

Collaboration, Communication, Creativity, and Critical Thinking skills are embedded within the language of the Henry Teaching and Learning Standards

HCS Graduate
Learner Outcome

As a Henry County graduate, I will understand and analyze concepts related to forces and motion as demonstrated through the integration of scientific processes and practices.

GA Standard Code

SP1 Obtain, evaluate, and communicate information about the relationship between distance, displacement, speed, velocity, and acceleration as functions of time.

- SP1a Plan and carry out an investigation of one-dimensional motion to calculate average and instantaneous speed and velocity. • Analyze one-dimensional problems involving changes of direction, using algebraic signs to represent vector direction. • Apply one-dimensional kinematic equations to situations with no acceleration, and positive, or negative constant acceleration.
- SP1b Analyze and interpret data using created or obtained motion graphs to illustrate the relationships among position, velocity, and acceleration, as functions of time.
- SP1c Ask questions to compare and contrast scalar and vector quantities.
- SP1d Analyze and interpret data of two-dimensional motion with constant acceleration. • Resolve position, velocity, or acceleration vectors into components (x and y, horizontal and vertical). • Add vectors graphically and mathematically by adding components. • Interpret problems to show that objects moving in two dimensions have independent motions along each coordinate axis. • Design an experiment to investigate the projectile motion of an object by collecting and analyzing data using kinematic equations. • Predict and describe how changes to initial conditions affect the resulting motion. • Calculate range and time in the air for a horizontally launched projectile.

SP2 Obtain, evaluate, and communicate information about how forces affect the motion of objects.

- SP2a Construct an explanation based on evidence using Newton's Laws of how forces affect the acceleration of a body. • Explain and predict the motion of a body in absence of a force and when forces are applied using Newton's 1st Law (principle of inertia). • Calculate the acceleration for an object using Newton's 2nd Law, including situations where multiple forces act together. • Identify the pair of equal and opposite forces between two interacting bodies and relate their magnitudes and directions using Newton's 3rd Law.
- SP2b Develop and use a model of a Free Body Diagram to represent the forces acting on an object (both equilibrium and non-equilibrium).
- SP2c Use mathematical representations to calculate magnitudes and vector components for typical forces including gravitational force, normal force, friction forces, tension forces, and spring forces.

- SP2d Plan and carry out an investigation to gather evidence to identify the force or force component responsible for causing an object to move along a circular path. • Calculate the magnitude of a centripetal acceleration.
- SP2e Develop and use a model to describe the mathematical relationship between mass, distance, and force as expressed by Newton's Universal Law of Gravitation.

**HCS Graduate
Learner Outcome**

As a Henry County graduate, I will understand and analyze concepts related to energy and momentum as demonstrated through the integration of scientific processes and practices.

GA Standard Code

SP3 Obtain, evaluate, and communicate information about the importance of conservation laws for mechanical energy and linear momentum in predicting the behavior of physical systems.

- SP3a Ask questions to compare and contrast open and closed systems.
- SP3b Use mathematics and computational thinking to analyze, evaluate, and apply the principle of conservation of energy and the Work-Kinetic Energy Theorem. • Calculate the kinetic energy of an object. • Calculate the amount of work performed by a force on an object.
- SP3c Plan and carry out an investigation demonstrating conservation and rate of transfer of energy (power) to solve problems involving closed systems.
- SP3d Construct an argument supported by evidence of the use of the principle of conservation of momentum to • explain how the brief application of a force creates an impulse. • describe and perform calculations involving one dimensional momentum. • connect the concepts of Newton's 3rd law and impulse. • experimentally compare and contrast inelastic and elastic collisions.

**HCS Graduate
Learner Outcome**

As a Henry County graduate, I will understand and analyze the characteristics and properties of waves as demonstrated through the integration of scientific processes and practices.

GA Standard Code

SP4 Obtain, evaluate, and communicate information about the properties and applications of waves.

- SP4a Develop and use mathematical models to explain mechanical and electromagnetic waves as a propagating disturbance that transfers energy.
- SP4b Develop and use models to describe and calculate characteristics related to the interference and diffraction of waves (single and double slits).
- SP4c Construct an argument that analyzes the production and characteristics of sounds waves.

- SP4d Plan and carry out investigations to characterize the properties and behavior of electromagnetic waves.
- SP4e Plan and carry out investigations to describe common features of light in terms of color, polarization, spectral composition, and wave speed in transparent media. • Analyze experimentally and mathematically aspects of reflection and refraction of light waves and describe the results using optical ray diagrams. • Perform calculations related to reflections from plane surfaces and focusing using thin lenses.
- SP4f Plan and carry out investigations to identify the behavior of light using lenses.
- SP4g Plan and carry out investigations to describe changes in diffraction patterns associated with geometry and wavelength for mechanical and electromagnetic waves.

HCS Graduate
Learner Outcome

As a Henry County graduate, I will understand and analyze electricity and magnetism as demonstrated through the integration of scientific processes and practices.

GA Standard Code

SP5 Obtain, evaluate, and communicate information about electrical and magnetic force interactions.

- SP5a Develop and use mathematical models and generate diagrams to compare and contrast the electric and gravitational forces between two charged objects.
- SP5b Plan and carry out investigations to demonstrate and qualitatively explain charge transfer by conduction, friction, and induction.
- SP5c Construct an explanation based on evidence of the behavior of charges in terms of electric potential energy.
- SP5d Plan and carry out an investigation of the relationship between voltage, current, and power for direct current circuits.
- SP5e Plan and carry out investigations to clarify the relationship between electric currents and magnetic fields.

HCS Graduate
Learner Outcome

As a Henry County graduate, I will understand and analyze concepts of nuclear physics as demonstrated through the integration of scientific processes and practices.

GA Standard Code

SP6 Obtain, evaluate, and communicate information about nuclear changes of matter and related technological applications.

- SP6a Develop and use models to explain, compare, and contrast nuclear processes including radioactive decay, fission, and fusion.
- SP6b Construct an argument to compare and contrast mechanisms and characteristics of radioactive decay.
- SP6c Develop and use mathematical models and representations to calculate the amount of substance present after a given amount of time based on its half-life and relate this to the law of conservation of mass and energy.