



Physics Learning Targets

Motion and Forces	
1.	Students know how to solve problems that involve circular motion, balanced forces (statics), constant speed and average speed.
2.	Students know the concepts behind Newton's three laws and are able to solve various problems involving them.
3.	Students know the relationship between the universal law of gravitation and the effect of gravity on an object at the surface of Earth.
4.	Students know Newton's laws are not exact but provide very good approximations unless an object is moving close to the speed of light or is small enough that quantum effects are important.
5.	Students know how to resolve two-dimensional vectors into their components and calculate the magnitude and direction of a vector from its components.
Conservation of Energy and Momentum	
6.	Students know how to calculate kinetic energy and gravitational potential energy and how to solve problems involving conservation of energy in simple systems, such as falling objects.
7.	Students know an unbalanced force on an object produces a change in its momentum and how to calculate momentum as the product mv .
8.	Students know how to solve problems involving elastic and inelastic collisions in one dimension by using the principles of conservation of momentum and energy.
Heat and Thermodynamics	
9.	Students know heat flow and work are two forms of energy transfer between systems and how to solve problems involving heat flow, work, and efficiency in a heat engine.
10.	Students know the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy.
11.	Students know that entropy is a quantity that measures the order or disorder of a system, that this quantity is larger for a more disordered system and that most processes tend to decrease the order of a system over time.
Waves	
12.	Students know waves carry energy from one place to another and know how to identify transverse and longitudinal waves in mechanical media
13.	Students know how to solve problems involving wavelength, frequency, and wave speed.
14.	Students know the properties of radio waves, light, and X-rays.
15.	Students know how to identify the characteristic properties of waves:

interference (beats), diffraction, refraction, Doppler effect, and polarization.

Electric and Magnetic Phenomena

16. Students know how to predict the voltage or current in simple direct current (DC) electric circuits constructed from batteries, wires, resistors, and capacitors.

17. Students know any resistive element in a DC circuit dissipates energy, which heats the resistor. Students can calculate the power in any resistive circuit element.

18. Students know the properties of transistors and the role of transistors in electric circuits.

19. Students know the properties of and relationships between charged particles, electric fields and magnetic fields. They are able to analyze straight wire or coil situations and can use the right hand rule to find the direction of the force on a charged particle in a magnetic field.

20. Students know plasmas, the fourth state of matter, contain ions or free electrons or both and conduct electricity.