Unit 1 How Sounds Move / Unit 2 Water Music

The Speed of Sound

Sound is a form of energy that is produced by vibrating matter. In addition, where there is no matter there is no sound. Sound waves must have a medium (matter) to travel through. When we talk, sound waves travel in the air. Sound also travels in liquids and solids. The speed of sound depends on the kind of matter it is moving through.

Of the three phases of matter (gas, liquid, and solid), sound waves travel the slowest through gases, faster through liquids, and fastest through solids. Let's find out why.

Sound moves slowest through a gas. That's because the molecules in a gas are spaced very far apart. In order for sound to travel through air, the floating molecules of matter must vibrate and collide to form compression waves. Because the molecules of matter in a gas are spaced far apart, sound moves slowest through a gas.

Sound travels faster in liquids because molecules are packed more closely together. This means that when the water molecules begin to vibrate, they quickly begin to collide with each other forming a rapidly moving compression wave. Sound travels over four times faster than in air!

Sound travels fastest through solids. This is because molecules in a solid are packed against each other. When a vibration begins, the molecules of a solid immediately collide and the compression wave travels rapidly. Sound waves travel over 17 times faster through steel than through air. That's amazing!

Unit 3 Mirror Vision / Unit 4 Writing Backward

What happens when light hits a mirror?

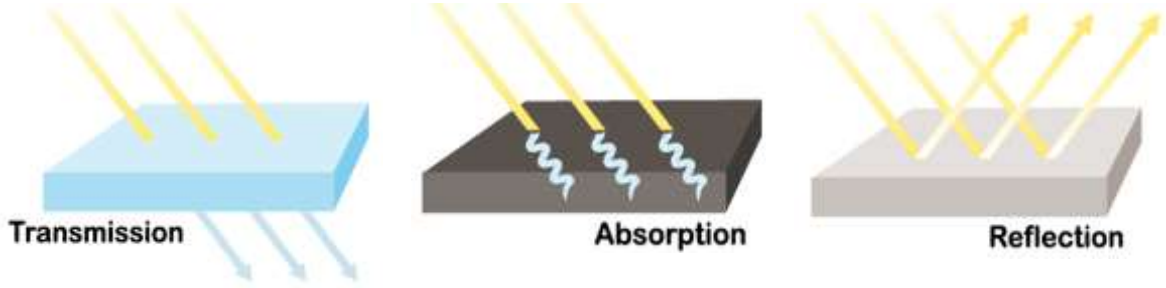
When you stand in front of a mirror, what you see is the conservation of energy in action, working its magic on light. Light is energy traveling at high speed and, when it hits an object, all that energy has to go somewhere.

There are three things that can happen when light hits something.

1. It can pass through (if the object is transparent).

2. It can sink in and disappear (if the object is opaque and darkly colored).

3. It can reflect back again (if the object is shiny, light-colored, and reflective).

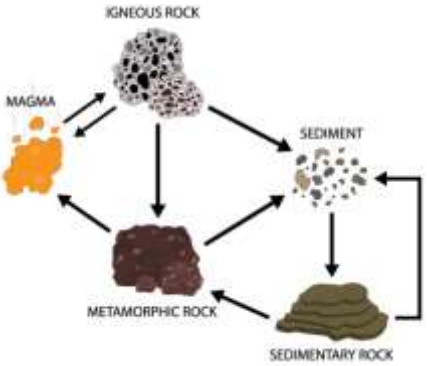


Either way, the conservation of energy is at work: there is just as much energy around before light hits something as afterward, though some of the light may be converted into other forms.

What happens when you look in a mirror? In the daytime, light reflects off your body in all directions. That's why you can see yourself and other people can see you. Your skin and the clothes you're wearing reflect light in a diffuse way: light rays bounce off in no particular direction. The light will reflect off the mirror in a more orderly way than it reflects off your clothes. We call that specular reflection—it's the opposite to diffuse reflection.

Unit 5 Sedimentary Rocks / Unit 6 Making Rocks from Rocks

Sedimentary rocks are the most common type of rocks and they cover 75% of Earth's surface. In addition to sedimentary rocks, there are two more main types of rocks: igneous and metamorphic. Each of these rocks are formed by physical changes—such as melting, cooling, eroding, compacting, or deforming—that are part of the rock cycle.



Sedimentary rocks are formed from pieces of other existing rock or organic material.

 Clastic	• Form from clast, or pieces of other rock • Weathering or breaking down of the rock into small pieces
 Organic (Biological)	• Form from hard, biological materials (plants, shells, bones, etc.) • Weathering or breaking down of the rock into small pieces
 Chemical	• Form from chemical compounds (calcium carbonate, salt, etc.) • Water travels through Earth's crust, dissolving minerals

Metamorphic Rocks are rocks that have been changed from their original form by immense heat or pressure.

 Foliated	• Flat minerals put under immense pressure, lining up in layers
 Nonfoliated	• Minerals not included, do not have the layers • When magma contacts with the surrounding rock

Igneous Rocks are formed when molten hot material cools and solidifies.

 Intrusive	• Form inside of the Earth • A coarse texture with large mineral grains
 extrusive	• Form outside or on top of Earth's crust • Relatively fine grains • Sometimes has holes

Unit 7 Fun Fossils / Unit 6 Tony and the Fossil

1. **Sediment fossil** – Organism dies and becomes buried under sediment. It decomposes and leaves a hollow or mold in the sediment.

2. **Petrified fossil** – Minerals replace bone, shell or other hard part of the organism. The organism is trapped and turned into rock. Most dinosaur bones are petrified fossils.

3. **Trace fossil** – This fossil is made by footprints, tracks, trails, and burrows of living things.

4. **Cast fossil** – It is a model in the shape of a living thing or its remains. It is formed when minerals or rock particles fill the space in a mold.

5. **Mold fossil** – It is the space in a rock that has the shape of the remains of living things that once occupied that space.

6. **Coprolite fossil** – It is petrified remains of animal dung.

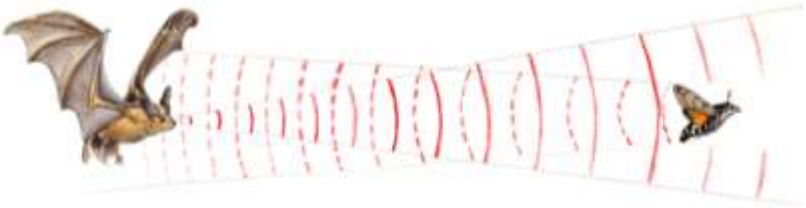
7. **Imprint fossil** – Impressions of organisms left in soil or sediment before it hardened. This fossil is made usually by thin objects like leaves, fish, and feathers.

Unit 9 Bouncing Sounds / Unit 10 Mountain Echo

If you've ever been inside a large canyon, you've probably observed the wonder of echoes. But how do they work? An echo happens when a sound wave reflects off a surface and the sound is repeated back to you.

There are certain requirements in order to produce an echo. One requirement is that the size of the reflector must be large compared to the wavelength of the incident sound. In addition, the distance between the source of sound and the reflector should be at least 66 feet. Additionally, the loudness of the sound should be sufficient for the reflected sound reaching the ear to be audible.

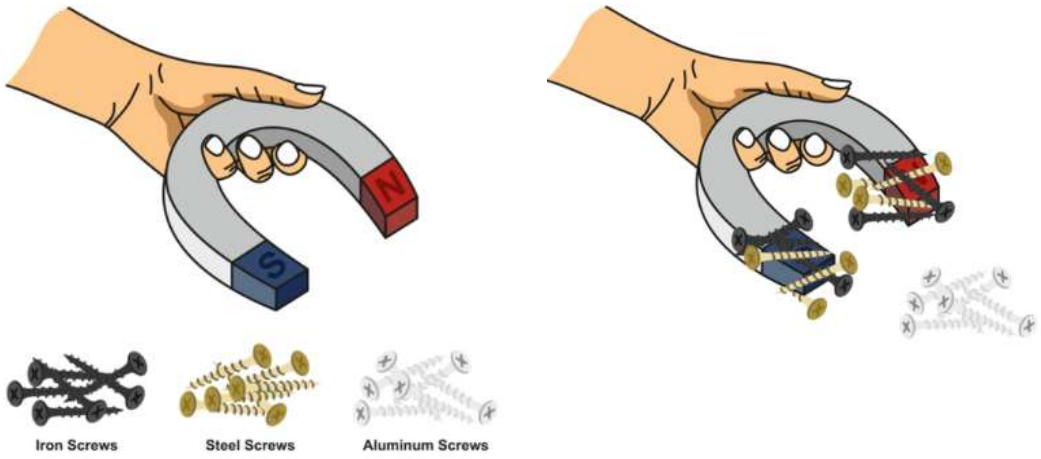
The farther away the surface is, the longer it will take for the echo to come back to you. One could tell how far away an object is and how fast it is moving by an echo, and it is called echolocation. Bats use echoes to find moths while flying around at night. Luckily for bats, they have very large ears and can sense even very soft sounds in certain wavelengths. It continues to send out sound and receive echoes until it targets on the moth and has its meal.



The dolphin is another mammal which uses echolocation. The dolphin doesn't have vocal cords, but instead developed its phonic lips from what was once the dolphin's nose. The dolphin forces air through its phonic lips, and the air vibrates and comes out sounding like clicking. When the clicks bounce off of the object, dolphin gets a mental picture of that object.

Unit 11 Sort With Sieves / Unit 12 The Incredible Beach-Cleaning Machine

Is Aluminum Magnetic? Iron is attracted to magnets because of its highly conductive nature. Aluminum, on the other hand, is quite different. While it's not far behind in terms of conductivity, it is not attracted to magnets as iron is.



What is Paramagnetism? Under normal circumstances, aluminum is not magnetic, mainly because of its crystal structure. It's referred to as a paramagnetic material along with other metals like Magnesium and Lithium.

Paramagnetic materials have a composition similar to ferromagnetic materials (which are readily attracted to a physical magnet). Paramagnetic materials have unpaired electrons in their partially filled energy orbitals. These materials also have some dipoles which are not lined up on the direction of the applied magnetic field. The misaligned dipoles obstruct magnetic fields created by the aligned dipoles. Because of this trait, paramagnetic materials prefer external magnetic fields to some degree.

In simple terms, paramagnetic materials like aluminum behave like a very weak magnet. When exposed to permanent magnets, paramagnetic materials are weakly attracted. But, they immediately revert to diamagnetism when you remove the external magnetic field.

Unit 13 Drops of Water / Unit 14 Hot Water, Cold Lid

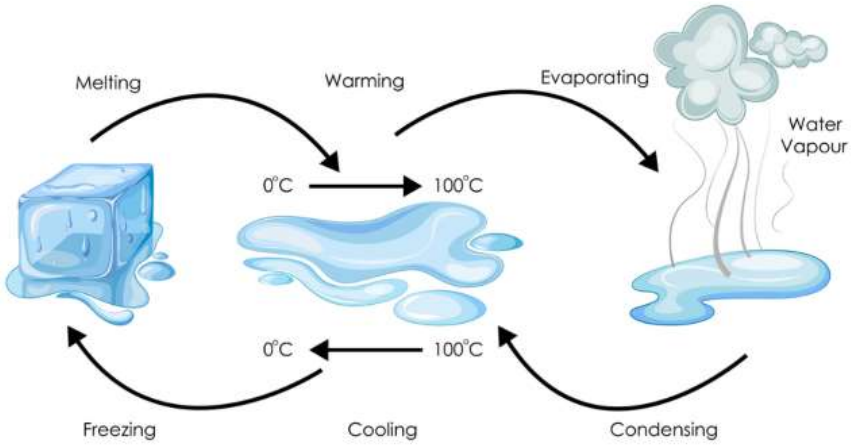
Evaporation

Evaporation happens when a liquid is heated. For example, as the sun heats water in a puddle, the puddle slowly shrinks. The water seems to disappear, but it actually moves into the air as a gas called water vapor. This is an example of evaporation.

All molecules in a liquid move. Some move faster than others, though. As the molecules at the surface of a liquid absorb heat, they begin to move around more quickly. This gives them the energy to break the bonds that connect them to other water molecules. When the molecules are moving fast enough, they are able to "escape." They leave the surface of the liquid as gas molecules.

Condensation

An example of condensation can be seen when drops of water form on the outside of a glass of ice water. The drops seem to appear from nowhere. However, they actually form from water vapor in the air. The dew that forms on grass overnight is another example of condensation. Condensation happens when molecules in a gas cool down. As the molecules lose heat, they lose energy and slow down. They move closer to other gas molecules. Finally these molecules collect together to form a liquid.



Unit 15 Protecting the Environment

What does an environmental scientist do?

Environmental scientists concern themselves with studying the impact of human activity on the environment, and identifying ways to manage or minimize any negative impacts, such as air pollution. Environmental scientists gather samples and observational data in the field and conduct tests in the lab. For example, they often analyze water and soil for pollution caused by industry and agriculture. They will test water, soil or air samples to find the type, concentration and source of the pollution. The environmental scientist will then undertake a rigorous assessment to identify if that contaminant source has the potential to affect or harm individuals and communities. The next step is to identify possible ways to solve the problem.

Typical responsibilities include:

- deciding on the best data collection methods
- conducting field surveys and collecting data
- conducting lab tests on water, air and soil samples
- interpreting data to identify whether contamination exists in accordance with environmental laws
- building conceptual models that identify the potential contaminant sources that could have an adverse impact on the environment
- preparing detailed scientific reports or presentations based on their findings
- communicating the results of their studies to senior scientists and key stakeholders
- devising plans to minimize or fix environmental problems

Unit 16 Geologists Study the Earth

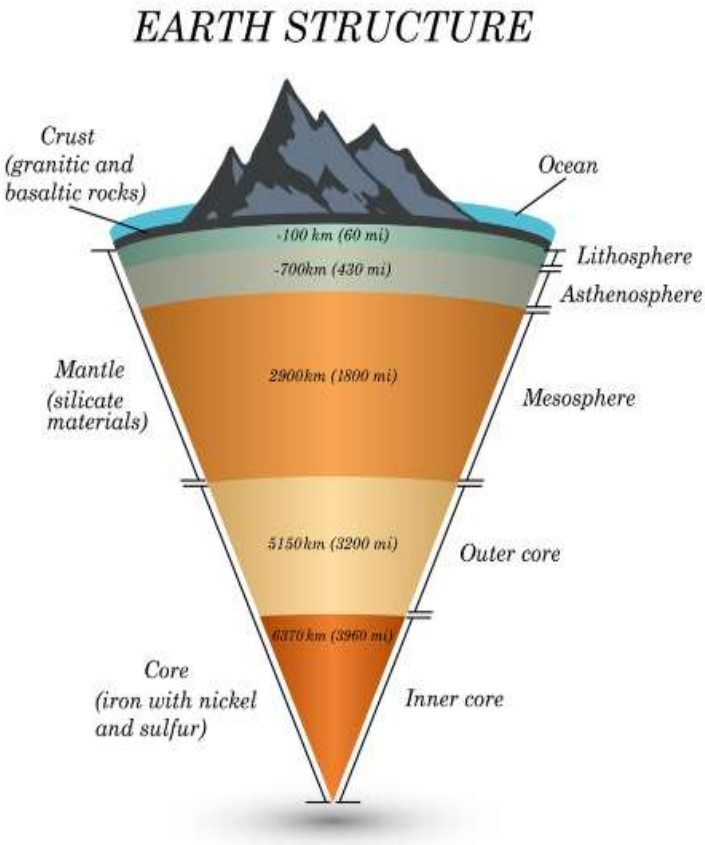
The earth is made up of three different layers: the crust, the mantle and the core.

The crust

This is the outside layer of the earth and is made of solid rock, mostly basalt and granite. There are two types of crust; oceanic and continental. Oceanic crust is denser and thinner and mainly com posed of basalt. Continental crust is less dense, thicker, and mainly composed of granite.

The mantle

The mantle lies below the crust and is up to 2900 km thick. It consists of hot, dense, iron and magnesium-rich solid rock. The crust and the upper part of the mantle make up the lithosphere, which is broken into plates, both large and small.



The core

The core is the center of the earth and is made up of two parts: the liquid outer core and solid inner core. The outer core is made of nickel, iron and molten rock. Temperatures here can reach up to 50,000 C.