

# Physics Scope and Sequence

## Wylie High School

Note: Objectives that are stated in the required Texas Essential Knowledge & Skills are underlined and italicized. The Sequence Calendar is listed on the last page.

- I. Introduction to Physics
  - A. "What is Physics" [ 3C,3E]
  - B. Describe the connection between physics and future careers [3D]
- II. Measurement
  - A. Make quantitative observations and measurements with precision. [2B]
  - B. Find the density of various objects using both the water displacement method and regular solid formula. [2A-2F]
  - C. Make conversions using the factor label method.
- III. One Dimensional Kinematics
  - A. Analyze examples of uniform and accelerated motion including linear, projectile, and circular [4B]
  - B. Solve word problems using the following equations; [4B]

$$v = x/t$$

$$a = (v_f - v_i) / t$$

$$x = \frac{1}{2} (v_f + v_i) t$$

$$x = v_i t + \frac{1}{2} a t^2$$

$$v_f^2 = v_i^2 + 2ax$$

- C. Generate and interpret graphs describing motion including the use of real-time technology. [2B,2C,4A,4B]  
Use the labpro motion sensors to draw distance-time graphs and velocity time graphs of the motion of students walking.
- IV. Vector Mathematics
  - A. Use trigonometry to find the x & y components of a vector. [3B]
  - B. Use the component method to add and subtract vectors [3B]
  - C. The students should know that velocity, acceleration, and forces are vectors. [3B]
- V. Two dimensional kinematics
  - A. Analyze examples of uniform and accelerated motion including linear, projectile, and circular. [4B]
  - B. Solve problems for horizontal projectiles, equal height projectiles launched at an angle, and unequal height projectiles launched at an angle.[4B]
  - C. Football Lab: Find the velocity of the football using projectile equations. [2A-2F,4B,4C]
- VI. Dynamics
  - A. Students will describe Newton's laws of motion [4A-4E]
  - B. Solve problems using  $F = ma$  [4C]
  - C. Identify the influence of mass and distance on gravitational forces [6A]
  - D. Solve  $F = ma$  problems involving friction including an incline plane [4B,4C,4D]

- E. Solve elevator problems where  $T - w = ma$  [4B,4C,4D]
  - F. Solve problems involving an Atwood machine [4B,4C,4D]
  - G. Solve problems involving a pulley attached to an inclined plane [4B,4C,4D]
- VII. Work and Energy
- A. Solve problems involving  $W = Fd$  [5A]
  - B. Solve problems involving kinetic energy  $KE = \frac{1}{2} mv^2$  [5B]
  - C. Solve problems involving power  $P = W/t$
  - D. Observe and describe examples of kinetic and potential energy and their transformations [5B]  
Solve roller coaster problems involving  $mgh_i + \frac{1}{2} mv_i^2 = mgh_f + \frac{1}{2} mv_f^2$
  - E. Understand mechanical advantage and how it relates to machines. [TAKS]
  - E. Interpret evidence for the work-energy theorem  $W = \Delta E$  [5A]
- VIII. Linear Momentum
- A. Calculate the mechanical energy and momentum in a physical system such as billiards, cars, and trains [5C]
  - B. Work problems involving momentum  $p = mv$  [5C]
  - C. Work problems involving the impulse momentum theorem  $Ft = \Delta mv$  [5C]
  - D. Understand how seat belts reduce force using the impulse-momentum theorem [5C]
  - E. Students will apply the impulse-momentum theorem by building an Egg Drop vehicle. [1A,5A-5D]
  - F. Demonstrate the conservation of energy and momentum. [5D]
  - F. Solve problems involving the conservation of momentum. [5D]
- IX. Rotational Kinematics
- A. Analyze examples of uniform and accelerated motion including linear, projectile, and circular [4B].
  - B. Show how the same kinematics equations for linear motion still apply to circular motion. [4B]
  - C. Understand and solve problems involving torque. ( $\tau = Fr$ ) [4B,4C]
  - D. Understand the importance of moment of inertia in baseball bats, golf clubs, footballs, divers [4B-4C]
  - E. Understand the rotational analogue for Newton's Second law. ( $\tau = I\alpha$ ) [4B-4C]
  - F. Solve problems involving statics.
  - G. Students will build bridges using the West Point Bridge software. [2C,2D,2E,3C-3E]
- X. Waves
- A. Examine and describe a variety of waves propagated in various types of media and describe wave characteristics such as velocity, frequency, amplitude, and behaviors such as reflection, refraction, and interference [8A]
  - B. Solve problems using  $v = \lambda f$  [8A]
  - C. Explain the difference between longitudinal and transverse waves [8A]
    - D. Recognize that light travels in transverse waves and sound travels in longitudinal waves. [8A]
  - E. Interpret the role of wave characteristics and behaviors found in medicinal and industrial applications. [8C]
- XI. Sound
- A. Identify the characteristics and behaviors of sound and electromagnetic waves [8B]
  - B. Calculate frequency shifts due to Doppler Effect [8A]

- C. Calculate the Intensity of sound and convert intensities into decibels [8B]
  - D. Describe resonance and explain its significance to musical instruments and bridges and buildings [8B]
- XII. Light
- A. Describe and explore the applications of the electromagnetic spectrum. [8A-8C]
  - B. Explain how light can be propagated. [8A-8C]
  - C. Solve problems using the mirror equation. [8A-8C]
  - D. Describe the properties of concave and convex mirrors. [8A-8C]
  - E. Understand polarization and how Polaroid lenses work [8A-8C]
  - F. Explain how light is refracted [8A-8C]
  - G. Solve problems using the Index of Refraction and Snell's Law [8A-8C]
  - H. Solve problems using the lens equation. [8A-8C]
  - I. Explain nearsightedness and farsightedness and how it is corrected. [8A-8C]
  - J. Determine the focal length of a convex lens using an Optics Bench [8A-8C]
  - K. Explain Total internal Reflection and its application to fiber optics, etc. [8A-8C]
  - L. Explain how a mirage is produced. [8A-8C]
  - M. Explain how a LASER works and its applications [8A-8C]
- XIII. Electricity & Magnetism
- A. Identify and analyze the influences of charge and distance on electric forces [6C]
    - B. Solve problems using Coulomb's Law. Race coke cans with static charge. [2A,2D,2E,6C]
  - C. Understand voltage, current, and resistance and their relationship through Ohm's Law. [6E]
  - D. Design and analyze electric circuits by building series and parallel circuits [6E]
  - E. Demonstrate the relationship between electricity and magnetism. by building a simple motor and generator. [6D]
- XIV. Relativity, Quantum Mechanics, and String Theory
- A. Explain how Einstein's View of gravity is different from Newton's [3A,3S,3E]
  - B. Calculate time dilation, mass increase, and length contraction using relativity equations.[6B]
  - C. Understand the development of a better understanding of matter and forces by watching "The Elegant Universe"[3A,3C,3D,3E,9A,9B]

Sequence Calendar:

First Six Weeks	I, II, III
Second Six Weeks	IV, V, VI
Third Six Weeks	VII, VIII
Fourth Six weeks	IX, X
Fifth Six Weeks	XI, XII
Sixth Six Weeks	XIII, XIV

