PHYSICAL SCIENCE: COURSE OVERVIEW

These academic standards establish the core content for Physical Science courses taught in Tennessee high schools.

The major disciplinary core ideas utilized for Physical Science include:

Physical Science (PSCI)
Physical Sciences (PS)
Matter and Its Interactions ● Structure and properties of matter ● Chemical reactions
Motion and Stability: Forces and Interactions ● Forces and motion ● Types of interactions ● Stability and instability in physical systems
Energy ● Definitions of energy ● Conservation of energy and energy transfer
Waves and Their Applications in Technologies for Information Transfer ● Wave properties ● Electromagnetic radiation

Science and engineering practices are embedded in the content standards. These practices are established to meet the specific academic standards. Skills, such as pattern recognition, cause and effect, experimental design, scale and proportion, systems, structure and function, and stability, should be stressed through hands-on learning within the classroom.

Inquiry is the central action within science and engineering. The process of observation, hypothesis testing, and refinement/application of ideas should be continually incorporated within the content of this course and not taught in isolation. Inquiry activities should be appropriate for the students' abilities.

By using these academic standards, curriculum relating to this course should be developed by teachers, schools, and districts. Emphasis should be placed on critical thinking, problem solving and applications, and communication (written and verbal) of student learning. It is recommended that a minimum of 25% of this course be devoted to hands-on learning. Equipment and materials for completion of these investigations should be available for implementation by small student groups.

Although science is a body of content knowledge consisting of theories that explain data, science is also a set of practices that use analysis and argumentation to establish, extend, and refine knowledge. The

science and engineering practices are used as a means to learn science by doing science, thus combining content knowledge with skill. These practices are not intended to be a sequence of steps nor are they intended to be taught as a separate, introductory unit for the course. By combining content knowledge with skill, students discover how scientific knowledge is acquired and applied to solve problems or advance scientific knowledge further. In addition, there are seven crosscutting concepts that are fundamental to the nature of science and thus stretch across all science disciplines. The Physical Science standards have been constructed by explicitly integrating practices and crosscutting concepts, iteratively and in combination, within each core idea to provide students with a well-rounded education in science.

These academic standards should be used for the development of classroom and course-level assessments.

PHYSICAL SCIENCE: ACADEMIC STANDARDS

PSCI.PS1: Matter and Its Interactions

1) Use a model to explain the changes of state for solids, liquids, gases, and plasma using the kinetic molecular theory and heat flow considerations.

2) Carry out an investigation to graphically represent the relationship(s) among pressure, volume, and temperature of a gas.

3) Engage in an argument from evidence to explain physical and chemical changes.

4) Use a model to predict the relative properties of elements on the periodic table.

5) Predict how elements may combine using the patterns of electrons in the outermost energy level.

6) Predict the formulas of binary ionic compounds using the periodic table.

7) Develop, or use, a model to illustrate the claim that atoms and mass are conserved during a chemical reaction (i.e., balancing chemical equations).

8) Develop, or use, a model to classify a substance as acidic, basic, or neutral by using pH tools and appropriate indicators.

PSCI.PS2: Motion and Stability: Forces and Interactions

1) Use mathematics and computational thinking to graphically represent how various factors (e.g., position, time, direction of force) affect one-dimensional kinematics parameters (e.g., distance, displacement, speed, velocity, acceleration).

2) Use mathematics and computational thinking to solve problems involving constant velocity and constant acceleration in one-dimension.

3) Plan and carry out an investigation to gather evidence, and provide a mathematical explanation, about the relationship among force, mass, and acceleration using F=ma.

4) Use mathematical reasoning and computational thinking to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

5) Design, evaluate, and refine a device that minimizes the force on an object during a collision.

6) Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field.

PSCI.PS3: Energy

1) Use mathematical and computational thinking to solve problems regarding the work-energy theorem and power using various forms of energy (e.g., kinetic, gravitational potential, elastic potential).

2) Plan and conduct an investigation to provide evidence that thermal energy will move as heat between objects of two different temperatures, resulting in a more uniform energy distribution among objects.

3) Design, build, and refine a device within design constraints that has a series of simple machines to transfer energy and/or do mechanical work.

4) Plan and carry out an investigation to examine the relationships among kinetic, potential, and total energy within a closed system (i.e., the Law of Conservation of Energy).

5) Design, build, and construct simple series circuits and simple parallel circuits using Ohm's Law.

PSCI.PS4: Waves and Their Applications in Technologies for Information Transfer

1) Construct an explanation to compare and contrast the properties of transverse and longitudinal waves, including examples of each.

2) Obtain, evaluate, and communicate information to describe the similarities and differences across the electromagnetic spectrum, including devices used to measure the characteristics of the electromagnetic spectrum.