Physics of Sound

Youth Science Institute

Second-Grade Teacher Resource Guide

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Physics of Sound and Motion:
Lesson Summary and Vocabulary

Lesson Summary: The YSI ***Physics of Sound and Motion*** program provides a hands-on introduction to physics and a closer look at two of its major topics. Students participate in an instructor-led discussion on energy, matter, and other physics fundamentals before moving on to the specifics of sound and motion. During the Sound portion of the presentation, activities are used to qualify sound as a vibration and determine how it travels. Students work together to model molecules and waves, participate in experiments on sound traveling through different states of matter, and create a noisemaking device to take home. The Motion half of the program places an emphasis on flight. Students discuss the four fundamental forces of flight and Bernoulli's principle, creating first paper fliers and then stomp rockets to try different methods of propulsion through the air. For older groups, an emphasis is also placed on Newton's laws of motion, and how adding mass to their rocket can affect it. This program focuses on critical thinking and experimentation, encouraging students to join in the discovery process at every stage.

Vocabulary: Below are words and concepts that relate to the ***Physics of Sound and Motion*** program.

Drag: the "backward" force of flight; friction due to collisions with air molecules
Energy: the ability to do work; found in forms such as light, heat, and chemical storage
Force: a push or a pull
Gas: the least dense state of matter, where molecules move freely to fill all space provided
Gravity: the "downward" force of flight; the universal force attracting two objects with mass
Lift: the "upward" force of flight; an upward push due to differences in air pressure
Liquid: the state of matter where molecules can move, but stay close to each other
Matter: the basic structural component of the universe; everything physical
Molecules: small particles of matter
Motion: a change in position caused by a force
Physics: the field of science that deals with matter, energy, motion, and force
Solid: the densest state of matter, where molecules are fixed in place
Thrust: the "forward" force of flight; a force that propels a flying object
Vibrations: small movements back and forth; sound

Definitions based on www.dictionary.reference.com

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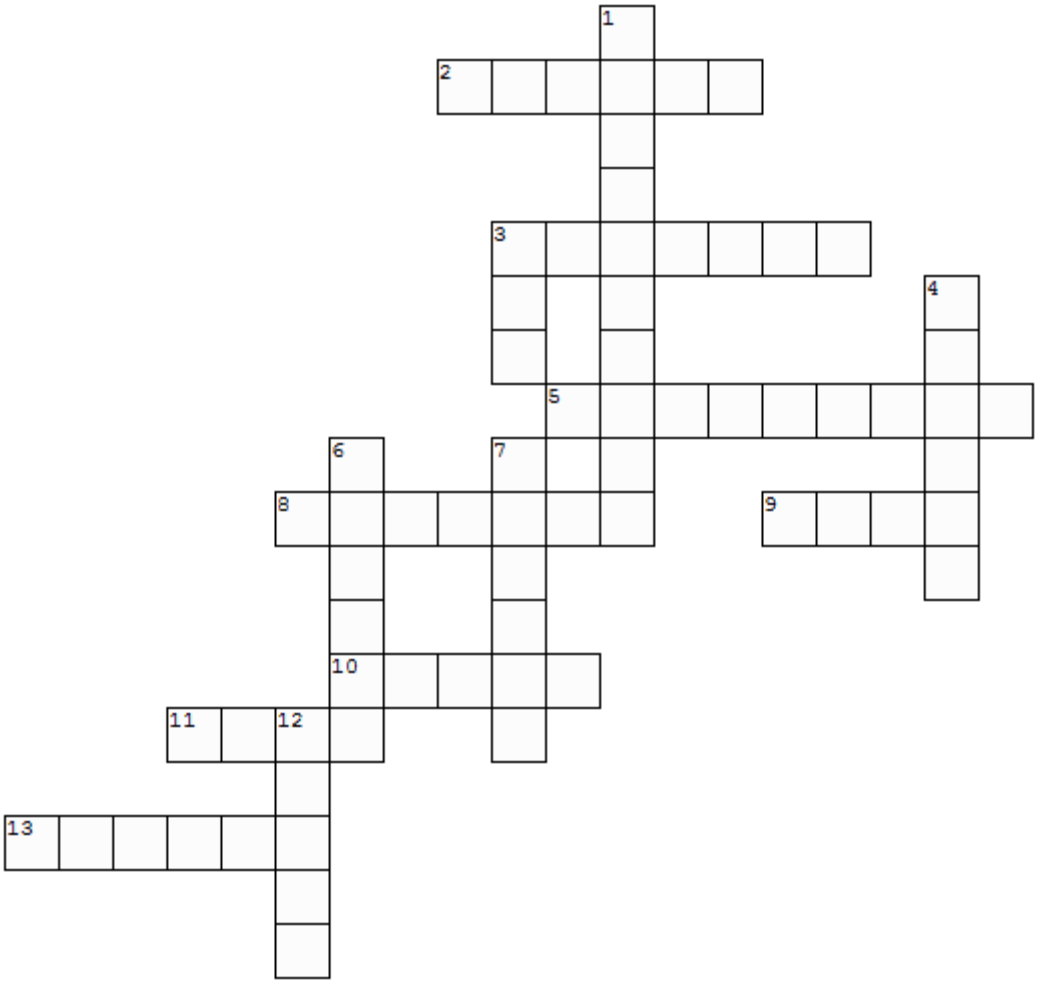
Name_____

Physics of Sound and Motion
Language Arts Crossword Puzzle



MOLECULES PHYSICS VIBRATIONS GRAVITY FORCE LIQUID MATTER SOLID
MOTION ENERGY DRAG LIFT GAS THRUST

Down

1. Small movements back and forth; sound.
3. The least dense state of matter, where molecules move freely to fill all space provided.
4. The ability to do work, found in forms such as light, heat, and chemical storage.
6. The "forward" force of flight; a force that propels a flying object.
7. The state of matter where molecules can move, but stay close to each other.
12. A push or a pull.

Across

2. A change in position caused by a force.
3. The "downward" force of flight; the universal force attracting two objects with mass.
5. Small particles of matter.
8. The field of science that deals with matter, energy, motion, and force.
9. The "backward" force of flight; friction due to collisions with air molecules.
10. The densest state of matter, where molecules are fixed in place.
11. The "upward" force of flight; an upward push due to differences in air pressure.
13. The basic structural component of the universe; everything physical

Definitions based on www.dictionary.reference.com

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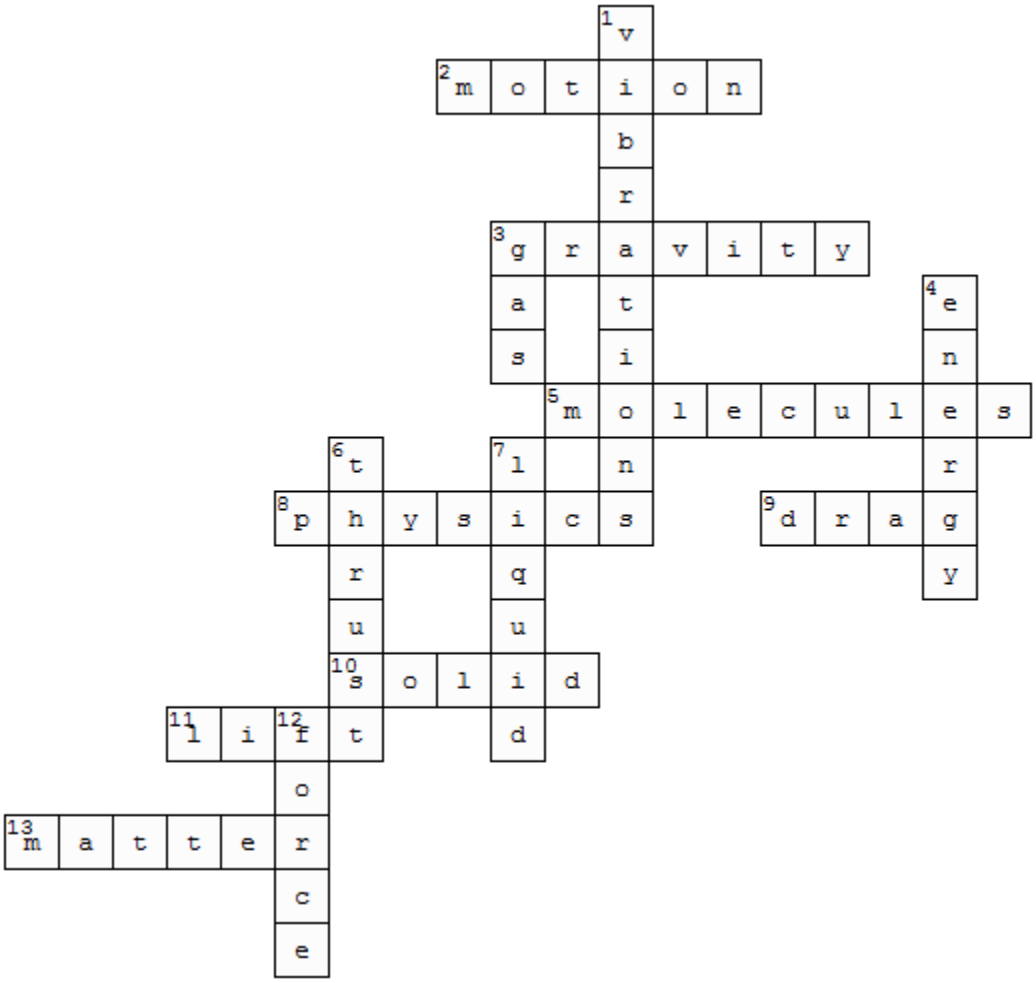
Answer Key
Physics of Sound and Motion
Language Arts Crossword Puzzle



Down

1. Small movements back and forth; sound **(vibrations)**.
3. The least dense state of matter, where molecules move freely to fill all space provided **(gas)**.
4. The ability to do work, found in forms such as light, heat, and chemical storage **(energy)**.
6. The "forward" force of flight; a force that propels a flying object **(thrust)**.
7. The state of matter where molecules can move, but stay close to each other **(liquid)**.
12. A push or a pull **(force)**.

Across

2. A change in position caused by a force **(motion)**.
3. The "downward" force of flight; the universal force attracting two objects with mass **(gravity)**.
5. Small particles of matter **(molecules)**.
8. The field of science that deals with matter, energy, motion, and force **(physics)**.
9. The "backward" force of flight; friction due to collisions with air molecules **(drag)**.
10. The densest state of matter, where molecules are fixed in place **(solid)**.
11. The "upward" force of flight; an upward push due to differences in air pressure **(lift)**.
13. The basic structural component of the universe; everything physical **(matter)**.

Name: _____

Physics of Sound and Motion
Language Arts Word Search

Circle the vocabulary in the word search below. Can you find all the earth-related words?

F O R C E R N L G E C N M A U M
H E X L F Y H R X P O Q A P L O
F I R V X M I E X I X B T D I R
Y T I V A R G O T U O I T S R H
C V W V E P K O W O H I E E E F
D N M B I M M L M T V X R L N R
N U E X B B I D Q Y F P X U Q A
J J G V M Q R T S U R H T C X M
A Z G G U Q G A S W W A V E Q P
T K A I Y W E C T S X F P L Y A
W R D W K T E Y U I O B Y O F D
D Y G R E N E R F P O L R M N S
T F I L L Z F N P Y R N I X Q Z
V M H V J M U Z I H F E S D H J
X F Q Q Z F Y L M J W W G E S E
K I M T S P H Y S I C S Y K T T

Word Bank

DRAG
ENERGY
FORCE
GAS
GRAVITY
LIFT
LIQUID
MATTER
MOLECULES
MOTION
PHYSICS
SOLID
THRUST
VIBRATIONS

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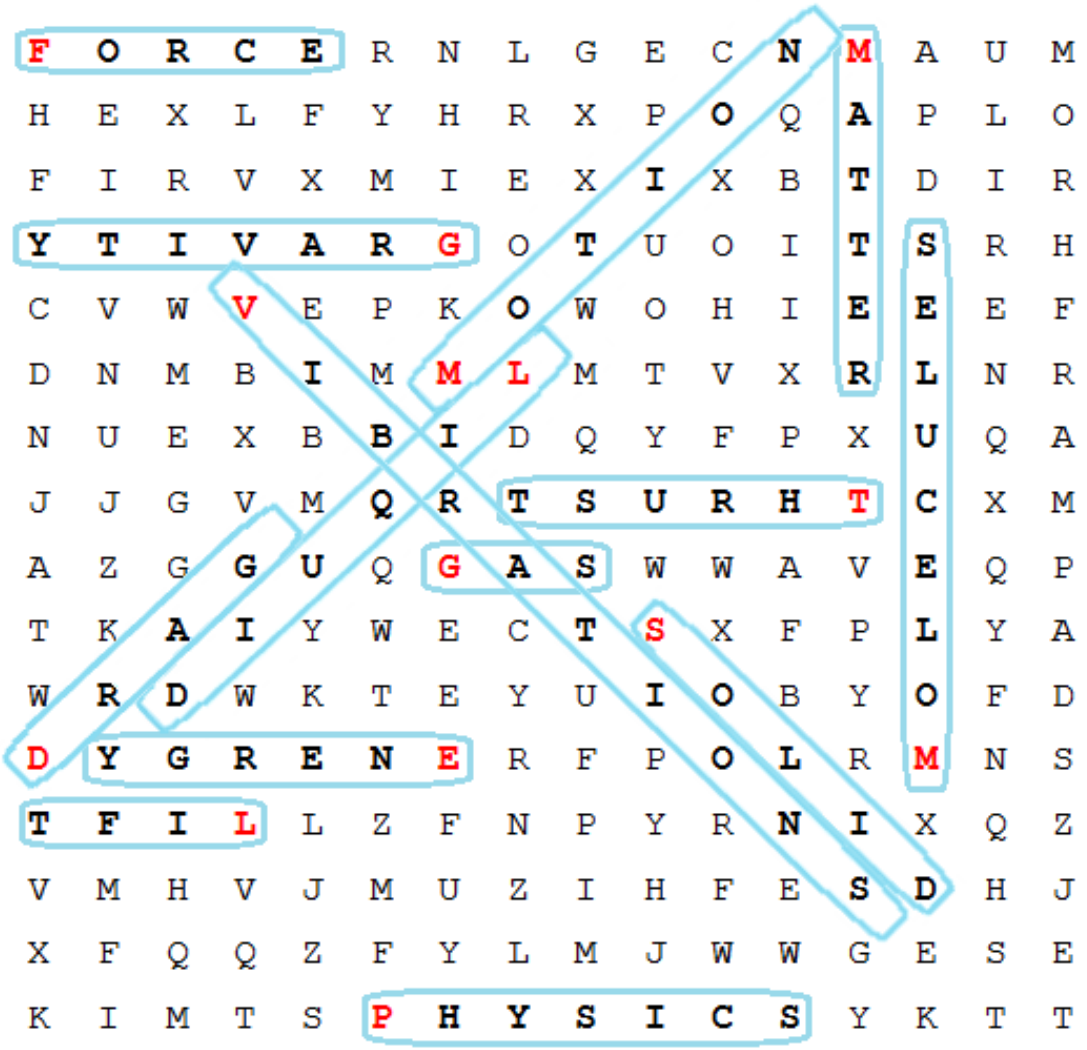
Answer Key
Physics of Sound and Motion
Language Arts Word Search



Word Bank

DRAG
ENERGY
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Physics of Sound and Motion: Extension Activities

The extension activities listed below are from RAFT (Resource Area For Teaching). RAFT educational content is available online (www.raftbayarea.org) at no cost and is aligned to California Science Standards and Next Generation Science Standards. Below is a selection of post-visit activities from RAFT to build on student learning about physics, sound, and motion.

RAFT Idea: Sound String - Resource Area For Teaching - RAFT Bay Area
Grades Covered: K through 6
Subjects Covered: Physical Science
Curriculum topics: Sound, Vibration, Sound Transfer
Description: Students can transmit sound using a simple device constructed from cups and string…
http://www.raftbayarea.org/ideas/Sound%20String.pdf

RAFT Idea: Lunch Plate Launch Pad - Resource Area For Teaching - RAFT Bay Area
Grades Covered: 2 through 12
Subjects Covered: Physical Science, Earth/Space Science
Curriculum topics: Forces, Motion, Gravity, Newton's Laws
Description: Explore forces, trajectories, and flight stability…
http://www.raftbayarea.org/ideas/Lunch%20Plate%20Launch%20Pad.pdf

RAFT Idea: Marble Rollercoaster - Resource Area For Teaching - RAFT Bay Area
Grades Covered: 2 through 12
Subjects Covered: Physical Science
Curriculum topics: Forces, Motion, Gravity, Potential and Kinetic Energy
Description: Students will love this hands-on exploration of forces and motion…
http://www.raftbayarea.org/ideas/Marble%20Rollercoaster.pdf

Physics of Sound and Motion: Education Standards

Our Physics of Sound and Motion program will contribute to students' ability to meet the California Science Content Standards, Common Core, and Next Generation Science Standards listed on the following pages.

California Science Content Standards Second Grade:

Physical Sciences: 1. The motion of objects can be observed and measured. As a basis for understanding this concept:

- **a.** *Students know* the position of an object can be described by locating it in relation to another object or to the background.
- **b.** *Students know* an object's motion can be described by recording the change in position of the object over time.
- **c.** *Students know* the way to change how something is moving is by giving it a push or a pull. The size of the change is related to the strength, or the amount of force, of the push or pull.
- **d.** *Students know* tools and machines are used to apply pushes and pulls (forces) to make things move.
- **e.** *Students know* objects fall to the ground unless something holds them up.
- **f.** *Students know* magnets can be used to make some objects move without being touched.
- **g.** *Students know* sound is made by vibrating objects and can be described by its pitch and volume.

Investigation and Experimentation: 4. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:

- **a.** Make predictions based on observed patterns and not random guessing.
- **c.** Compare or sort common objects according to two or more physical attributes (e.g., color, shape, texture, size, weight).
- **g.** Follow oral instructions for a scientific investigation.

Excerpted from CA State Standards: http://www.cde.ca.gov/

Common Core Second Grade:

Speaking and Listening Standards: Students will…

1. Participate in collaborative conversations with diverse partners about grade 2 topics with peers and adults in small and larger groups.
    a. Follow agreed-upon rules for discussions.
    b. Build on others' talk in conversations by linking their topics to the remarks of others.

c. Ask for clarification and further information as needed about the topics under discussion.

2. Recount or describe key information from information presented orally.
3. Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or clarify something that is not understood.

Excerpted from Common Core Standards: http://www.corestandards.org/

Next Generation Science Standards Second Grade:
Structure and Properties of Matter

- **2-PS1-2:** Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
  - **Science and Engineering Practices:**
    - **Analyzing and Interpreting Data**: Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.
    - Analyze data from tests of an object or tool to determine if it works as intended. (2-PS1-2)
  - **Disciplinary core ideas**:
    - **PS1.A: Structure and Properties of Matter:** Different properties are suited to different purposes. (2-PS1-2)
  - **Crosscutting Concepts**
    - **Cause and Effect:** Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2)

Engineering Design

- **K-2-ETS1-3:** Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
  - **Science and Engineering Practices:**
    - **Analyzing and Interpreting Data**: Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.
    - Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3)
  - **Disciplinary core ideas**:
    - **ETS1.C: Optimizing the Design Solution:** Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K-2-ETS1-3)

Excerpted from NGSS: http://www.nextgenscience.org/