



Power Standards for Science **Grade 12**

Physics

Laws of Motion - Describe, Represent and Apply Laws of Motion.

- *1.1 Describe the importance of safety in scientific work and in the physics laboratory.
- *1.2 Visually represent components of motion and force problems.
- *1.3 Demonstrate the ability to calculate speed and velocity, to solve equations involving speed, velocity, distance, and time for an object in motion.
- *1.4 Demonstrate and apply mathematical relationships among position, velocity, acceleration, and time to solve acceleration problems using an organized strategy.

Forces and Motion - Determine and Apply How Forces Affect Motion.

- *2.1 Define and manipulate the inertia formula to solve for weight, mass, or gravity.
- *2.2 Define and manipulate the force formula to solve for force, mass, or acceleration.
- *2.3 Define and provide an example of how Newton's 3rd Law applies to their everyday life.

Energy and Movement - Apply Conservation of Energy and Momentum To the Movement of Objects.

- *3.1 Manipulate the Kinetic energy formula to solve for energy, mass, or velocity.
- *3.2 Changes in gravitational potential energy near Earth can be calculated by using the formula (change in potential energy) $GPE=mgh$.
- *3.3 Define the Law of Conservation of Energy and how it applies to real world applications.
- *3.4 Manipulate the Momentum formula to solve for momentum, mass, or velocity.
- *3.5 State the law of conservation of momentum and recognize the conditions under which momentum is conserved (example when a fire-cracker explodes).
- *3.6 Analyze collisions and explain how the principles of conservation of momentum and energy can be used to solve problems involving elastic and inelastic collisions in one dimension.

Energy and Heat - Illustrate Energy Transformations Using Heat and Thermodynamics.

- *4.1 Describe how Heat is related to the internal energy U of the system and work W done by the system by the first law of thermodynamics.
- *4.2 Explain how a change in energy changes the states of matter.

Waves - Identify and Differentiate Wave Production and Transmission.

- *5.1 Identify how waves transfer energy without transferring matter.
- *5.2 Calculate wavelength, frequency and wave speed using $\lambda=v/f, f=1/T$.
- *5.3 Describe how waves are reflected and refracted at boundaries between media.

Electricity and Magnetism - Describe and Apply Electric and Magnetic Phenomena.

- *6.1 Solve problems and diagram simple circuits involving current potential difference, and resistance using the formula $V=IR$.
- *6.2 Calculate power in any resistive circuit element by using the power formula $P = I^2R$.
- *6.3 Relate electric fields to electric forces and distinguish between them.
- *6.4 Relate electromagnetic induction to the direction of the force on a current-carrying wire in a magnetic field.

Foundations of Physical Sciences-10

Energy Transformations – Examine and Illustrate Transfer of Energy From One Form to Another.

- *1.1 Explain how energy is transferred by conduction, convection and radiation.
- *1.2 Describe the availability, current uses and environmental issues related to the use of fossil and nuclear fuels to produce electricity.
- *1.3 Describe the availability, current uses and environmental issues related to the use of hydrogen fuel cells, wind and solar energy to produce electricity.

Chemical Structures and Properties – Identify and Apply Properties and Structures and Interactions of Matter.

- *2.1 Describe the general structure of the atom, and explain how the properties of the first 20 elements in the Periodic Table are related to their atomic structures.
- *2.2 Describe how atoms combine to form new substances by transferring electrons (ionic bonding) or sharing electrons (covalent bonding).
- *2.3 Explain how the structure of the carbon atom affects the type of bonds it forms in organic and inorganic molecules.
- *2.4 Explain the general formation and structure of carbon-based polymers, including, synthetic polymers, such as polyethylene, and biopolymers, such as carbohydrate..

Scientific Inquiry, Numeric and Literacy – Explore How Scientific Knowledge Is Created And Communicated.

- *3.1 Read, interpret and examine the credibility and validity of scientific claims in different sources of information.
- *3.2 Use appropriate tools and techniques to make observations and gather data.
- *3.3 Assess the reliability of the data that was generated in the investigation.
- *3.4 Use mathematical operations to analyze and interpret data, and present relationships between variables in appropriate forms.
- *3.5 Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.

Science Electives-Grades 11

BIOLOGY

This course will focus on biological concepts. Topics include the scientific method of inquiry, as well as the following: basic biochemistry; the study of cell structure and function; cell physiology; cell reproduction and development; Mendelian genetics; population genetics; ecology; and the classification, structure and function of organisms. The application of scientific concepts to trade experiences reinforces the course curriculum. A variety of laboratories provide the student with opportunities to form hypotheses, design experiments, use technology, analyze data and draw conclusions.

CHEMISTRY

Building on knowledge developed in the previous integrated science courses, students will be introduced to chemistry topics such as: atomic structure, chemical bonding, energy changes, stoichiometry, periodicity, properties of gasses, solutions, acid-base theory, electrochemistry, and organic and biochemistry. Students will investigate the properties, composition and structure of matter and the laws that govern the combination of elements and reaction of substances. The application of scientific concepts to trade experiences reinforces the curriculum. Students will apply their knowledge of chemistry to various problem-solving activities with the use of science-specific technologies and standard laboratory tools.