

How sound travels and how we hear it

Grade 6 science (Year 7 · Class 6) · Worksheet

Name: _____ Date: _____ Class: _____

These problems train you to link sound to vibrations, explain why sound needs a medium, tell loudness from pitch and calculate distances and frequencies. They finish with sonar, storm and noise problems that need several steps.

The worksheet suits Grade 6, Year 7 and Class 6 students working with NGSS middle school wave topics or similar curricula.

Level: Grade 6 science (Year 7 · Class 6) · **Curriculum:** MS-PS4-1

Problem 1 What vibrates? (easy)

Name the part that vibrates to make the sound in each case.

1. A guitar.
2. A drum.
3. Your own voice.
4. A loudspeaker.

Problem 2 Can sound travel? (easy)

State whether sound can travel through each of these: air, water, a steel wall, empty space.

Problem 3 Units of sound (easy)

1. Name the unit of loudness and give its symbol.
2. Name the unit of frequency and give its symbol.
3. Convert 2 kHz into Hz.

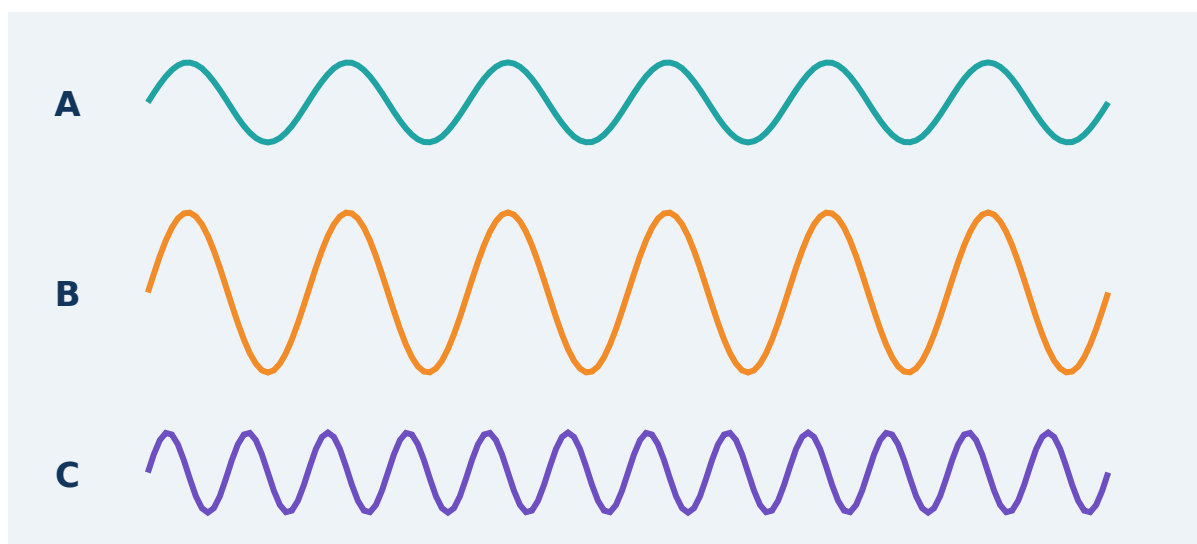
Problem 4 Loudness or pitch? (easy)

Decide whether each change alters the loudness or the pitch of a guitar note.

1. Plucking the string harder.
2. Tightening the string.
3. Pressing the string against the neck to make the vibrating part shorter.

Problem 5 Comparing three traces (easy)

The figure shows three sounds recorded with the same equipment.



Three sounds recorded with the same equipment and time scale.

1. Which sound is the loudest?
2. Which sound has the highest pitch?
3. Which two sounds have the same pitch?

Problem 6 Ear safety (easy)

A farm worker in Kenya uses a loud tractor every day.

1. Suggest two ways to protect his hearing.
2. Explain why very loud noise is harmful.

Problem 7 Thunder and lightning (medium)

A child in Kampala sees lightning and hears thunder 4 s later. Use 340 m/s.

1. Calculate the distance to the lightning in metres.
2. Write the answer in kilometres.

Problem 8 Speed in three media (medium)

The speed of sound is about 340 m/s in air, 1500 m/s in water and 5000 m/s in steel.

1. Calculate the time for sound to travel 1500 m in each medium (to 2 significant figures).
2. State in which medium sound is fastest and why.

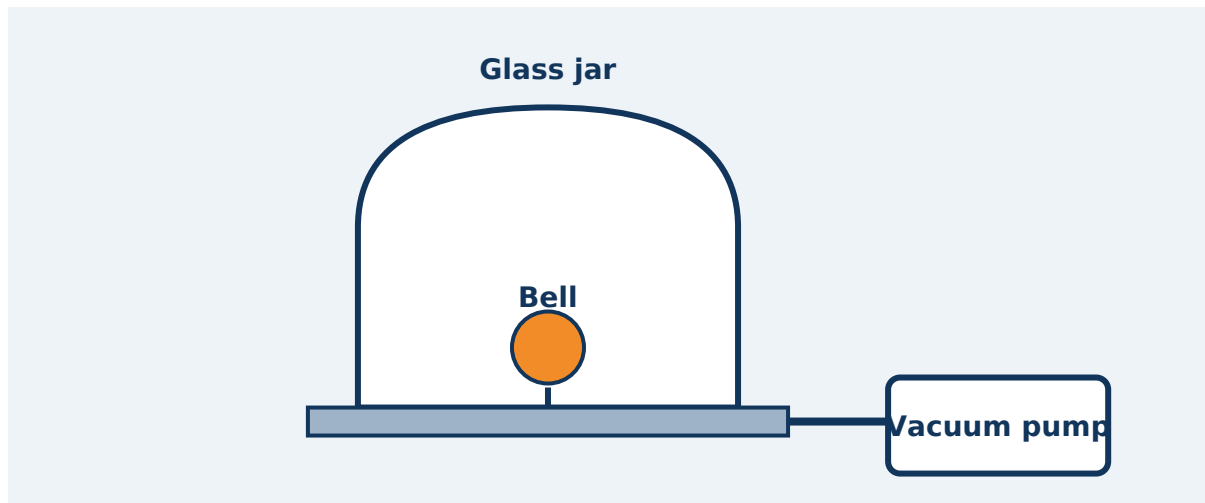
Problem 9 An echo (medium)

Hina shouts towards a wall 85 m away. Use 340 m/s.

1. Calculate the total distance travelled by the sound.
2. Calculate the time before she hears her echo.

Problem 10 Bell in a jar (medium)

A bell is ringing in a sealed glass jar. A pump slowly removes the air.



A bell jar connected to a vacuum pump.

1. Describe what you hear as the air is removed.
2. Explain your answer.
3. Explain why astronauts on a spacewalk talk by radio.

Problem 11 Frequency (medium)

Calculate the frequency of each source.

1. A tuning fork vibrates 5120 times in 20 s.
2. A mosquito wing beats 1650 times in 3 s.

Problem 12 Ranking pitches (medium)

The table shows four sounds.

Sound	Frequency (Hz)
Flute note	880
Bass drum	80
Bat squeak	50 000
Man speaking	120

1. Rank the sounds from lowest to highest pitch.
2. Which sound is too high for humans to hear?

Problem 13 Noise levels (medium)

Sound levels of five sources: whisper 30 dB, conversation 60 dB, busy road 80 dB, live concert 105 dB, jet engine nearby 140 dB. Long exposure above 85 dB can damage hearing.

1. List the sources that are safe for a long time.
2. List the sources that can cause damage.
3. Suggest how a musician at a concert can reduce the risk.

Problem 14 Spot the error (medium)

Diego says: "A high-pitched sound is always louder than a low-pitched sound."

1. Explain what is wrong.
2. Give a correct example.

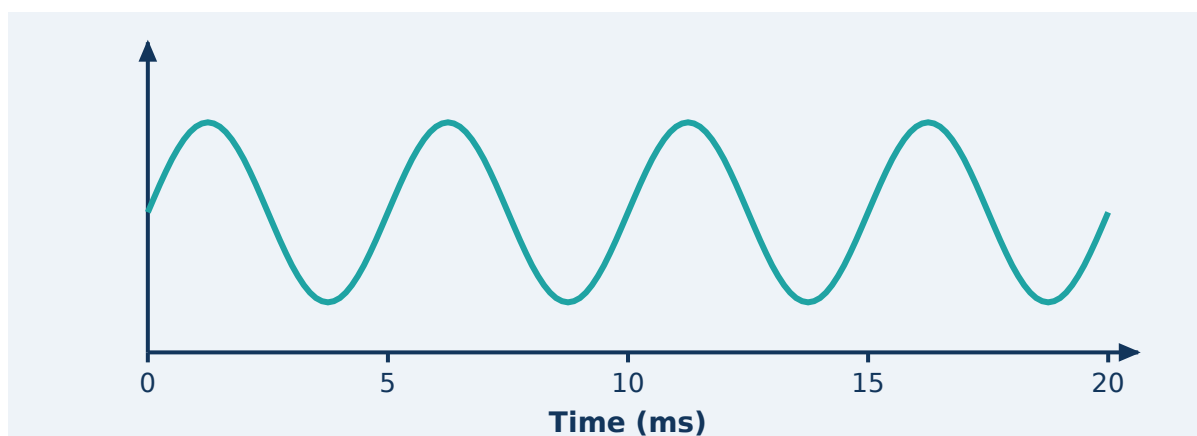
Problem 15 Hitting a drum (medium)

Mei hits a drum harder and the sound gets louder, but its pitch stays the same.

1. Explain why the sound is louder.
2. Explain why the pitch does not change.

Problem 16 Frequency from a trace (hard)

The figure shows the trace of a sound on a screen.



Trace of a sound on a screen.

1. Count the complete waves between 0 and 20 ms.
2. Convert 20 ms into seconds.
3. Calculate the frequency.
4. State how the trace would change for a sound of twice the frequency.

Problem 17 A moving storm (hard)

A student in Pune watches a storm. At one moment thunder follows lightning after 7.5 s. Exactly 60 s later the delay is 4.5 s. Use 340 m/s.

1. Calculate both distances.
2. Calculate how far the storm moved.
3. Calculate its speed in m/s and in km/h.

Problem 18 Sonar on a fishing boat (hard)

Kofi's fishing boat sends a sound pulse down to the sea floor. The echo returns after 0.40 s. Later an echo from a shoal of fish returns after 0.12 s. The speed of sound in water is 1500 m/s.

1. Calculate the depth of the sea floor.
2. Calculate the depth of the shoal.
3. Calculate how far the shoal is above the sea floor.

Problem 19 Noise in a factory (hard)

Workers in a factory are exposed to 95 dB for eight hours. Ear defenders reduce the level reaching the ear by 25 dB. The safe limit for long exposure is 85 dB.

1. Calculate the level reaching the ear with defenders.
2. State whether this is safe.
3. Suggest two further actions the factory can take.

Problem 20 Planning an investigation (hard)

Plan an investigation to find how the length of a plucked rubber band affects the pitch.

1. State the variable to change and the variable to measure.
2. Name two variables to keep the same.
3. State your prediction and give a reason.
4. Give one safety point.