# Physics - Unit 6 - Waves and Harmonic Motion

## Unit Focus

Students will explore the anatomy of waves, types of waves, and wave interactions. Students will begin with analyzing common oscillators, objects which make repetitive motions (such as pendulums and springs). Through this analysis, students will uncover the periodic motion of oscillators and waves, as well as what factors dictate their motion. Ultimately, students will analyze how information can be transmitted on waves.

## Stage 1: Desired Results - Key Understandings

### Standard(s)

**Next Generation Science**
*High School Physical Sciences: 9 - 12*

- Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. *HS-PS4-1*
- Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy. *HS-PS4-5*

**Madison Public Schools Profile of a Graduate**
*Creative Thinking*

- Idea Generation: Studying a problem, need or model (mentor text, political piece, documents, art work, etc.) to consider limitations and imagine new solutions/transformations. (POG.2.1)
- Design: Engaging in a process to refine a product for an intended audience and purpose. (POG.2.2)

### Transfer

**T1** Use the scientific process to generate evidence that addresses the original questions.

### Meaning

| Understanding(s) | Essential Question(s) |
|---|---|
| **U1** When waves encounter objects they can reflect, refract, diffract or absorb depending on the property of material.<br>**U2** Two or more waves that occupy the same space at the same time may interfere constructively or destructively. | **Q1** How are standing waves created?<br>**Q2** How do the fundamental forces of the universe explain the behavior and interactions of objects? (e.g. particles, people, stars, planets)<br>**Q3** How are waves beneficial? |

### Acquisition of Knowledge and Skill

| Knowledge | Skill(s) |
|---|---|
| **K1** Students will understand that the cause of every wave is a vibrating source<br>**K2** Students will be able to define the word medium and be able to identify the mediums of common waves.<br>**K3** Students will be able to diagram a wave by identifying features (amplitude, wavelength, frequency etc)<br>**K4** Students will be able to define simple harmonic motion and identify the force(s) creating this motion in pendula, springs and other situations | **S1** solve spring and pendulum problems for period, frequency or force<br>**S2** calculate the period and frequency for an object in SHM<br>**S3** draw standing waves and identify wavelength, amplitude and calculate velocity of the wave<br>**S4** describe how the spring constant affects the period of a spring in SHM |