

# 09\_Sound

Content Area: **Science**  
Course(s):  
Time Period: **Full Year**  
Length: **3 weeks**  
Status: **Published**

## **General Overview, Course Description or Course Philosophy**

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This course is about the nature of basic things such as motion, force, energy, matter, sound, light, electricity and the composition of atoms. Laboratory experiments, demonstrations, applications to daily life and current topics in physics provide students with an appreciation of this most basic science.

## **OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS**

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Essential questions:

- How do the physical properties of sound waves relate to our perception of sound?

Students will understand:

- Waves transfer energy
- Waves have unique properties
- Math can be used to understand wave patterns

## **CONTENT AREA STANDARDS**

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SCI.HS-PS4-1 Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

## **RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)**

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HSA.CED.A.4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

MA.K-12.2 Reason abstractly and quantitatively.

MA.A-SSE.A.1 Interpret expressions that represent a quantity in terms of its context.

MA.K-12.4 Model with mathematics.

PFL.9.1.K12.P.8 Use technology to enhance productivity increase collaboration and communicate effectively.

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.

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.
WRK.K-12.P.4	Demonstrate creativity and innovation.
TECH.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.

## STUDENT LEARNING TARGETS

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### Declarative Knowledge

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Students will know:

- Physical properties of sound waves relate to how loud and how high we perceive a sound.
- Standing wave formations in open and closed pipes and on strings.
- The relationship between pitch, frequency, wavelength, and loudness

The following misconception will be addressed during this unit:

- The pitch emitted from a source does not change despite an observer experiencing the Doppler Effect.

### Procedural Knowledge

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Students will be able to:

- Students identify and describe the relevant components in the mathematical representations:
  1. Mathematical values for frequency, wavelength, and speed of waves traveling in various specified media
  2. The relationships between frequency, wavelength, and speed of waves traveling in various specified media.
- Students show that the product of the frequency and the wavelength of a particular type of wave in a given medium is constant, and identify this relationship as the wave speed according to the mathematical relationship  $v = f\lambda$ .
- Students use the data to show that the wave speed for a particular type of wave changes as the medium through which the wave travels changes.
- Students predict the relative change in the wavelength of a wave when it moves from one medium to another (thus different wave speeds using the mathematical relationship  $v = f\lambda$ ). Students express the relative change in terms of cause (different media) and effect (different wavelengths but same frequency).
- Using the mathematical relationship  $v = f\lambda$ , students assess claims about any of the three quantities when the other two quantities are known for waves travelling in various specified media.
- Students use the mathematical relationships to distinguish between cause and correlation with respect to the supported claims.

## **EVIDENCE OF LEARNING**

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### **Formative Assessments**

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Strategic questioning

Class/small group discussions

Homework and classwork assignments

Conducting and analyzing labs

### **Summative Assessments**

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- Benchmarks – departmental benchmark given at the end of MP1, MP2, and MP3
- Alternative Assessments
  - Lab inquiries and investigations
  - Lab Practicals
  - Exploratory activities based on phenomenon
  - Gallery walks of student work
  - Creative Extension Projects
  - Build a model of a proposed solution
  - Let students design their own flashcards to test each other
  - Keynote presentations made by students on a topic
  - Portfolio

## **RESOURCES (Instructional, Supplemental, Intervention Materials)**

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The Physics Classroom - <http://www.physicsclassroom.com/>

PhET simulations - <https://phet.colorado.edu/>

Pivot - <https://www.pivotinteractives.com/>

Edpuzzle - <https://edpuzzle.com/>

Vernier labs - teacher lab manual available in classroom

## **INTERDISCIPLINARY CONNECTIONS**

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Calculations drive connections with mathematics courses

## **ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS**

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See link to Accommodations & Modifications document in course folder.