Physics

Twelfth Grade

UNIT TITLE	CORE TOPICS (Key Concepts & Real World Contexts)	UNIT BENCHMARKS	SUGGESTED ASSESSMENT	POSSIBLE RESOURCES
WHAT IS PHYSICS?	▪ Relate theory, experiment, and applications to the role they play in physics research ▪ Demonstrate the scientific method	**I.1.HS.1** **I.1.HS.2** **I.1.HS.4** **II.1.HS.4**		
A MATHEMATICAL TOOL KIT	▪ Define S.I. measurements ▪ Using metric prefixes ▪ Using algebra, trigonometry, and calculus ▪ Graphing data and sharing/recognizing relationships between variables	**I.1.HS.3** **II.1.HS.1** **II.1.HS.2** **II.1.HS.3**		
DESCRIBING MOTION	▪ Define velocity and acceleration ▪ Differentiate between scalar and vector			
VECTORS	▪ Graphically and mathematically adding vectors ▪ Use the process of resolution of vectors to find the components of vectors ▪ Adding vectors using components.			
MOTION IN ONE DIMENSION	▪ Write equations that describe the position of an object moving at constant velocity and/or constant acceleration/free fall ▪ Interpret d vs t and v vs t graphs ▪ Use the kinematics equations for motion			
FORCES	▪ Define forces and differentiate between contact and long-range forces ▪ Use Newton's Second Law; explain the meaning of the first and third laws ▪ Differentiate between mass and weight ▪ Solve, mathematically, force problems with and without the influence of friction ▪ Define the four fundamental forces ▪ Describe simple harmonic motion	**IV.3.HS.1** **IV.3.HS.2**		

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FORCES AND MOTION IN TWO DIMENSIONS	▪ Describe resultants and equilibrants ▪ Analyze the motion of an object on an inclined plane ▪ Relate the height, time, initial vertical velocity of a projectile and calculate the range ▪ Frame of reference and its effect on the shape of the trajectory ▪ Analyze and calculate variables in uniform circular motion			
UNIVERSAL GRAVITATION	▪ Relate Kepler's laws of planetary motion to Newton's Law of Universal Gravitation ▪ Calculate periods and speeds of orbiting objects ▪ Relate weightlessness to free fall ▪ Contrast Newton's and Einstein's view of gravity			
IMPULSE AND MOMENTUM	▪ Compare a system before and after an event in momentum problems ▪ Define impulse and momentum ▪ Relate Newton's Third Law to conservation of momentum in collisions and explosions ▪ Apply conservation of momentum to rockets ▪ Solve one- and two-dimensional conservation problems			
ENERGY, WORK, AND SIMPLE MACHINES	▪ Describe the relationship between work and energy ▪ Identify forces that do work ▪ Calculate work, power, MA, and efficiencies for simple machines ▪ Identify the simple machines	**IV.3.HS.1** **IV.3.HS.2**		

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ENERGY	▪ Calculate the potential and kinetic energy of objects ▪ Define the 3 types of potential energy ▪ Solve problems using the law of conservation of energy ▪ Analyze collisions to find the change in kinetic energy	**IV.3.HS.2** **IV.2.HS.4**		
STATES OF MATTER	▪ Describe fluids and how they create pressure ▪ Apply Pascal's Archimedes and Bernoullis Principles ▪ Explain capillary action, surface tension, evaporation and condensation ▪ Compare solids, liquids, gases, and plasmas ▪ Calculate the expansion of solids and possible problems created	**IV.1.HS.3**		
WAVES AND ENERGY TRANSFER	▪ Explain how waves transfer energy without transferring matter ▪ Compare/contrast types of waves ▪ Relate velocity, frequency, wave length, and period ▪ Explain wave behaviors at boundries ▪ Explain reflection, retraction, and diffraction ▪ Principle of super position	**IV.4.HS.1** **IV.4.HS.3** **IV.4.HS.4**		
SOUND	▪ Properties of sound ▪ Doppler Shift ▪ Solve problems using wave equation ▪ Describe origins of sound and how musical instruments work ▪ Define timbre, resonance, fundamental, and overtones ▪ How we perceive and produce sounds ▪ Determine beat frequency	**IV.4.HS.1** **IV.4.HS.3** **IV.4.HS.4**		

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LIGHT	▪ Recognize light and the electromagnetic spectrum ▪ Solve wave equation problems ▪ Define and solve problems with illuminance, luminous intensity, and luminous flux ▪ Explain why we see colors ▪ Models of light	**IV.4.HS.1** **IV.4.HS.2** **IV.4.HS.3** **IV.4.HS.4**		
REFLECTION AND REFRACTION	▪ Explain law of reflection ▪ Calculate the index of refraction ▪ Explain total internal reflection and critical angle ▪ Using Snell's law in problems			
MIRRORS AND LENSES	▪ Explain concave, convex, and plane mirrors and lenses ▪ Using ray diagrams and calculate image location and size using equations ▪ Explain spherical and chromatic aberration ▪ Explain virtual and real images ▪ Explain how optical instruments work			