

Name \_\_\_\_\_

Date \_\_\_\_\_

## Sound Absorption Assessment

1. What is the meaning of the word volume?

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2. What is the meaning of the word absorb?

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3. Which of these objects is the best sound absorber?

- a. rock
- b. paper
- c. styrofoam
- d. glass

4. Sound travels in

- a. lines
- b. waves
- c. bubbles
- d. drops

5. What is the purpose of a sound absorbing wall?

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6. Where might you find a sound absorbing wall? Why?

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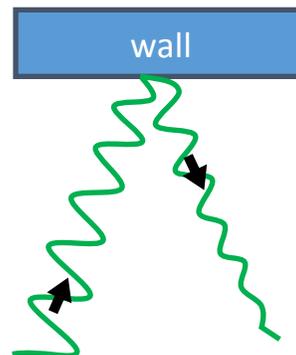
7. The high school band needs to practice next door to a math class. The math students cannot hear the math teacher when the band is practicing. The principal agreed to build a sound absorbing wall between the two rooms. The principal hired the Quiet Time Engineering Company to design a sound absorbing wall for the school.

Who is the client? \_\_\_\_\_

8. Engineers at the Quiet Time Company have designed and built a model of the sound absorbing wall. What should they do next?
- a. sketch the design ideas
  - b. determine the constraints
  - c. test the prototype
  - d. determine the criteria

9. Which best describes what is happening to the sound wave shown to the right?

- a. it is absorbed
- b. it is reflected
- c. it is deleted
- d. it is transmitted



10. Reflection: Write about the materials your team used to design a sound absorbing wall. Why did you choose those materials? Were you successful? What would you do differently?

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Date \_\_\_\_\_

## Sound Absorption Assessment **Answer Key**

1. What is the meaning of the word volume?

The level of sound that is heard by a listener. The volume can be high (loud sound) or low (quiet sound).

2. What is the meaning of the word absorb?

To take in, such as an object that causes a sound to be reduced in volume, going from loud to quiet.

3. Which of these objects is the best sound absorber?

- a. rock
- b. paper
- c. styrofoam
- d. glass

4. Sound travels in

- a. lines
- b. waves
- c. bubbles
- d. drops

5. What is the purpose of a sound absorbing wall?

To reduce the volume of sound that is heard by a nearby person.

6. Where might you find a sound absorbing wall? Why?

In movie theaters, to reduce the sound of the audience (ex, people talking, coughing) while they are watching a movie.

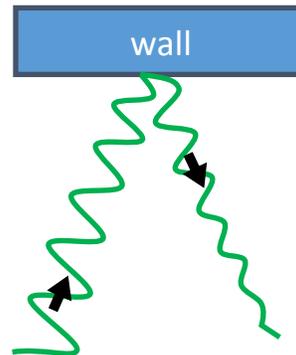
7. The high school band needs to practice next door to a math class. The math students cannot hear the math teacher when the band is practicing. The principal agreed to build a sound absorbing wall between the two rooms. The principal hired the Quiet Time Engineering Company to design a sound absorbing wall for the school.

Who is the client? **The principal (Note: the math students are the "users".)**

8. Engineers at the Quiet Time Company have designed and built a model of the sound absorbing wall. What should they do next?

- a. sketch the design ideas
- b. determine the constraints
- c. test the prototype**
- d. determine the criteria

9. Which best describes what is happening to the sound wave shown to the right?



- a. it is absorbed
- b. it is reflected**
- c. it is deleted
- d. it is transmitted

10. Reflection: Write about the materials your team used to design a sound absorbing wall. Why did you choose those materials? Were you successful? What would you do differently? **Free response, based on the design activity.**

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These rubrics are used to assess the engineering design process. The first one can be used *by the teacher* to assess the notebook and the design itself. The second one can be used *by the teacher* to assess teamwork.

NAME \_\_\_\_\_

Date \_\_\_\_\_

DESIGN TASK: \_\_\_\_\_

Score \_\_\_\_\_ / 25

	5	4	3	2	1
<b>Identified each step of the design process</b> (1. problem, 2. goal, 3. client, 4. user, 5. criteria, 6. constraints)	Correctly identified 6 steps of the design process	Correctly identified 5 steps of the design process	Correctly identified 4 steps of the design process	Correctly identified 3 steps of the design process	Correctly identified 1 or 2 steps of the design process
<b>Individual Design</b> (includes 1. clearly drawn sketch, 2. measurements, 3. labels, 4. different viewpoints, 5. materials)	Individual design fully explained (all 5 criteria were included)	Individual design includes 4 of the requirements	Individual design includes 2 or 3 of the requirements	Individual design includes only 1 of the requirements	Individual design not included
<b>Group Design</b> (same 5 criteria as Individual Design)	Group design fully explained (all 5 criteria were included)	Group design includes 4 or 5 of the requirements	Group design includes 2 or 3 of the requirements	Group design includes only 1 of the requirements	Group design not included
<b>Applied Knowledge</b>	Applied what was learned to a successful design	Considered many ideas that were learned to make a successful design	Considered some ideas that were learned to make a successful design	Considered few ideas that were learned to make a successful design	Did not consider ideas that were learned to make a success design
<b>Reflection</b> (1. What I did? 2. What worked well? 3. What didn't work well? 4. What I would change? 5. What I learned?)	Reflection answered all questions	Reflection answered 4 of the questions	Reflection answered 3 of the questions	Reflection answered 2 of the questions	Reflection answered only 1 of the questions

	3	2	1
<b>Participation</b>	I participated in all parts of the design process with my group	I participated in most of the design process with my group	I did not help my group much with the design process
<b>Cooperation</b>	I respectfully cooperated with all members of my group	I was cooperative part of the time	I did not cooperate well with my group members
<b>Presentation</b>	My presentation was clear and showed what I know about the design process	My presentation was somewhat clear or did not fully explain the design process	My presentation was not clear or did not show an understanding of the design process

TEAMWORK:

\_\_\_\_ / 9

*This rubric is used by the students to self-assess their notebook. The “smiley” face indicates that the specified content was included in their notebooks, the “frown” face indicates that the content was not included.*

Problem		
Goal		
Client		
User		
Criteria		
Constraints		
Individual Design		
Group Design		
Sketch		
Reflection		

## Design Brief

A group of students are starting a rock band. One of the students' parents will allow the band to practice in their house but only if a sound reducing wall is installed in the student's bedroom. The parents hire the Silence Is Golden Company to design the sound reducing wall. As one of the company's acoustic engineers, you and your team must design, build, and test a wall that reduces as much of the noise that escapes from the student's bedroom as possible. The wall should be no thicker than 4.5 cm.

### Teacher Resources and Supporting Information

- The full SLED engineering design activity can be accessed via the STEMEd hub: "Sound Absorption," <https://stemedhub.org/resources/1766>.
- Another activity focused on sound absorption which would be a nice complement to the current engineering design activity is "Sound Booth Engineers," available through LEARN NC, a program of the University of North Carolina School of Education, [www.learnnc.org/lp/pages/7359?ref=search](http://www.learnnc.org/lp/pages/7359?ref=search)
- Information regarding the 2-room testing model: The sound generator shown in Figure 1 (p. 53) is a 12V buzzer (RadioShack part number 273-059, \$3.99) connected with red and black alligator clip wires to a battery pack (RadioShack part number 270-409, \$2.49) containing 4 AA batteries. A kitchen timer can also be used as the sound generator, although this can lead to less reliable results.