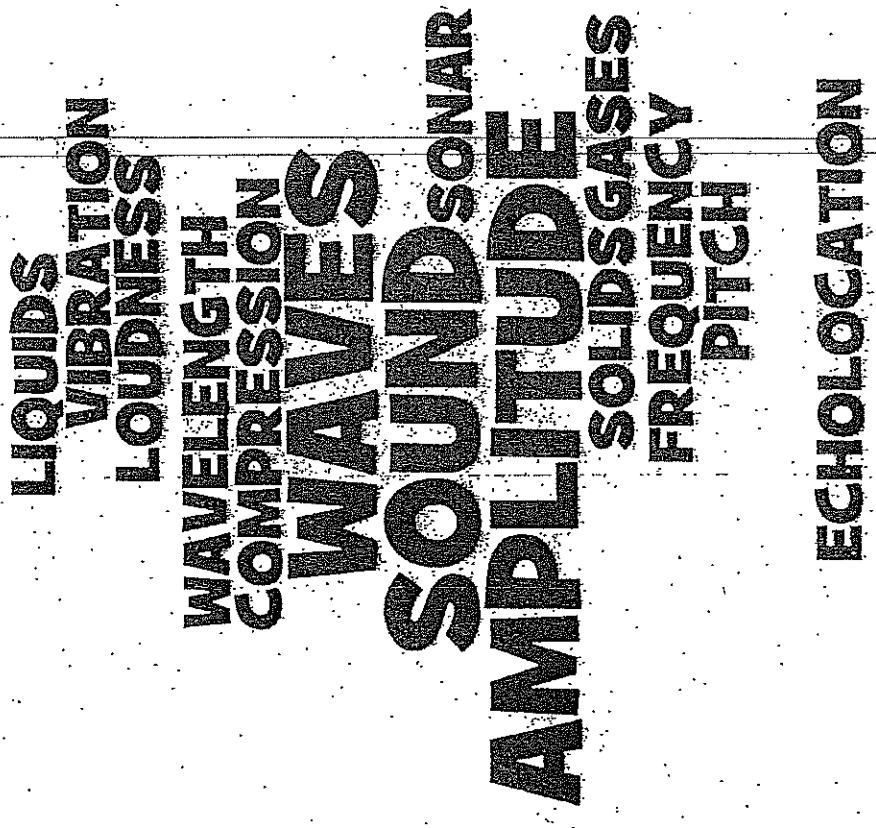
I, _____, promise to love and care for this wonderful packet of notes. I will bring it to each science class, and study the valuable information inside of it. I will be responsible and put forth my best effort.

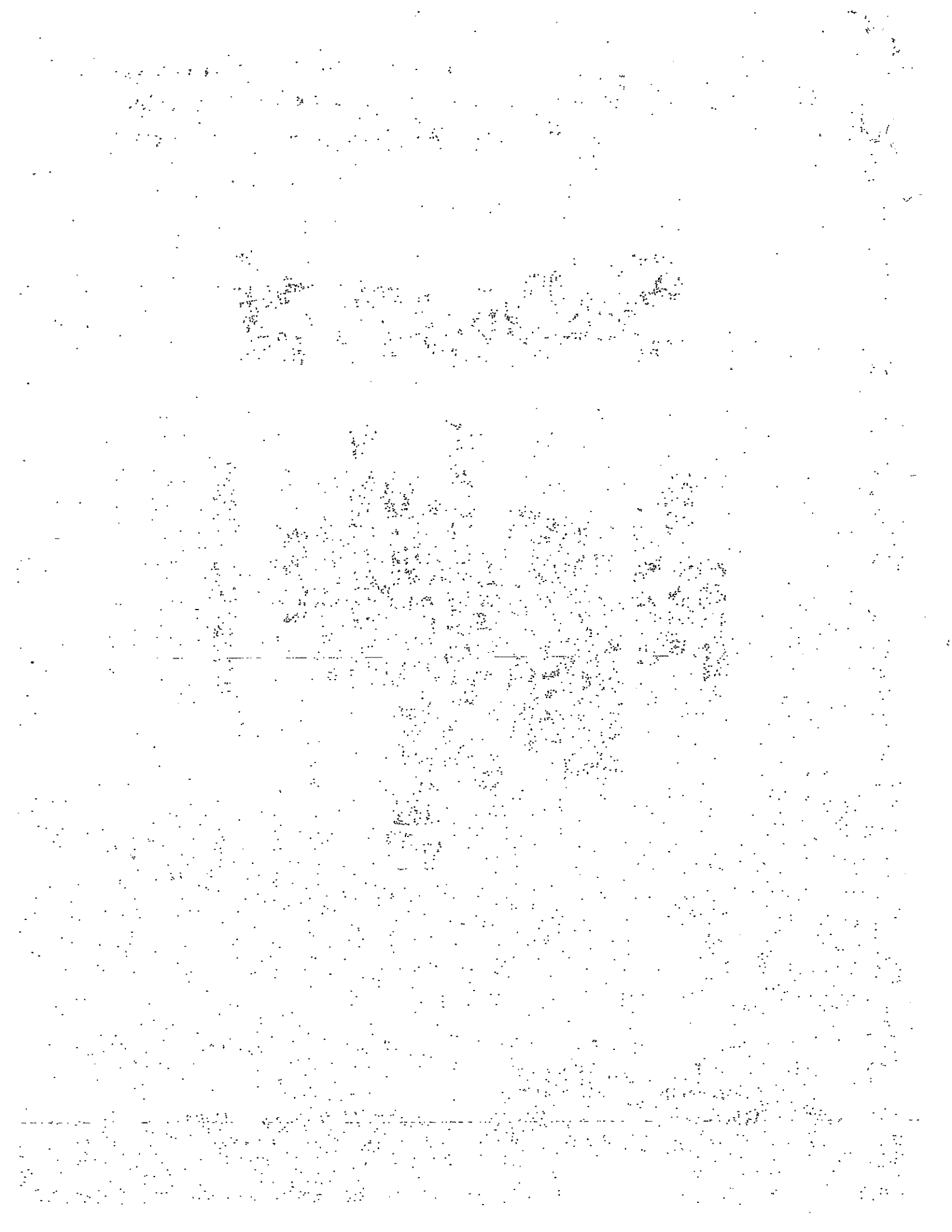
Sound



Virginia SOLs-

2 The student will investigate and understand how sound is transmitted and is used as a means of communication. Key concepts include

a) frequency, waves, wavelength, vibration;
b) the ability of different media (solids, liquids, and gases) to transmit sound; and
c) uses and applications (voice, sonar, animal sounds, and musical instruments).



Sound Outline

➢ *Read the following pages in your Exploring Science All Around Us textbook. Use the information to complete the following outline.*

Now Hear This *p. 28-29*

1) Sound is your brain recognizing _____ made in _____ hitting your _____.
2) Sound is a form of _____.
3) Sound is useful in so many ways:
   - o _____: to tune and play instruments
   - o _____: invent better pair of headphones
   - o _____: use ultrasound to "see" inside a person's body
   - o _____: mapping the ocean floor

What is Sound? *p. 30-31*

1) Sound is a form of _____ that is made and moved by _____.
2) In order for sound to be made, a _____ makes something _____ (ex: plucking a guitar string and it moving back and forth), the vibrating strings bump into the _____ (causing a sound wave to move through the air), and the sound wave zips through the air to reach _____.
3) Sound travels very _____!
4) The _____ is measured in decibels. Caution!- Extremely loud sounds can _____!

Do the Wave *p. 32-33*

1) Sound waves work in a similar way to _____ _____ when a pebble is dropped in a pond.
2) Sound travels through _____, _____, and _____.

3) When your hands clap together some of the air molecules are being _____, which pushes against _____, and continues until it reaches your _____. Then you can hear the clap!

4) Parts of a sound wave:

   a. _____: parts of a sound wave that are squeezed together

   b. _____: parts of a sound wave that are spread out

   c. _____: the distance between two compressions and two rarefactions

5) Sound waves are also called _____ or _____.

How Sound Travels *p. 34-35*

1) Remember: molecules in _____ are spread out, molecules in _____ are a closer together, and molecules in a _____ are packed tightly together.

2) _____ determines how fast the sound waves are able to travel.

3) Sound travels the fastest through _____ and the slowest through _____. Sound travels through _____ at a medium speed.

4) The speed of the sound effects how quickly it reaches your ears, not how _____ it is.

5) If an object goes faster than the speed of sound that it is making, you hear a loud bang called a _____.

6) Sound cannot travel through a _____, such as _____ where there are places with no matter to _____ through.

7) Astronauts communicate in space through radios and people talk over thousands of miles with cells phones. Both of these types of technology turn

sound waves into _____ that can travel without matter. Then the _____ are turned back into _____ when they reach the other astronaut or cell phone.

Frequency and Pitch *p. 36-37*

1) Frequency is _____

_____.

2) _____ wavelengths create lots of vibrations in a period of time, so they have a higher frequency. _____ wavelengths create fewer vibrations in a period of time, so they have a lower frequency.

3) Pitch is _____. When frequency is high, pitch is _____. When frequency is low, pitch is _____. Pitch and frequency are different because _____ is more measurable (quantitative) and _____ is more of your opinion (qualitative).

4) Loud sounds have more energy: more _____. Soft sounds have less _____: less air in each compression.

5) Frequency is measured in _____ (Hz). 1 Hz = 1 vibration per second

Good Vibrations *p. 38-39*

1) Changing the tension, length, thickness, and amount of air involved in an object that vibrates changes the _____ of the sound.

2) Thick objects vibrate to make a _____ pitch. Thin objects vibrate to make a _____ pitch.

Making Sound *p. 40-41*

1) Human ears can hear frequencies between _____hertz and _____ hertz.

2) _____ is any sound below 20 hertz. These sounds travel really far.

3) _____ is any sound that is above 20,000 hertz.

4) Your voice makes sounds by air passing over stretchy bands in your vocal chords, which then vibrate, and send sound waves through the air.

5) You hear by sound waves hitting your _____, a thin layer inside your ear. Your eardrum vibrates, which makes tiny bones in your ear vibrate, and then your nerves send those signals to your brain.

6) Echolocation:

   - Bats, dolphins, and toothed whales use it to _____ and _____.
   - The animal makes _____ that go out in all directions. The sounds reflect off objects and _____ back to the animal. The animal uses these echoes to hear what's around them.

7) _____ also use high frequency sound waves and their echoes to see inside the human body.

Making Music *p. 42-43*

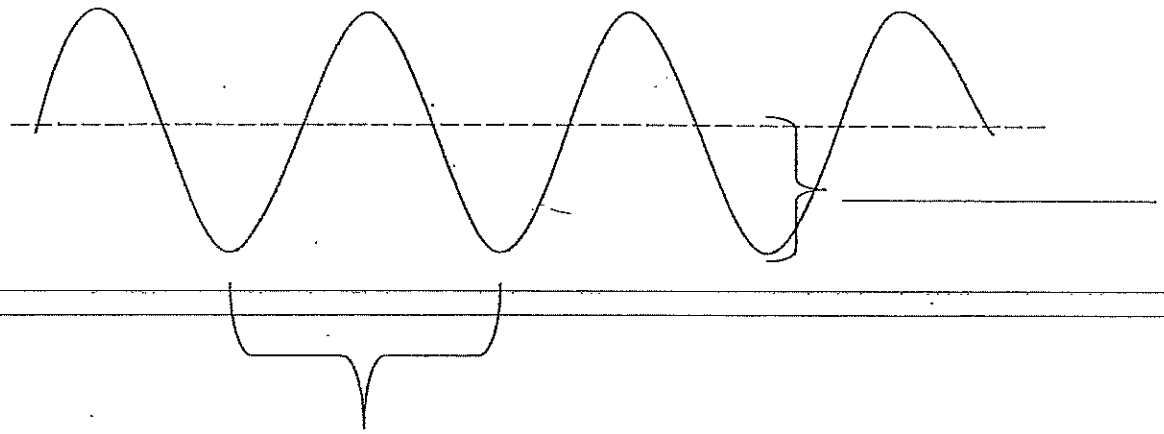
1) _____ is random sounds with no pattern. _____ is sound that follows a repeating pattern.

2) How instruments make sound:

   - _____ (drums, xylophone, cymbals): vibrating surface
   - _____ (flute, saxophone, clarinet): vibrating air
   - _____ (guitar, piano, violin): vibrating strings
   - _____ (trumpet, trombone, tuba): vibrating lips

SOUND WAVES

This is a _____.

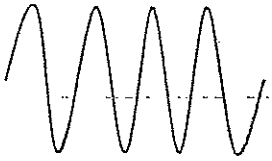


_____

Fast Vibrations = _____ wavelengths = _____ Pitch
Slow Vibrations = _____ wavelengths = _____ Pitch

This sound wave has a _____ pitch

because it has a _____ wavelength.



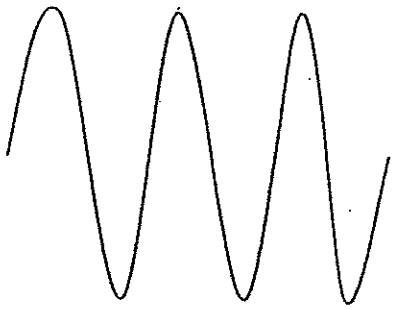
This sound wave has a _____ pitch

because it has a _____ wavelength.

Higher Waves = _____ Amplitudes = _____ Sound
Shorter Waves = _____ Amplitudes = _____ Sound

This sound wave has a _____ sound

because it has a _____ amplitude.



This sound wave has a _____ sound

because it has a _____ amplitude.

Review Drawings

Draw a loud, high pitched sound.

It will have a _____ wavelength

and a _____ amplitude.

Draw a soft, high pitched sound.

It will have a _____ wavelength

and a _____ amplitude.

Draw a loud, low pitched sound.

It will have a _____ wavelength

and a _____ amplitude.

Draw a soft, low pitched sound.

It will have a _____ wavelength

and a _____ amplitude.

Sound Waves Homework

Directions: Pick 5 sounds from around your house or neighborhood. Describe their loudness and pitch. Then describe what their amplitude and wavelengths probably look like. Finally, use what you have written about the amplitude and wavelength to draw a picture of what the sound's wave might look like.

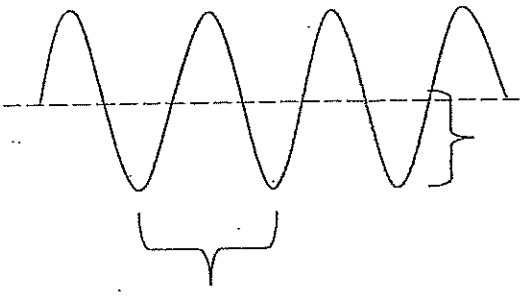
Sound	Description	Sound Wave Drawing
	Loudness- Loud or Soft **Amplitude**- Tall or Low **Pitch**- High or Low **Wavelength**- Short or Long	
	Loudness- _____ Amplitude- _____ Pitch- _____ Wavelength- _____	
	Loudness- _____ Amplitude- _____ Pitch- _____ Wavelength- _____	

Sound	Description	Sound Wave Drawing
	Loudness- _____ Amplitude- _____ Pitch- _____ Wavelength- _____	
	Loudness- _____ Amplitude- _____ Pitch- _____ Wavelength- _____	
	Loudness- _____ Amplitude- _____ Pitch- _____ Wavelength- _____	

Which sound do you think has the highest frequency (the highest number of vibrations in a certain time)?

Sound Waves Brain Builder

This is a _____.



_____

_____

Fast Vibrations = _____ **wavelengths** = _____ **Pitch**

Slow Vibrations = _____ **wavelengths** = _____ **Pitch**

Higher Waves = _____ **Amplitudes** = _____ **Sound**

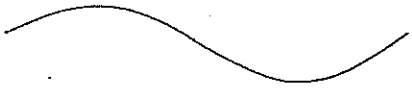
Shorter Waves = _____ **Amplitudes** = _____ **Sound**

This is a _____, _____ pitched sound.

because it has a _____ wavelength

and a _____ amplitude.

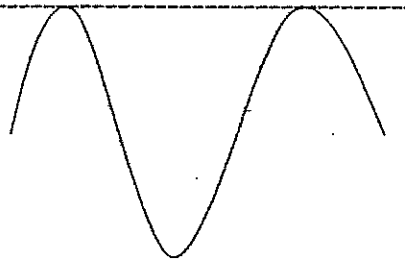
This is a _____, _____ pitched sound.



because it has a _____ wavelength

and a _____ amplitude.

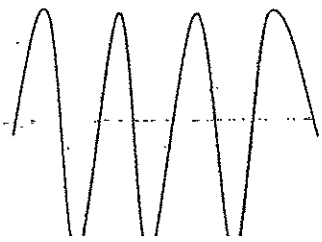
This is a _____, _____ pitched sound.



because it has a _____ wavelength

and a _____ amplitude.

This is a _____, _____ pitched sound.



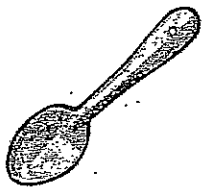
because it has a _____ wavelength

and a _____ amplitude.

Musical Bottles

Getting Started: Fill several glass bottles with different levels of water.

☺ **Tap on each bottle with a metal spoon and listen to the different sounds.**



1) What is vibrating when you tap on the bottles with a spoon *(what is the sound vibrating through)*? _____

2) Which bottle makes the lowest pitch? Why?_____

_____

3) What would this wavelength look like?_____

4) Which bottle makes the highest pitch? Why? _____

_____

5) What would this wavelength look like?_____

6) How would you increase the amplitude of the sound?_____

_____

7) What does increasing the amplitude do to the sound?_____

_____

8) How would you decrease the amplitude of the sound? _____

_____

9) What does decreasing the amplitude do to the sound? _____

_____

☺ **Blow <u>across</u> the top of each bottle and listen to the different sounds.**

1) What is vibrating when you blow across the bottles *(what is the sound vibrating through)*?_____

2) Which bottle makes the lowest pitch? Why?_____

_____

3) What would this wavelength look like?_____

4) Which bottle makes the highest pitch? Why?_____

_____

5) What would this wavelength look like?_____

6) How would you increase the amplitude of the sound?_____

_____

7) What does increasing the amplitude do to the sound?_____

_____

8) How would you decrease the amplitude of the sound?_____

_____

9) What does decreasing the amplitude do to the sound?_____

_____

<u>Wrapping It Up:</u> Which material does sound travel best through? Why?

_____

_____

Sound Experiments

Introduction

1) What do sound waves need in order to move from one place to another?

_____

2) What makes it easier for sound to be transferred?

_____

3) What makes it harder for sound to be transferred?

_____

Speed and Energy- Describe what happens to the sound wave as I:

- Add energy- _____
- Take away energy- _____
- Add speed- _____
- Take away speed- _____

Musical Rulers

Part 1: Sound with your hand

1) What kind of sound can you make when you pluck the short ruler?_____

2) What kind of sound can you make when you pluck the long ruler?_____

3) What do you have to do in order to make a high-pitched sound?_____

_____

4) What do you have to do in order to make a low-pitched sound?_____

_____

Part 2: Sound with a rubber band

5) What do you have to do to the rubber band in order to make a high-pitched sound?

_____

Why does this work?_____

6) What do you have to do to the rubber band in order to make a low-pitched sound?

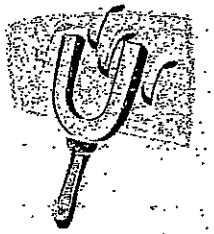
_____

Why does this work?_____

7) What makes high pitches?_____

8) What makes low pitches?_____

Tuning Forks



1) Record your observations as you touch the tuning fork to each of the materials? Focus on how well each material transfers the vibrations. Sometimes you will be able to see the vibrations and sometimes you will be able to hear the vibrations.

Material	Observations
Ball	
Water	
Oil	
Wood	
Glass	
Skin	

2) Which type of material transferred the vibrations the best? Why do you think this is? *(Hint: Think about what you know about the particles in a gas, solid, and liquid.)*

_____

_____

_____

CHAPTER 5

Review and Test Preparation

Vocabulary Review

Use the terms below to complete the sentences. The numbers in ( ) tell you where to look in the chapter if you need help.

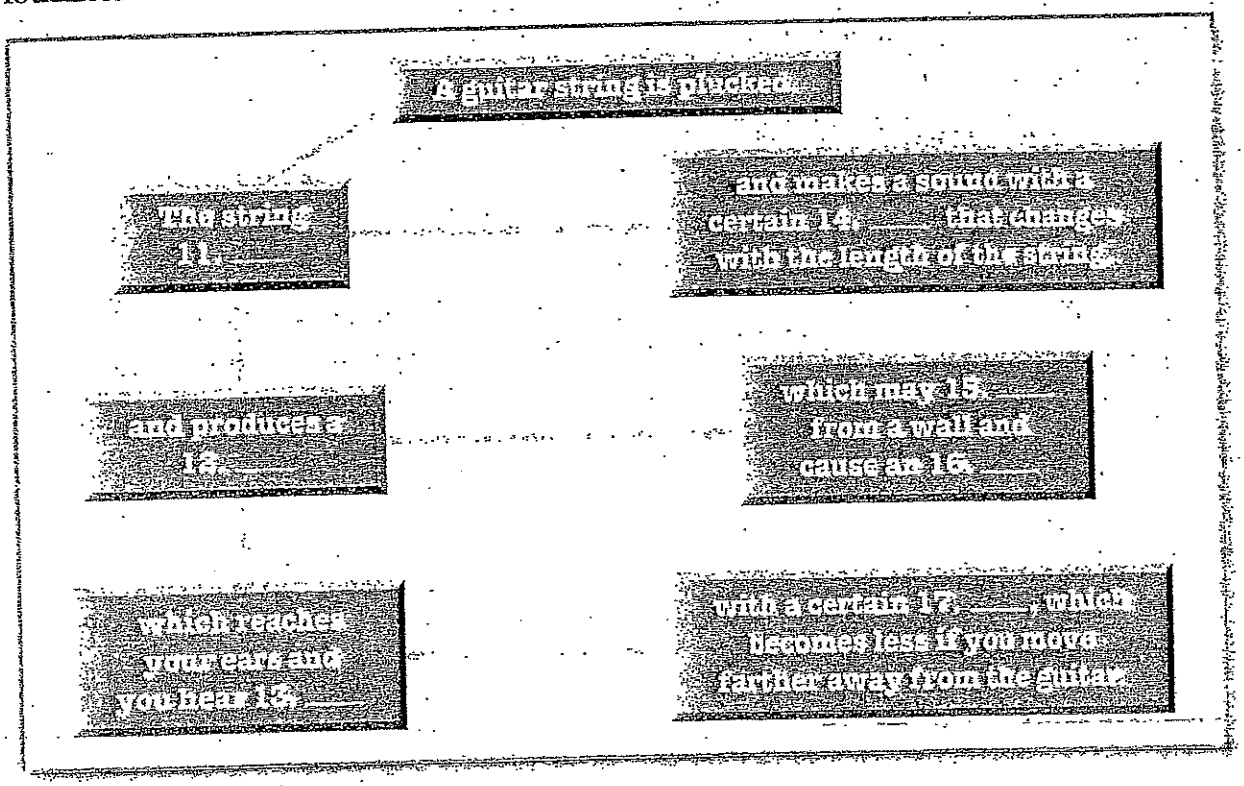
sounds (E70)	**loudness** (E78)
sound waves (E71)	**pitch** (E79)
compression (E71)	**speed of sound** (E84)
amplitude (E72)	**echo** (E86)
wavelength (E72)	**sonic boom** (E88)

1. The ____ of a sound describes how high or low a sound is.
2. Moving areas of high and low pressure that carry sound are ____.
3. Vibrations that you hear are ____.
4. The amount of sound energy reaching your ears is ____.
5. A reflection of sound is an ____.
6. How fast sound moves is the ____.
7. The sound of a shock wave produced by an object moving faster than the speed of sound is a ____.
8. A ____ is a place where particles are squeezed closer together by a sound wave.
9. The height of a wave above rest position is its ____.
10. The distance from one point on a wave ripple to the same point on the next ripple is its ____.

Connect Concepts

Use the terms in the Word Bank to complete the diagram.

pitch	**sound wave**	**sound**	**echo**
loudness	**vibrates**	**reflect**	



Check Understanding

Write the letter of the best choice.

18. Sound waves cannot travel through —
    A a solid
    B gases
    C empty space
    D liquids

19. What we hear as pitch is related mostly to —
    F reflection
    G how far away the source of the sound is
    H the speed of sound
    J how fast the source of the sound is moving back and forth

20. You can make the sound louder if you pluck a guitar string by —
    A moving the string farther before letting go
    B stopping the string when it starts to move
    C shortening the string
    D lengthening the string

21. A sound wave has areas called ____ where particles are squeezed together.
    F echoes
    G compressions
    H sonic booms
    J pitches

22. If the ____ of a wave changes, you will hear a softer sound because less energy is reaching your ears.
    A pitch
    B wavelength
    C amplitude
    D echo

23. You are more likely to hear an echo when standing —
    F close to a short wall
    G facing a tall, smooth wall
    H in a large, open field
    J in a very small room

24. A ____ is the sound you hear when something is moving faster than the speed of sound.
    A vibration
    B pitch wave
    C high pitch
    D sonic boom

Critical Thinking

25. Explain how the vibrations you cause by hitting a drum move from the drum to your brain, where they are interpreted as sound.

26. How does a sonic boom form?

Process Skills Review

27. What features would you use to describe a sound that you **observed**?

28. What is the difference between **observing** a vibration and **inferring** how the vibration affects air particles?

29. Why do scientists sometimes use drawings to **record** the **data** they gather?

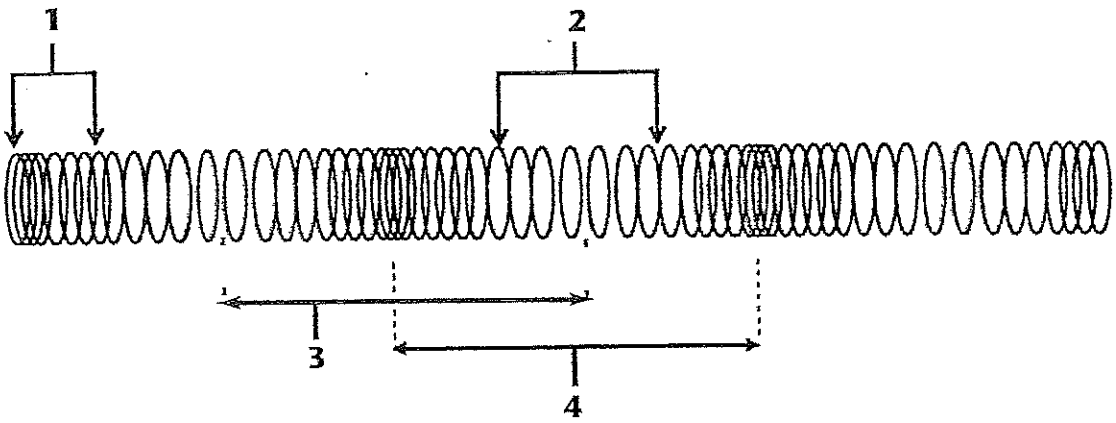
Performance Assessment

Sound Vibrations

Strike a tuning fork. After you hear the sound of the fork, place its base on a tabletop. Observe and report what happens. Explain your observations in terms of vibrations and sound waves. You may use a drawing as part of your explanation.

TEST TAKING STRATEGY-2

1.



Which arrow is pointing to the wavelength of a compression wave as measured from one compression to the next compression?

A 1
B 2
C 3
D 4

2. **What happens to sound in a vacuum?**

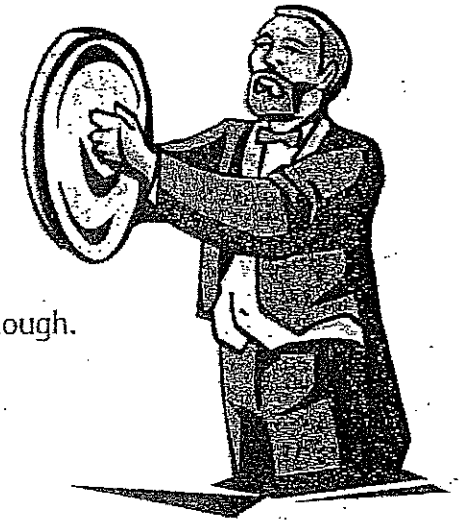
F The pitch is lowered.
G The sound cannot travel.
H The sound is amplified.
J The frequency increases.

3. **Bats locate prey in their path and navigate by receiving reflected –**

A compressions
B rarefactions
C ultrasonic waves
D infrasonic waves

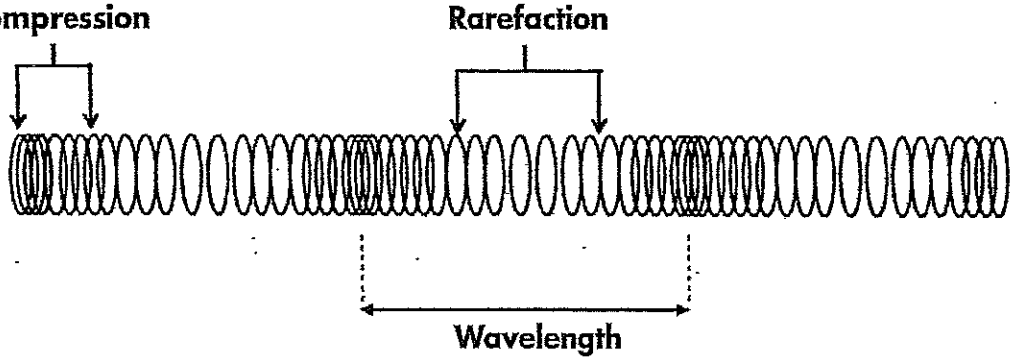
4. **Which of the following is the *best* explanation of why this instrument produces sound?**

F The instrument is struck.
G The instrument has air blown across it.
H The instrument is played with a bow.
J The instrument produces different pitches by changing the length of tubing the air moves though.



SOUND STUDY GUIDE

Sound is a form of energy made by vibrations. Sound vibrations travel in **compression waves.**



We hear sound when molecules vibrate. Sound travels better in certain media (phases of matter) than in others because of how close the molecules are located. Draw a picture of how molecules would behave in each phase of matter in the boxes below:

Molecules in a gas

Molecules in a liquid

Molecules in a solid

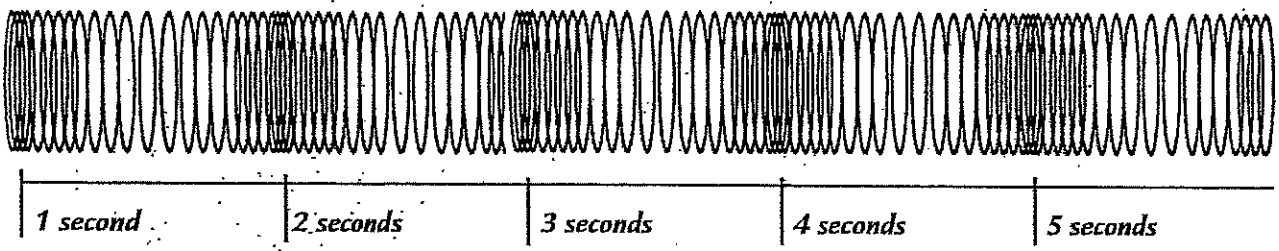
In which phase of matter does sound travel best and why? _____

_____

In which phase of matter does sound travel worst and why? _____

_____

30-Second Lion's Roar Sound Wave



Frequency is the number of wavelengths in a given amount of time in a **sound wave.**

What is the frequency of the lion's roar? _____

Wavelength is the distance between any two adjacent compressions or rarefactions.

What is the wavelength of the lion's roar in centimeters? _____

Higher Sound Waves = Louder Sounds

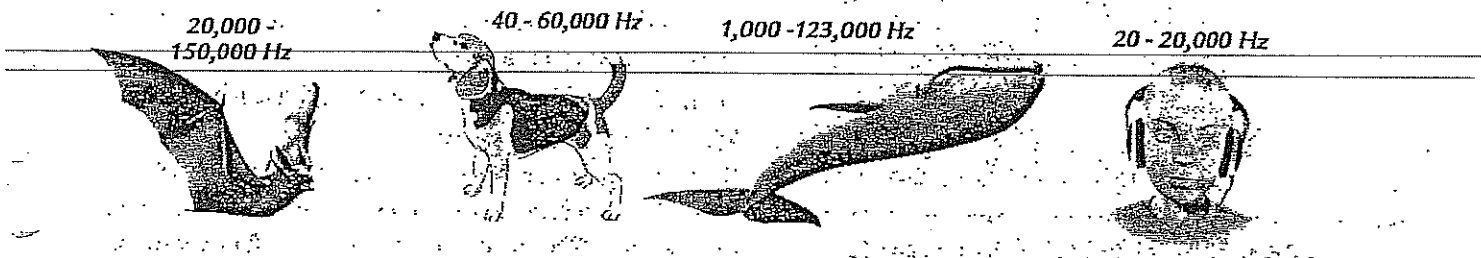
Lower Sound Waves = Softer Sounds

Pitch is how we hear a sound. We use the words high or low to describe pitch. The pitch is determined by the frequency.

High Pitch = _____ **frequency**

Low Pitch = _____ **frequency**

Animals can hear sounds that humans cannot hear.



Which animal above can hear the lowest frequency sound? _____

Which animal above can hear the highest frequency sound? _____

Musical instruments vibrate to produce sound. Musical instruments are classified by the way in which the sound is produced by the instrument.

STRING INSTRUMENTS *Example:* *How do string instruments produce sound?*	**WOODWINDS** *Example:* *How do woodwinds produce sound?*
PERCUSSION INSTRUMENTS *Example:* *How do percussion instruments produce sound?*	**BRASS INSTRUMENTS** *Example:* *How do brass instruments produce sound?*