Oconto Unified School District
Leaders and Learners…Today and Tomorrow!

Physical Science A

Course Description: This semester is an introduction to the fundamentals of physics. Included this semester will be such topics as motion and the properties of moving objects, forces and Newton's Laws, work and energy, and an introduction to electricity. Some basic algebra and graphing skills will be incorporated, as well as several opportunities to get lab experience.

Learning Targets

Domain: Physics

SCI.PS2.A.h Motion and changes in motion can be quantitatively described using concepts of speed, velocity, and acceleration (including speeding up, slowing down, and/or changing direction). Newton's second law of motion (F=ma) and the conservation of momentum can be used to predict changes in the motion of macroscopic objects. If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system.

- I can measure and calculate the speed of an object using distance and time.
- I can describe velocity as speed in a specific direction and calculate it in different situations.
- I can define acceleration as the rate of change of velocity and calculate it using the formula
- I can explain how acceleration includes speeding up, slowing down, and changing direction.
- I can use Newton's Second Law of Motion (F = ma) to solve for force, mass, or acceleration in different scenarios.
- I can define momentum and calculate it using the formula
- I can explain the law of conservation of momentum and apply it to collisions and other system interactions.
- I can analyze how external forces (like friction or applied force) affect the momentum and motion of objects in a system.
- I can interpret data from motion graphs (distance-time, velocity-time) to describe and compare the motion of objects.

SCI.PS2.B.h Forces at a distance are explained by fields that can transfer energy and can be described in terms of the arrangement and properties of the interacting objects and the distance between them. These forces can be used to describe the relationship between electrical and magnetic fields. Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects.

- I can describe how some forces (like gravity, magnetism, and electric forces) can act at a distance without physical contact.
- I can describe how energy is transferred through fields (such as in electromagnetic waves or through electric circuits).

- I can explain how the attraction and repulsion of electric charges affect the behavior of atoms and molecules.
- I can describe contact forces (such as friction, tension, and normal force) and explain how they differ from forces that act at a distance.
- I can provide real-world examples of contact forces and forces at a distance, and explain how they apply to different systems.

SCI.PS3.A.h Systems move towards more stable states

- I can define different forms of energy, including kinetic, potential, thermal, and chemical energy.
- I can give real-world examples of each type of energy and explain how they are used or observed.
- I can describe how energy is transferred or transformed within a system (e.g., mechanical to thermal).
- I can explain how systems tend to move toward equilibrium or stable states due to energy changes.
- I can describe how the conservation of energy applies to physical systems.
- I can predict how adding or removing energy can change the stability or behavior of a system.
- I can explain that energy transformations are not 100% efficient and often result in energy being transferred as heat.

SCI.PS3.B.h The total energy within a system is conserved. Energy transfer within and between systems can be described and predicted in terms of energy associated with the motion or configuration of particles (objects).

- I can explain the law of conservation of energy: energy cannot be created or destroyed, only transformed or transferred.
- I can identify examples of energy conservation in real-world or closed systems (e.g., a roller coaster, pendulum, or bouncing ball).
- I can describe how energy moves between objects or systems through conduction, convection, radiation, or mechanical interactions.
- I can define kinetic energy as energy of motion and calculate it using the formula.
- I can define gravitational potential energy as energy due to position and calculate it using the formula.
- I can explain the relationship between kinetic and potential energy in systems (e.g., a swinging pendulum or falling object).
- I can describe how energy is transformed between kinetic and potential energy in various systems and predict changes in energy forms.

SCI.PS3.C.h Fields contain energy that depends on the arrangement of the objects in the field.

- I can explain how changing the position or arrangement of objects within a field changes the energy involved (e.g., raising an object in a gravitational field increases its potential energy).
- I can describe gravitational, electric, and magnetic fields as regions where forces act at a distance.
- I can investigate how energy is stored and transferred in different types of fields.

- I can apply the concept of potential energy in fields to real-world systems, such as satellites in orbit, charged particles, or magnets.

SCI.PS4.A.h The wavelength and frequency of a wave are related to one another by the speed of the wave, which depends on the type of wave and the medium through which it is passing. Waves can be used to transmit information and energy.

- I can identify and describe the basic properties of waves, including amplitude, wavelength, frequency, and speed.
- I can compare transverse and longitudinal waves and describe how particles move in each type.
- I can use the wave speed formula to calculate wave speed, frequency, or wavelength.
- I can explain how changing the frequency or wavelength affects the speed of a wave in a given medium.
- I can describe how different types of waves (sound, light, water) require or do not require a medium to travel.
- I can identify the mediums through which various waves travel (e.g., sound through air, light through vacuum, seismic waves through Earth).
- I can explain how waves are used to transfer energy and information in technologies like radios, cell phones, and fiber optics.
- I can describe how wave properties (like frequency and amplitude) affect how we hear or see signals (e.g., pitch, color, volume).

SCI.PS4.B.h Both an electromagnetic wave model and a photon model explain features of electromagnetic radiation broadly and describe common applications of electromagnetic radiation.

- I can describe the characteristics of electromagnetic waves, including wavelength, frequency, and energy.
- I can identify the different regions of the electromagnetic spectrum (radio, microwave, infrared, visible light, ultraviolet, X-rays, gamma rays) and describe their properties.
- I can explain the dual nature of electromagnetic radiation as both a wave and a particle.
- I can describe how electromagnetic radiation interacts with matter (e.g., absorption, reflection, transmission).
- I can identify and explain at least three practical applications of electromagnetic radiation in technology or nature (e.g., medical imaging, communication, solar panels).