Trivia Question March 2015
Writer: Carol L Brunk
Lesson Plan Explanation **Sound Weight** DRAFT
Date: March 17, 2015 Includes **Sound Waves**

TRIVIA QUESTION with ANSWER:

Sound waves have a weight.

1) If they have a weight, the pitch is it made of energy? **Yes**
2) And if it's made of energy, does it burn its own energy or what is around it? **both**

Lesson Plan Explanation

INSTRUCTOR USE RECOMMENDED FOR THE FOLLOWING LESSON PLAN AND EXPLANATION

Sound waves can be found on the internet and in text books.

Sources for sound waves found on the web are

1) Encyclopedia Wikipedia and whatissoundenergy.com
2) http://en.wikipedia.org/wiki/Speed_of_sound
3) Note: Other sources are available on line and text books in library, etc.

SOUND it's what we hear. SOUND is energy. It flies. It moves. It can be directed in a direction, pin pointed and delivered to a certain special area or direction depending on what it is and what launched it.

Some Samples of launches can be a) the voice box of a human or b) mechanical as in an electronic cd player.

NOTE TO INSTRUCTOR: In understanding the concept of sound wave and sound energy, gather the following for demonstration use and explanation: *small paper balls (decibels)*, a *straw to launch (particle velocity)* and 3 *construction boards (represents mediums) as a distant target or ending target*. One construction board labeled gases (cut the center out of this one), and one labeled 'liquids, plasmatic' (cut center and roll into a tube and tape as tube with square open towards where the paper ball may enter when blown in that direction) and one labeled 'solid'.

Two of the above uses both its own energy and burns the energy around it when launched –one medium uses only one energy. Guess which medium.

Place the straw, bowl of water and paper on a table.

Tape the construction boards one to a chair.

Paper balls can be thought of as the visual we hear but never see with the naked eye- let's call them the ***decibels*** (key word: ***decibels*** are considered the *pitch* we hear in our ears). The paper ball represents ***particle*** that what's called the ***decibels***. The paper ball represent two words in this case decibels and particle. ***Particle velocity*** is the particle (decibels) (paper ball) with ***velocity (speed)*** is ***how fast*** the paper ball that was attached on the end of the straw flies through the air when launched with pressure.

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The straw is the launch for the paper ball **(particle and decibel)**. It's what we are going to blow through. The **blow (the push)** of the air movement that pushes through the straw we will call ***sound pressure***. The amount of pressure is **how *hard you blow*** through the straw is considered *the force. The push that goes through the straw- is the pressure*. Pressure that keeps the paper ball, **(particle decibel)** in this case paper ball, traveling through the air.

Sound travels through what has been labeled mediums. The mediums are gases (sky consider the air or atmosphere), liquids (water, juice, coffee, tea) and plasmatic (oil, mud, blood, mucus, jelly, butter) and solid medium (houses, buildings, trees, people, cars).

It also known as the movement and scientist study movement in what they name ***physics.***

When it comes to solids the pitch **(decibels)** can bounce-paper ball. Take the paper ball and launch it straight at the solid (whole construction board). The ball **(decibels)** will bounce in a different direction and can bounce off more than one solid object. This is

Solids (the decibels) can bound or can completely stop and dissipate (actually falls apart in sporadic different directions). What happens to the sporadic burned up particles? They become something else- usually waste that is burned up by something else to produce energy again.

P = sound pressure

, v = particle velocity (speed),

po = density and (weight)

combine in formula the result is c = sound speed.

http://whatissoundenergy.com/

Sound Energy

In order to understand what sound energy is, we must first understand what sound is exactly. Sound is defined as a mechanical wave (a wave which cannot travel without some sort of a medium) which travels via a gaseous, liquid, plasmatic or solid medium. This mechanical wave is actually a vibration of pressure and is only classified as a "sound" in its earliest senses if it falls within the audible range of frequencies.

Now that we know what sound is, it would be easier to understand the energy that is present within sound. It can be defined simply as the energy that is present within each of the above mentioned occurrences and is thus achieved via oscillation of matter. The following formula is used to elaborate the concept of sound energy in physics:

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$$W = W_{potential} + W_{kinetic} = \int_v P^2/2poc^2 \times dV + \int_v pv^2/2 \times dV$$

In the equation above, *P* = sound pressure, *v* = particle velocity, *po* = density and *c* = sound speed.

A point to be noted is the fact that sound energy is indeed a form of mechanical energy because the waves of pressure which are exerted upon the medium through which they travel cause compression and rarefaction in them. Sound energy is usually not very prominent under normal circumstances because the energy it contains is not significant enough. Nonetheless, it can do work (causing change) and thus it is a form of energy.

As the energy within a traveling wave of sound is not very prominent, joule is not used to measure sound, unlike other forms of energy. Instead, more emphasis is put on the pressure and intensity of sound, which is why pascals or decibels are the preferred units of measuring sound.

Using the energy in sound

This is a concept which is not as abundant or easily achievable as it sounds. The main difference between the energy in sound and the energy in other alternate sources of energy such as the wind or water is the fact that the amount of energy in sound is far lesser. However, sound energy is constantly being researched upon from different aspects and for various purposes.

1. **Military application** –– Scientists had found out long ago that sound frequencies can be manipulated to disrupt living cells. Although it is not a use that we should particularly look forward to, weaponization of sound is possible and the detrimental effects of high frequencies on lab animals have confirmed internal bleedings and significant physical damage. The technology is still at its experimental stage though and will take time before maturing into full-fledged weaponry.

2. **Alternate source of energy** –– Perhaps what most of us look forward to when we discuss the uses of sound energy is the progress we are making in terms of using sound as a source of useable energy. Sound requires closed energy production units to produce useable energy and one such apparatus is the Stirling engine. Simply put, the steam engine's process of working can be defined in this way; liquid is heated and cooled within the engine in such a way that it turns the piston inside, which generates the necessary energy for locomotion. Sound energy has the potential to do the job within this motor via the application of appropriate frequencies. The excess heat produced as a byproduct of using sound energy is also promising as this model could then not only provide homes with electricity, but with additional water and air heating facilities also.

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3. **Lift and propulsion** -– Another potent aspect of sound energy that the scientists are trying to utilize is its locomotive capabilities. It has been found that sound at ultrahigh frequencies can indeed cause objects to propel forward or lift up. The famous experiment which revealed and confirmed this feature of sound to the world was done by Japanese scientist Yoshiki Hashimoto. He used totally controlled supersonic waves (20,000 vibrations/second) to levitate by one mm, a wafer made out of silicon. This instrument was introduced as the Kaijo Acoustic Levitator by Hashimoto, which can revolutionize the semiconductor industry. While comparing it with other sources of "zero contact" locomotion like electromagnetism, Kaijo Corporation is of the opinion that ultra-frequencies fare a lot better.

4. **Sonoluminescence** -– This is something that has interested the American scientists more than anything else and has reached prominence outside the planet itself! The absence of weight has made space a perfect backdrop for sonic experiments because they can be carried out better without the interference of gravity. It was in one of such space labs that new and groundbreaking facts about sonoluminiscence (also known as acoustic luminescence) were discovered by Americans.

It was discovered to the amazement of scientists that the proper liquid, when subjected to sound frequencies of high-intensity, produces light. Amazing as this fact is, one should know that this is not a new phenomenon as the same kind of luminescence was seen back in the 1930s, right here on earth. There is however, a significant difference between the two observations. The difference is more of degree than of kind as it was possible to perform the experiment on a single bubble of water; which revealed to the researchers that the luminescence occurs in pulses and each of the pulses has an extremely short duration. The complex experiment, according to Tim Leighton (University of Southampton) is not easy to explain to even an expert who is new to acoustic physics as it crosses the boundaries of standard physics.

5. **Virtual sound** -– It is now time to discuss a more entertaining use of sound that the researchers are considering as well at Southampton. The technology is known simply as Stereo Dipole and the most basic way to describe it would be to call it a kind of virtual sound system that will accompany virtual reality based entertainment systems. The concept has already won them the "Millennium Product" award from the Design Council, due to its potential to produce absolutely life-like 360° surround sound. The extent of the experience however, may depend on a particular person's hearing capacities.