSON 1: CHEMISTRY FOR PHYSICS**

#### **Study: Atomic Structure and the Periodic Table**

Learn about the structure of an atom; learn how to use the periodic table to find information about atoms; learn about the history of atomic theory.

Duration: 0 hrs 45 mins Scoring: 0 points

#### **Quiz: Atomic Structure and the Periodic Table**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

#### **Study: Chemical Bonds**

Learn how molecules are different from atoms; learn how molecules form; learn how molecules bond to other molecules.

Duration: 0 hrs 45 mins Scoring: 0 points

#### **Quiz: Chemical Bonds**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

#### **Explore: History of Atomic Theory**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

### **LESSON 2: INTRODUCTION TO STATES OF MATTER**

#### **Study: Movement in Matter**

Learn about the various states of matter in terms of kinetic molecular theory; learn why molecules move and how their movements can be measured.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Movement in Matter**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: Fluid Dynamics and Buoyancy**

Learn about and apply Archimedes' and Bernoulli's principles; learn about and apply Pascal's principle; learn about the unique properties of water.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Fluid Dynamics and Buoyancy**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Explore: Blood Flow**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

**LESSON 3: DOING SCIENCE: CHEMICAL PHYSICS****Project: Semester 2 Honors Physics Project, Part 1**

Students choose their project.

Duration: 0 hrs 30 mins Scoring: 20 points

**Study: The People of Science**

Learn about the process of scientific inquiry.

Duration: 0 hrs 40 mins Scoring: 0 points

**Quiz: The People of Science**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Lab: Fluids**

Use scientific methods and skills to perform a lab experiment.

Duration: 1 hr 30 mins Scoring: 50 points

**Discuss: Fluids Lab**

Discuss the results of your lab.

Duration: 0 hrs 20 mins Scoring: 15 points

**LESSON 4: CHEMICAL PHYSICS WRAP-UP****Practice: Chemical Physics**

Practice problem-solving skills related to concepts in the lesson.

Duration: 1 hr 15 mins Scoring: 40 points

**Review: Unit Review**

Prepare for the unit test by reviewing key concepts and skills.

Duration: 0 hrs 30 mins Scoring: 0 points

**Test (CS): Computer-Scored Unit Test**

Take a computer-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

**Test (TS): Teacher-Scored Unit Test**

Take a teacher-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

**UNIT 8: THERMODYNAMICS****LESSON 1: LAWS OF THERMODYNAMICS**

**Study: Potential Energy in Chemical Reactions**

Learn what enthalpy and entropy are; learn the difference between exothermic and endothermic reactions; learn how to draw a potential energy diagram for a chemical reaction.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Potential Energy in Chemical Reactions**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: The First Law of Thermodynamics**

Learn about the first and second laws of thermodynamics and how to apply them; learn about differences between open, closed, and isolated systems.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: First Law of Thermodynamics**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: Second Law of Thermodynamics**

Learn how to compare and contrast different methods of heat flow.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Second Law of Thermodynamics**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Explore: Entropy and Time Travel**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

**LESSON 2: ENERGY CHANGE****Study: Heat Flow**

Learn how work is done in a heat engine and what factors affect its efficiency

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Heat Flow**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: Heating, Cooling, and Phase Changes**

Learn how to solve problems using specific heat capacity and latent heat values; learn how to determine the final temperature when two objects of different temperatures are in contact.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Heating, Cooling, and Phase Changes**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**LESSON 3: DOING SCIENCE: THERMODYNAMICS****Project: Semester 2 Honors Physics Project, Part 2**

Students submit research for their project.

Duration: 0 hrs 30 mins Scoring: 20 points

**Study: Scientific Models**

Learn about the process of scientific inquiry.

Duration: 0 hrs 40 mins Scoring: 0 points

**Quiz: Scientific Models**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Lab: Thermodynamics**

Use scientific methods and skills to perform a lab experiment.

Duration: 1 hr 30 mins Scoring: 50 points

**Discuss: Thermodynamics Lab**

Discuss the results of your lab.

Duration: 0 hrs 20 mins Scoring: 15 points

**LESSON 4: THERMODYNAMICS WRAP-UP****Practice: Thermodynamics**

Practice problem-solving skills related to concepts in the lesson.

Duration: 1 hr 15 mins Scoring: 40 points

**Review: Unit Review**

Prepare for the unit test by reviewing key concepts and skills.

Duration: 0 hrs 30 mins Scoring: 0 points

**Test (CS): Computer-Scored Unit Test**

Take a computer-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

**Test (TS): Teacher-Scored Unit Test**

Take a teacher-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

**UNIT 9: ELECTRICITY AND MAGNETISM****LESSON 1: ELECTRICITY****Study: Electrostatics**

Learn how to determine the force between two electric charges; learn how to calculate an electric field; learn how to use the right-hand rule to determine the direction of an electric force.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Electrostatics**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: Electric Potential and Capacitance**

Learn the difference between an electric field; potential energy; potential difference; and capacitance; learn how to perform calculations on electrical systems using these concepts.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Electrical Potential and Capacitance**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Explore: Nerve Impulse Transmission**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

**LESSON 2: ELECTRICAL CIRCUITS****Study: Current and Resistance**

Learn about relationships between current; voltage; resistance; and power; learn how to solve problems using Ohm's law and

how to calculate energy dissipation in a resistor.

Duration: 0 hrs 45 mins Scoring: 0 points

### **Quiz: Current and Resistance**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

### **Study: Series Circuits**

Learn how to diagram series circuits; learn how to determine the current; resistance; or voltage in a circuit; differentiate between complete; open; and short circuits.

Duration: 0 hrs 45 mins Scoring: 0 points

### **Quiz: Series Circuits**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

### **Study: Parallel and Combined Circuits**

Learn how to diagram parallel and combined circuits; learn how to determine the current; resistance; or voltage in a parallel circuit.

Duration: 0 hrs 45 mins Scoring: 0 points

### **Quiz: Parallel and Combined Circuits**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

## **LESSON 3: MAGNETISM AND ELECTROMAGNETISM**

### **Study: Magnetism**

Learn about properties of magnetic fields.

Duration: 0 hrs 45 mins Scoring: 0 points

### **Quiz: Magnetism**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

### **Study: Electromagnetism**

Learn how magnetic fields can produce electric fields, and vice versa; learn about properties of electromagnetic waves.

Duration: 0 hrs 45 mins Scoring: 0 points

### **Quiz: Electromagnetism**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

### **Explore: Computer Memory**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

## **LESSON 4: DOING SCIENCE: ELECTRICITY AND MAGNETISM**

### **Project: Semester 2 Honors Physics Project, Part 3**

Students submit a plan for their project.

Duration: 1 hr 40 mins Scoring: 20 points

### **Study: Testing Scientific Solutions**

Learn about the process of scientific inquiry.

Duration: 0 hrs 40 mins Scoring: 0 points

### **Quiz: Testing Scientific Solutions**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

### **Lab: Circuit Building**

Use scientific methods and skills to perform a lab experiment.

Duration: 1 hr 30 mins Scoring: 50 points

### **Discuss: Circuit Building**

Discuss the results of your lab.

Duration: 0 hrs 20 mins Scoring: 15 points

## **LESSON 5: ELECTRICITY AND MAGNETISM WRAP-UP**

### **Practice: Electricity and Magnetism**

Practice problem-solving skills related to concepts in the lesson.

Duration: 1 hr 15 mins Scoring: 40 points

### **Review: Unit Review**

Prepare for the unit test by reviewing key concepts and skills.

Duration: 0 hrs 30 mins Scoring: 0 points

### **Test (CS): Computer-Scored Unit Test**

Take a computer-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

### **Test (TS): Teacher-Scored Unit Test**

Take a teacher-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

## **UNIT 10: WAVES**

### **LESSON 1: INTRODUCTION TO WAVE MOTION**

#### **Study: Introduction to Waves**

Learn about different types of waves; about properties of waves; and about how waves move; learn how to solve problems involving wave speed; frequency; and wavelength.

Duration: 0 hrs 45 mins Scoring: 0 points

#### **Quiz: Introduction to Waves**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

#### **Study: Wave Interactions**

Learn about how waves interact with media and with other waves; learn the differences between constructive and destructive interference.

Duration: 0 hrs 45 mins Scoring: 0 points

#### **Quiz: Wave Interactions**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

#### **Explore: Physics of the Ocean**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

### **LESSON 2: SOUND AND LIGHT**

#### **Study: Sound**

Learn about the properties of sound waves; about the Doppler effect with respect to sound waves; and about practical applications of sound waves in technology and engineering.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Sound**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: Light**

Learn about the regions of the electromagnetic spectrum and how electromagnetic waves travel; learn how to solve problems involving electromagnetic wave speed; frequency; and wavelength; learn about engineering applications of electromagnetic waves.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Light**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**LESSON 3: OPTICS****Study: Introduction to Optics**

Learn how to draw and interpret ray diagrams; learn about the process of image formation; learn how light reflects and refracts.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Introduction to Optics**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: Lenses and Mirrors**

Learn how to solve problems using lens and mirror equations.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Lenses and Mirrors**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Explore: Cameras**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

**LESSON 4: DOING SCIENCE: WAVES****Project: Semester 2 Honors Physics Project, Part 4**

Students submit their completed project.

Duration: 0 hrs 45 mins Scoring: 140 points

**Study: Applications of Electromagnetic Radiation**

Learn about the process of scientific inquiry.

Duration: 0 hrs 40 mins Scoring: 0 points

**Quiz: Applications of Electromagnetic Radiation**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Lab: Optics**

Use scientific methods and skills to perform a lab experiment.

Duration: 1 hr 30 mins Scoring: 50 points

**Discuss: Optics Lab**

Discuss the results of your lab.

Duration: 0 hrs 20 mins Scoring: 15 points

**LESSON 5: WAVES WRAP-UP**

**Practice: Waves**

Practice problem-solving skills related to concepts in the lesson.

Duration: 1 hr 15 mins Scoring: 40 points

**Review: Unit Review**

Prepare for the unit test by reviewing key concepts and skills.

Duration: 0 hrs 30 mins Scoring: 0 points

**Test (CS): Computer-Scored Unit Test**

Take a computer-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

**Test (TS): Teacher-Scored Unit Test**

Take a teacher-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

## UNIT 11: MODERN PHYSICS

### LESSON 1: NUCLEAR PHYSICS

**Study: Nuclear Structure**

Learn how competing forces within the nucleus determine its stability; learn how to differentiate between nuclear and chemical reactions; learn how to apply Einstein's mass-energy equivalence formula to nuclear reactions.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Nuclear Structure**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: Radioactivity and Half-Life**

Learn about the processes of radioactive decay and the factors that determine the level of danger from various radiation sources; learn how to solve problems using half-life calculations; learn about useful and peaceful applications for nuclear processes.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Radioactivity and Half-Life**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: Fission and Fusion**

Learn about fission and fusion; learn about common examples of each; learn how forces in the nucleus affect the likelihood of fission or fusion occurring.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Fission and Fusion**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Explore: Radioactive Dating and the Earth**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

### LESSON 2: QUANTUM PHYSICS

**Study: Atomic Physics and Quantization**

Learn about the dual nature of light and key experiments that led to the current understanding of the nature of light; learn about the concept of quantization.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Atomic Physics and Quantization**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Study: Introduction to Relativity**

Learn about the importance of the concept of relativity and the difference between general and special relativity; learn about the connection between Newton's laws and Einstein's special theory of relativity; learn about the difference between quantum and Newtonian mechanics.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Introduction to Relativity**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Explore: Quantum Computing**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

**LESSON 3: COSMOLOGY****Study: Cosmology**

Learn about the development of the big bang theory.

Duration: 0 hrs 45 mins Scoring: 0 points

**Quiz: Cosmology**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Explore: Research in Cosmology: Dark Energy and Dark Matter**

Explore a topic that relates to the concepts in the lesson by applying scientific methods of analysis.

Duration: 0 hrs 30 mins Scoring: 25 points

**LESSON 4: DOING SCIENCE: MODERN PHYSICS****Study: Evaluating Scientific Claims**

Learn about the process of scientific inquiry.

Duration: 0 hrs 40 mins Scoring: 0 points

**Quiz: Evaluating Scientific Claims**

Take a quiz to assess your understanding of the material.

Duration: 0 hrs 20 mins Scoring: 20 points

**Lab: Nuclear Physics**

Use scientific methods and skills to perform a lab experiment.

Duration: 1 hr 30 mins Scoring: 50 points

**Discuss: Nuclear Physics Lab**

Discuss the results of your lab.

Duration: 0 hrs 20 mins Scoring: 15 points

**LESSON 5: MODERN PHYSICS WRAP-UP****Practice: Modern Physics**

Practice problem-solving skills related to concepts in the lesson.

Duration: 1 hr 15 mins Scoring: 40 points

**Review: Unit Review**

Prepare for the unit test by reviewing key concepts and skills.

Duration: 0 hrs 30 mins Scoring: 0 points

**Test (CS): Computer-Scored Unit Test**

Take a computer-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

**Test (TS): Teacher-Scored Unit Test**

Take a teacher-scored test to assess what you have learned in this unit.

Duration: 1 hr Scoring: 50 points

## UNIT 12: SEMESTER 2 REVIEW AND EXAM

### LESSON 1: SEMESTER 2 REVIEW AND EXAM

**Review: Semester 2**

Prepare for the unit test by reviewing key concepts and skills.

Duration: 1 hr Scoring: 0 points

**Exam: Semester 2**

Take a computer-scored exam to demonstrate your mastery of concepts and skills covered in Semester 2.

Duration: 1 hr Scoring: 100 points

**Final Exam: Physics Semester 2**

Take a teacher-scored exam to demonstrate your mastery of concepts and skills covered in Physics Semester 2.

Duration: 1 hr Scoring: 100 points