Unit 08: Waves

Content Area: **Science**
Course(s):
Time Period: **Marking Period 4**
Length: **3 Weeks**
Status: **Published**

Summary

This unit will investigate the propagation of waves in various media. We will examine the relationship between frequency, wavelength, and the speed of waves. The effect of the medium of transmission on these quantities is also probed. General behavior of waves such as interference and diffraction are studied.

Updated 2022

Standards

9.4.12.CI	Creativity and Innovation
MA.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
9.4.12.CT	Critical Thinking and Problem-solving
MA.A-SSE.B.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
MA.N-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
MA.N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
MA.N-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
LA.RST.11-12.1	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
LA.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
8.1.12.DA.5	Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
MA.A-CED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
LA.SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
HS-PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-2	Evaluate questions about the advantages of using a digital transmission and storage of information.
HS-PS4-3	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some

	situations one model is more useful than the other.
HS-PS4-4	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
HS-PS4-5	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-ESS2-1	Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.
HS-ESS2-3	Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.
TECH.8.1.12.A.5	Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results.

Essential Questions

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- What is a mechanical wave?

- What are the properties of a wave?

- How can the speeds of different waves be calculated?

Enduring Understanding

- Waves are disturbances that travel through a medium

- The mechanical properties of a medium determine the speed of a wave that passes through it

Objectives

- Students will be skilled at sketching waves and labelling all their parts

- Students will be skilled at determining the speeds of waves in a variety of media

- Students will be skilled at sketching examples of constructive and destructive interference

- Students will be skilled at producing standing waves on a string and identifying nodes and anti-nodes

- Students will be skilled at using Snell's Law to calculate angles of incidence and refraction

- Students will know how stringed instruments and wind instruments produce different musical notes

- Students will know how to identify the parts of a wave

- Students will know the difference between longitudinal and transverse waves

- Students will know how light behaves when it passes from one medium into another

Learning Plan

- Power point: Mechanical Wave Properties: amplitude, wavelength, frequency

- Demos: Waves on strings

- Activity: Drawing waves

- Video: "The Mechanical Universe: Waves"

- Phet Simulation: Waves

- Class discussion: Sound waves and musical instruments

- Lab: Standing waves

- Collaborative problem solving: Waves

- Teacher presentation: interference and diffraction

- Class discussion: Refraction of light

- Phet simulation: Snell's Law

Assessment

Formative:

Do Now Questions

Exit Ticket Questions

Whole Class Discussion Participation

Small Group Discussion Participation

Individual Student Questions/Responses

Cooperative Problem Solving *(Waves)*

Lab Experiments *(Standing Waves, Snell's Law)*

Quizzes

Summative:

Formal Lab Report

Unit Test

Benchmark:

Honors Physics Final Exam

Alternative Assessments:

Guided Formal Lab Report

Unit Study Guide

Materials

Textbook PHYSICS: PRINCIPLES WITH APPLICATIONS 6th Edition GIANCOLI, PEARSON

Mechanical Universe Video Series

Cosmos Video Series

Equipment for wave and sound demos

Chromebooks for PhET Simulation

Lab Equipment: Springs, speakers, tuning forks, wave generator, glass prism, laser pointer, sound tubes, etc

Computer / Smart board

¼ inch graph paper

Integrated Accommodation and Modifications

FOR SPECIAL EDUCATION STUDENTS , ELL, AT RISK AND STUDENTS GIFTED STUDENTS

https://docs.google.com/spreadsheets/d/1XVU7bji7iOgH8W9w9PLxDox44Da1R1oCxiSeoIztRGQ/edit?usp=sharing