

**Science Standards**

**Introduction to Physics**

**Course Overview:**

This course is a continuation of Introduction to Chemistry. It is intended to give students a broad overview of Physics, with a focus on conceptual understandings of concepts. Students will need to apply Algebra to solve many of the questions in this class.

**Bold standards are essential standards that all students will learn as they complete the course.**

**Unit 1:** Kinematics

**Description:** This unit will introduce the mathematical description of motion to students.

**Standards**

1. Students can describe the motion of an object using position, velocity, and acceleration
2. Students can use slope relationships to infer the velocity or acceleration of an object from position or velocity graphs.
3. **Students can use the big three kinematic equations to solve problems.**
4. Students understand the difference between accelerations and velocities.

**NGS Standards:** PS2-1

**Unit 2:** Forces

**Description:** This unit will discuss how forces can cause motion and the different types of forces that can be

**Standards**

1. Students can use Newton's Second Law to relate forces and accelerations
2. **Students can draw free body diagrams for objects in or out of equilibrium.**
3. Students can calculate the value for forces due to gravity, friction, springs.
4. Students see the similarities of electric and magnetic forces.
5. Students can demonstrate how electric fields can generate magnetic forces.

**NGS Standards:** PS2-1, PS2-3, PS2-4, PS2-5, PS2-6, PS3-5

**Unit 3:** Momentum

**Description:** This unit will discuss how to solve conservation problems, and how conservation of momentum is a useful method to solve problems.

**Standards**

1. Students can describe before and after situations to allow them to solve momentum problems.
2. Students can use conservation of momentum to solve problems
3. Students can identify situations where momentum is not conserved
4. Students can use P=F\*t to solve problems

**NGS Standards:** PS2-2

**Unit 4:** Energy

**Description:** This unit will discuss conservation of energy. Additionally, students will apply their knowledge of conservation of energy to solve problems.

**Standards**

1. Students can describe before and after situations to allow them to solve energy problems
2. Students can calculate the amount of gravitational potential, spring potential, magnetic potential, electric potential, and kinetic energy an object has.
3. Students can explain how energy conservation allows them to solve problems.
4. Students can use energy conservation to solve problems.
5. **Students can explain how thermal energy transfers to create a uniform energy density.**
6. Students will design and build a marble roller coaster.

**NGS Standards:** PS3-1, PS3-2, PS3-3, PS3-4

**Unit 5:** Waves

**Description:** In this unit, students will discuss waves and how they apply to the real world. This includes optics and the use of waves to transfer signals and information.

**Standards**

1. Students can apply vocabulary related to waves to describe the attributes of waves.
2. Students understand how the period and frequency of waves are related.
3. Students can use the wave speed equation to solve the problem.
4. Students can apply the superposition principle to standing waves and combining waves.
5. Students can apply the properties of waves to understand why digital signals are superior to analog signals.
6. Students can apply the properties of waves to EM waves.
7. Students understand that EM waves can be described as waves or particles.
8. Students understand that different types of EM waves have different wavelengths and different energy levels.
9. Students can draw ray traces for lenses.

**NGS Standards:** PS4-1, PS4-2, PS4-3, PS4-4, PS4-5