

Grade 8 Science

Unit 2: Sound Waves

Driving question: How can a sound make something move?

20 lessons (investigations and weekly readings) and a words quiz. Use this pack with the unit's **Teacher Guide**, **Student Procedure Guide**, **Student Work Pages** and **Science Literacy Student Reader** (download them once from the course) to teach the whole unit without the internet.

What is in this pack

- A plan for each lesson: the lesson question, how many class days it takes, the Teacher Guide pages to follow, and the student pages to print.
- For each weekly reading: the Student Reader pages, words to know and the exercise page.
- The words quiz, ready to print, with its key at the back.

CKSci 6-8 was originally developed and authored by OpenSciEd (www.openscienced.org), licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0). Additions marked “Core Knowledge Science Literacy” are the work of the Core Knowledge® Foundation (www.coreknowledge.org), made available through licensing under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. This does not in any way imply that OpenSciEd or the Core Knowledge Foundation endorses this work. PGAMO added the lesson pages, study packs and quizzes layout, and shares them under the same license. License: CC BY-NC-SA 4.0 (<https://creativecommons.org/licenses/by-nc-sa/4.0/>).

Lesson schedule

Each investigation lesson takes the number of class days shown (about 45 minutes a day). Do each reading over a week alongside the lessons. Tick each one off as you go.

	Lesson	Days	Student pages
☐	Reading: Science Literacy Preface: Put Yourself in This Scene	1 week	—
☐	Lesson 1: How does a sound source make something like this happen?	3	2 to print
☐	Lesson 2: What is happening when speakers and other music makers make sounds?	2	6 to print
☐	Reading: Science Literacy Collection 1: Musical Instruments	1 week	1 to print
☐	Lesson 3: Do all objects vibrate when they make sounds?	2	3 to print
☐	Lesson 4: How do the vibrations of the sound source compare for louder versus softer sounds?	2	4 to print
☐	Lesson 5: How do the vibrations from a sound source compare for higher-pitch versus lower-pitch sounds?	1	4 to print
☐	Reading: Science Literacy Collection 2: Sounds in Nature	1 week	1 to print
☐	Lesson 6: How can any object make so many different sounds?	2	4 to print
☐	Lesson 7: What is actually moving from the sound source to the window?	1	3 to print
☐	Lesson 8: Do we need air to hear sound?	1	1 to print
☐	Lesson 9: How can we model sound traveling through a solid, liquid, or gas?	1	4 to print
☐	Reading: Science Literacy Collection 3: Sound and Media	1 week	1 to print
☐	Lesson 10: What exactly is traveling across the medium?	2	4 to print
☐	Lesson 11: How does sound make matter around us move?	2	4 to print

	Lesson	Days	Student pages
☐	Lesson 12: What goes on in people's ears so they can detect certain sounds?	1	5 to print
☐	Reading: Science Literacy Collection 4: Compression Waves	1 week	1 to print
☐	Lesson 13: What transfers more energy, waves of bigger amplitude or waves of greater frequency?	2	4 to print
☐	Lesson 14: How can we explain our anchoring phenomenon, and which of our questions can we now answer?	2	1 to print
☐	Reading: Science Literacy Collection 5: Air, Wind, and Sound	1 week	1 to print
☐	Words quiz	—	—

Page numbers are PDF page numbers of each file, so they match what your PDF reader shows.

Reading: Science Literacy Preface: Put Yourself in This Scene

Words to know

- **media** — the collective means of mass communication,
- **noise** — unwanted, intrusive sound
- **oppose** — to hold a position against something
- **science literacy** — the ability to read, hear, and comprehend information about scientific topics and demonstrate understanding in discussion and through writing
- **social media** — websites and applications that allow users to participate in sharing content on the internet
- **wind turbine** — a device that, by rotation of a vaned stress. wheel, converts the kinetic energy of wind to electricity

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 22–25: the steps, materials and timing for this lesson.

Read

Read Science Literacy Student Reader, Preface: “Put Yourself in This Scene”: PDF pages 6–9. Look at the pictures and maps together.

Check for understanding

- Use one of today's words in a sentence of your own.

Lesson 1: How does a sound source make something like this happen?

LESSON QUESTION

How does a sound source make something like this happen?

Plan about **3 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 26–49: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 6–9
- Initial Model Diagram — Student Work Pages, PDF pages 7–8

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
How does a sound source make something like this happen?

Lesson 2: What is happening when speakers and other music makers make sounds?

LESSON QUESTION

What is happening when speakers and other music makers make sounds?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 50–65: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 10–12
- How do instruments move when making sound (vibrating)? — Student Work Pages, PDF pages 9–10
- Progress Tracker — Student Work Pages, PDF pages 11–12
- How do insects make sounds? — Student Work Pages, PDF pages 13–14
- Reference: Instrument and Speaker Stations — Student Procedure Guide, PDF page 42
- Reference: Peer Feedback Guidelines — Student Procedure Guide, PDF pages 43–46

For the teacher

- Teacher Reference — Teacher Guide, PDF pages 270–287

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation: What is happening when speakers and other music makers make sounds?

Reading: Science Literacy Collection 1: Musical Instruments

Words to know

- **acoustic** — related to sound
- **amplify** — to increase intensity
- **density** — the quantity of mass per unit of volume
- **elasticity** — a measure of how much something can be stretched or bent without breaking and then return to its original shape
- **frequency** — the number of repetitions of a process over an increment of time; for sound, the rate of oscillations, or cycles of vibration, of a sound source
- **intonation** — the accuracy of pitch up and down a string and across all strings of a musical instrument
- **medium** — an intervening substance through which a higher than humans can detect force acts or an effect is produced
- **modulus of elasticity** — is a quantity that measures how forth past its starting position resistant a material is to temporarily deforming under
- **pitch** — the quality of highness or lowness of a sound, which is a reflection of the wave's frequency
- **sound wave** — a longitudinal wave that can be perceived by the sense of hearing
- **vibration** — movement of an object or material back and

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 66–71: the steps, materials and timing for this lesson.

Read

Read Science Literacy Student Reader, Collection 1: “Musical Instruments”: PDF pages 10–19. Look at the pictures and maps together.

Student pages to print

- Exercise Page 1 — Student Work Pages, PDF pages 81–82

Check for understanding

- Use one of today's words in a sentence of your own.

Lesson 3: Do all objects vibrate when they make sounds?

LESSON QUESTION

Do all objects vibrate when they make sounds?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 72-86: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 13-14
- How do objects move when they make sounds? — Student Work Pages, PDF pages 15-16
- Where else are lasers used to detect vibrations? — Student Work Pages, PDF pages 17-18

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
Do all objects vibrate when they make sounds?

Lesson 4: How do the vibrations of the sound source compare for louder versus softer sounds?

LESSON QUESTION

How do the vibrations of the sound source compare for louder versus softer sounds?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 87–109: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 15–17
- Harp String Graph Handout — Student Work Pages, PDF pages 19–20
- Motion Graphs — Student Work Pages, PDF pages 21–22
- Discussion Self Assessment — Student Work Pages, PDF pages 23–24

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
How do the vibrations of the sound source compare for louder versus softer sounds?

Lesson 5: How do the vibrations from a sound source compare for higher-pitch versus lower-pitch sounds?

LESSON QUESTION

How do the vibrations from a sound source compare for higher-pitch versus lower-pitch sounds?

Plan about **1 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 110–124: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 18–19
- How does the motion detector work? — Student Work Pages, PDF pages 25–26
- Pitch Graphs — Student Work Pages, PDF pages 27–28
- Analyzing Graphs of Sound Source Vibrations — Student Work Pages, PDF pages 29–30

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation: How do the vibrations from a sound source compare for higher-pitch versus lower-pitch sounds?

Reading: Science Literacy Collection 2: Sounds in Nature

Words to know

- **acoustic** — related to sound
- **decibel** — a unit for expressing the relative intensity of sounds on a scale from zero for imperceptible sound to about 130 for painfully loud sound
- **density** — the quantity of mass per unit of volume
- **frequency** — the number of repetitions of a process over an increment of time; for sound, the rate of oscillations, or cycles of vibration, of a sound source
- **hertz** — the quantifiable unit for the frequency of waves, identifying the number of cycles of a vibration of a wave source per second
- **infrasonic** — describing sounds with a frequency lower than what human ears can detect
- **intensity** — the measurable amount of a property; for sound, loudness
- **loudness** — the quality of the intensity of sound
- **medium** — an intervening substance through which a higher than humans can detect force acts or an effect is produced
- **noise** — unwanted, intrusive sound
- **noise pollution** — unwanted sound that is harmful to the health of organisms
- **pitch** — the quality of highness or lowness of a sound, which is a reflection of the wave's frequency

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 125–131: the steps, materials and timing for this lesson.

Read

Read Science Literacy Student Reader, Collection 2: “Sounds in Nature”: PDF pages 20–29. Look at the pictures and maps together.

Student pages to print

- Exercise Page 2 — Student Work Pages, PDF pages 83–84

Check for understanding

- Use one of today's words in a sentence of your own.

Lesson 6: How can any object make so many different sounds?

LESSON QUESTION

How can any object make so many different sounds?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 132–139: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 20–21
- Connecting Graphical Representations to the Sounds Made — Student Work Pages, PDF pages 31–36
- Supplemental Investigation 6A — Student Work Pages, PDF pages 37–38
- Supplemental Investigation 6B — Student Work Pages, PDF pages 39–42

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
How can any object make so many different sounds?

Lesson 7: What is actually moving from the sound source to the window?

LESSON QUESTION

What is actually moving from the sound source to the window?

Plan about **1 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 140–149: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 22–24
- Investigation Plan — Student Work Pages, PDF pages 43–44
- Exit Ticket — Student Work Pages, PDF pages 45–46

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
What is actually moving from the sound source to the window?

Lesson 8: Do we need air to hear sound?

LESSON QUESTION

Do we need air to hear sound?

Plan about **1 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 150–160: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 25–26

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
Do we need air to hear sound?

Lesson 9: How can we model sound traveling through a solid, liquid, or gas?

LESSON QUESTION

How can we model sound traveling through a solid, liquid, or gas?

Plan about **1 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 161–171: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 27–29
- Sound and States of Matter — Student Work Pages, PDF pages 47–48
- Modeling the Matter around the Sound Source — Student Work Pages, PDF pages 49–50
- Self Assessment for Classroom Discussions — Student Work Pages, PDF pages 51–52

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
How can we model sound traveling through a solid, liquid, or gas?

Reading: Science Literacy Collection 3: Sound and Media

Words to know

- **acoustic** — related to sound
- **acoustic soundscape** — the collective properties and behaviors of sounds in a given physical environment
- **compression** — the episode in the transmission of a longitudinal wave during which particles of the medium are bunched closely together
- **density** — the quantity of mass per unit of volume
- **elasticity** — a measure of how much something can be stretched or bent without breaking and then return to its original shape
- **geosphere** — the system of all the solid, nonliving parts of Earth
- **hydrosphere** — the system of all Earth's water
- **media** — the collective means of mass communication,
- **medium** — an intervening substance through which a higher than humans can detect force acts or an effect is produced
- **noise** — unwanted, intrusive sound
- **plane** — the flat, two-dimensional region that contains any three points that are not colinear
- **shockwave** — a high-pressure mechanical wave that pushes particles out of their original positions

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 172-177: the steps, materials and timing for this lesson.

Read

Read Science Literacy Student Reader, Collection 3: "Sound and Media": PDF pages 30-39. Look at the pictures and maps together.

Student pages to print

- Exercise Page 3 — Student Work Pages, PDF pages 85-86

Check for understanding

- Use one of today's words in a sentence of your own.

Lesson 10: What exactly is traveling across the medium?

LESSON QUESTION

What exactly is traveling across the medium?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 178–193: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 30–32
- Visualizing Sound in a Medium Investigations — Student Work Pages, PDF pages 53–56
- Analyzing Sound in a Medium Simulation Data — Student Work Pages, PDF pages 57–58
- Visualizing Sound Analogy Map — Student Work Pages, PDF pages 59–60

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation: What exactly is traveling across the medium?

Lesson 11: How does sound make matter around us move?

LESSON QUESTION

How does sound make matter around us move?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 194–205: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 33–35
- Revised Model — Student Work Pages, PDF pages 61–62
- Gotta-Have-It Checklist — Student Work Pages, PDF pages 63–64
- Peer Feedback Self Assessment — Student Work Pages, PDF pages 65–66

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
How does sound make matter around us move?

Lesson 12: What goes on in people's ears so they can detect certain sounds?

LESSON QUESTION

What goes on in people's ears so they can detect certain sounds?

Plan about **1 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 206–214: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 36–37
- Model Inside an Ear — Student Work Pages, PDF pages 67–68
- Information from the Experts — Student Work Pages, PDF pages 69–70
- Hearing in Elephants, Dogs, and Humans — Student Work Pages, PDF pages 71–72
- Activity Sheet — Student Work Pages, PDF pages 73–74

For the teacher

- Teacher Reference — Teacher Guide, PDF pages 288–291

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
What goes on in people's ears so they can detect certain sounds?

Reading: Science Literacy Collection 4: Compression Waves

Words to know

- **compression** — the episode in the transmission of a longitudinal wave during which particles of the medium are bunched closely together
- **decibel** — a unit for expressing the relative intensity of sounds on a scale from zero for imperceptible sound to about 130 for painfully loud sound
- **Doppler effect** — a change in the observed frequency of waves when a wave source and an observer are moving seismic, adj. referring to earthquakes or other vibrations closer together or farther apart of Earth's crust
- **frequency** — the number of repetitions of a process over an increment of time; for sound, the rate of oscillations, or cycles of vibration, of a sound source
- **infrasonic** — describing sounds with a frequency lower than what human ears can detect
- **intensity** — the measurable amount of a property; for sound, loudness
- **longitudinal wave** — a wave that vibrates in the direction surface wave, n. a mechanical wave that propagates in which it propagates along the boundary between two media
- **medium** — an intervening substance through which a higher than humans can detect force acts or an effect is produced
- **pitch** — the quality of highness or lowness of a sound, which is a reflection of the wave's frequency
- **plane** — the flat, two-dimensional region that contains any three points that are not colinear
- **rarefaction** — the episode in the transmission of a longitudinal wave during which particles of the medium are spaced most far apart
- **shockwave** — a high-pressure mechanical wave that pushes particles out of their original positions

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 215–222: the steps, materials and timing for this lesson.

Read

Read Science Literacy Student Reader, Collection 4: "Compression Waves": PDF pages 40–49. Look at the pictures and maps together.

Student pages to print

- Exercise Page 4 — Student Work Pages, PDF pages 87–88

Check for understanding

- Use one of today's words in a sentence of your own.

Lesson 13: What transfers more energy, waves of bigger amplitude or waves of greater frequency?

LESSON QUESTION

What transfers more energy, waves of bigger amplitude or waves of greater frequency?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 223–241: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 38–39
- Analogy Map for Energy Transfer Investigation — Student Work Pages, PDF pages 75–76
- Data Tables for Energy Transfer Investigation — Student Work Pages, PDF pages 77–78
- Energy Transfer Investigation Class Results — Student Work Pages, PDF pages 79–80

For the teacher

- Answer Key — Teacher Guide, PDF pages 292–294

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation: What transfers more energy, waves of bigger amplitude or waves of greater frequency?

Lesson 14: How can we explain our anchoring phenomenon, and which of our questions can we now answer?

LESSON QUESTION

How can we explain our anchoring phenomenon, and which of our questions can we now answer?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 242–246: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 40–41

For the teacher

- Rubric — Teacher Guide, PDF pages 295–303

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
How can we explain our anchoring phenomenon, and which of our questions can we now answer?

Reading: Science Literacy Collection 5: Air, Wind, and Sound

Words to know

- **association** — a mental connection that a person makes between two or more co-occurring things
- **frequency** — the number of repetitions of a process over an increment of time; for sound, the rate of oscillations, or cycles of vibration, of a sound source
- **hertz** — the quantifiable unit for the frequency of waves, identifying the number of cycles of a vibration of a wave source per second
- **infrasonic** — describing sounds with a frequency lower than what human ears can detect
- **intensity** — the measurable amount of a property; for sound, loudness
- **media** — the collective means of mass communication,
- **noise** — unwanted, intrusive sound
- **pitch** — the quality of highness or lowness of a sound, which is a reflection of the wave's frequency
- **support** — in an argument, evidence that bears proof of a position
- **wind turbine** — a device that, by rotation of a vaned stress. wheel, converts the kinetic energy of wind to electricity

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 247–254: the steps, materials and timing for this lesson.

Read

Read Science Literacy Student Reader, Collection 5: “Air, Wind, and Sound”: PDF pages 50–59. Look at the pictures and maps together.

Student pages to print

- Exercise Page 5 — Student Work Pages, PDF pages 89–94

Check for understanding

- Use one of today's words in a sentence of your own.

WORDS QUIZ

Sound Waves

Name: _____ Date: _____

Circle the letter of the best answer.

- 1.** Which word means “a device that, by rotation of a vaned stress. wheel, converts the kinetic energy of wind to electricity”?
 - a) infrasonic
 - b) plane
 - c) wind turbine
 - d) social media
- 2.** Which word means “to hold a position against something”?
 - a) modulus of elasticity
 - b) acoustic soundscape
 - c) compression
 - d) oppose
- 3.** Which word means “describing sounds that have a frequency”?
 - a) noise pollution
 - b) ultrasonic
 - c) modulus of elasticity
 - d) social media
- 4.** Which word means “the episode in the transmission of a longitudinal wave during which particles of the medium are spaced most far apart”?
 - a) sustain
 - b) science literacy
 - c) rarefaction
 - d) vibration
- 5.** Which word means “the quantifiable unit for the frequency of waves, identifying the number of cycles of a vibration of a wave source per second”?
 - a) density
 - b) oppose
 - c) hertz
 - d) geosphere
- 6.** Which word means “the measurable amount of a property; for sound, loudness”?
 - a) intensity
 - b) frequency
 - c) amplify
 - d) compression

- 7.** Which word means “a mental connection that a person makes between two or more co-occurring things”?
- a) social media
 - b) density
 - c) association
 - d) medium
- 8.** Which word means “the quality of the intensity of sound”?
- a) loudness
 - b) media
 - c) solution
 - d) wind turbine
- 9.** Which word means “the accuracy of pitch up and down a string and across all strings of a musical instrument”?
- a) social media
 - b) amplify
 - c) frequency
 - d) intonation
- 10.** Which word means “unwanted sound that is harmful to the health of organisms”?
- a) ultrasonic
 - b) sustain
 - c) frequency
 - d) noise pollution
- 11.** Which word means “an intervening substance through which a higher than humans can detect force acts or an effect is produced”?
- a) social media
 - b) medium
 - c) solvent
 - d) loudness
- 12.** Which word means “is a quantity that measures how forth past its starting position resistant a material is to temporarily deforming under”?
- a) loudness
 - b) modulus of elasticity
 - c) hertz
 - d) media

FOR THE TEACHER

Answers

Unit quiz key

1. c 2. d 3. b 4. c 5. c 6. a 7. c 8. a 9. d 10. d 11. b 12. b