

# Sound, Light, Electricity, and Magnetism Vocabulary

1. **Electricity**: A form of energy that can be produced from other forms of energy
2. **The Law of Conservation of Energy**: Energy can never be created or destroyed; it can change forms. When energy changes forms it is never 100% efficient because some energy is always given off in the form of heat.
3. **Static Electricity**: Non-moving electricity caused by the build up of electric charges on an object. Examples: lightning, hair standing up when rubbed with a balloon, socks sticking together when they come out of a dryer.
4. **Matter**: Anything that has mass and takes up space. Matter is made up of atoms. There are three phases of matter: solids, liquids, and gases.

**Solids**: molecules are tightly packed, have lots of bonds, and move by vibrating back and forth.

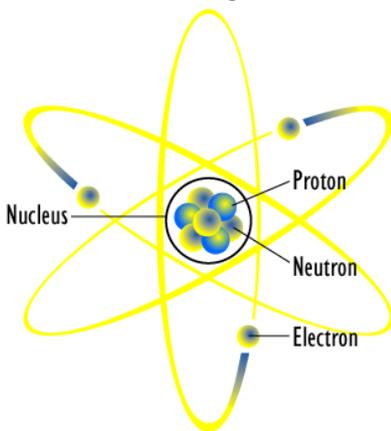
**Liquids**: molecules are more loosely packed than solids, have fewer bonds than solids, and move by rotating around each other.

**Gases**: molecules are very loosely packed, have very few bonds, and move all over the place like crazy.

**Vacuum**: an area / a place that has absolutely no matter / atoms in it. Examples of a vacuum are outer space, and the vacuum that can be created in a science lab using a bell jar that has all of the air sucked out of it using a pump.

5. **Atom**: The smallest piece of an element (like gold, oxygen, or lead) that still has all of the properties of the element. (see page 115 of your agenda for the periodic table of elements).

Diagram of an atom:



**Nucleus**: The center of an atom

**Protons**: Found in the nucleus of an atom; they have a positive charge

**Neutrons**: Found in the nucleus of an atom; they have no charge (they are neutral)

**Electrons**: Orbit around the nucleus; they have a negative charge

6. **Charged particles:** An atom gets a charge when it has an unequal number of protons and electrons.
  - Positive charge:** an atom gets a positive charge when it loses electrons (it will have more protons than electrons)
  - Negative charge:** an atom gets a negative charge when it gains electrons (it will have more electrons than protons)
  - Neutral charge:** an atom has a neutral charge when it has the same number of protons and electrons.
7. **Like Charges:** Like charges repel each other. Two objects with positive charges will repel each other. Two objects with negative charges will repel each other.

\* Two neutral objects will not have any reaction; they will neither attract nor repel.
8. **Unlike (opposite) Charges:** Unlike charges attract each other. A positive object will be attracted to a negative object and vice-versa. A positive object also attracts a neutral object, and a negative object will also attract a neutral object.
9. **Repel:** push away from each other.
10. **Attract:** pull towards each other.
11. **Methods of Charging Particles:**
  - a. **Friction Method:** 2 objects rubbing against each other
  - b. **Conduction:** involves the direct contact of objects; electrons flow through one object into another object.
  - c. **Induction:** No contact is necessary. Involves a rearrangement of electric charges when a neutral object gets close to a charged object.
12. **Electric Discharge:** loss of static electricity as charges move off of an object.
13. **Current Electricity:** moving electricity caused by the flow of electrons along a path called a circuit.
14. **Circuit:** pathway that allows for the flow of electrons. When a circuit is complete (closed) electrons are able to flow through the circuit. When a circuit is incomplete (open) electrons cannot flow through the circuit.
15. **Battery:** device that produces electricity by converting chemical energy into electrical energy. Batteries have two terminals; a positive terminal and a negative terminal. When a battery is hooked up to a circuit, electrons leave the battery through the negative terminal, flow through the circuit, and then return to the battery through the positive terminal.
16. **Direct Current:** A circuit in which the electrons flow in only one direction (from the negative terminal, around the circuit, and then back into the positive terminal of a battery).
17. **Series Circuits:** There is only one pathway for the electrons to travel in a series circuit, so the electrons must move through all of the devices in the circuit. If one device is shut off, all of the

devices will shut off. The devices must share the electrical pressure, so as more devices are added, each one gets less power.

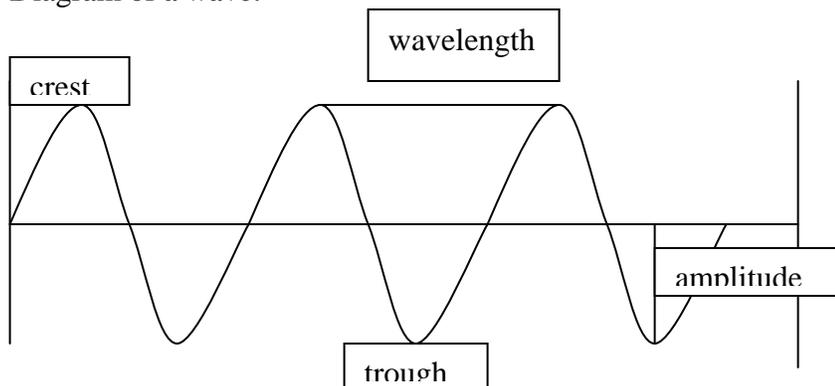
18. **Parallel Circuits:** Electrons have more than one path to follow. Each appliance has its own path, so you can shut off one appliance at a time. Appliances do not share the electrical pressure, so as more appliances are added, each appliance continues to get the full voltage that it needs to work properly.
19. **Voltmeter:** Measures electrical current.
20. **Galvanometer:** measures weak electrical current
21. **Conductors:** materials that allow electrical current to flow through them easily. Metals are good conductors.
22. **Insulators:** materials that do not allow electrical current to flow through them easily. Plastic and rubber are good insulators.
23. **Magnetism:** A force caused by a magnetic substance. Iron, nickel, and cobalt are the only three naturally magnetic elements.
24. **Magnets:** Magnets are attracted to metal objects, and will attract and repel each other. **Permanent magnets** are usually made out of steel. Temporary magnets (**electromagnets**) are made out of a soft iron core, copper wire, and a battery.
25. **Magnetic Poles:** a magnet is strongest at its poles (north and south).

**Like Poles:** Like poles repel each other . A north pole of a magnet will repel the north pole of another magnet. The south pole of one magnet will repel the south pole of another magnet.

**Unlike Poles:** Unlike poles attract each other. A north pole will be attracted to a south pole.

26. **Magnetic Field:** The invisible lines of force that surround a magnet. A magnetic field can produce current electricity (which can be measured by using a galvanometer). Current electricity can produce a magnetic field (when a compass is placed near a complete circuit, the compass needle will move).
27. **Wave:** All waves transfer energy (move energy from one place to another). There are two kinds of waves: mechanical waves and electromagnetic waves.

Diagram of a wave:



**Wavelength:** the distance from one crest to the next crest or from one trough to the next trough

**Frequency:** The number of wavelengths per second. Frequency is measured in **Hertz**. One Hertz = one wave per second. The higher the frequency, the higher the **pitch** of a sound will be.

**Amplitude:** the height of the wave from mid-point to crest or from mid-point to trough. The higher the amplitude, the louder the volume of a sound will be. Volume is measured in **decibels**.

28. **Mechanical Waves:** must travel through matter. They are created when atoms bump into each other. Examples of mechanical waves are ocean waves and sound waves.

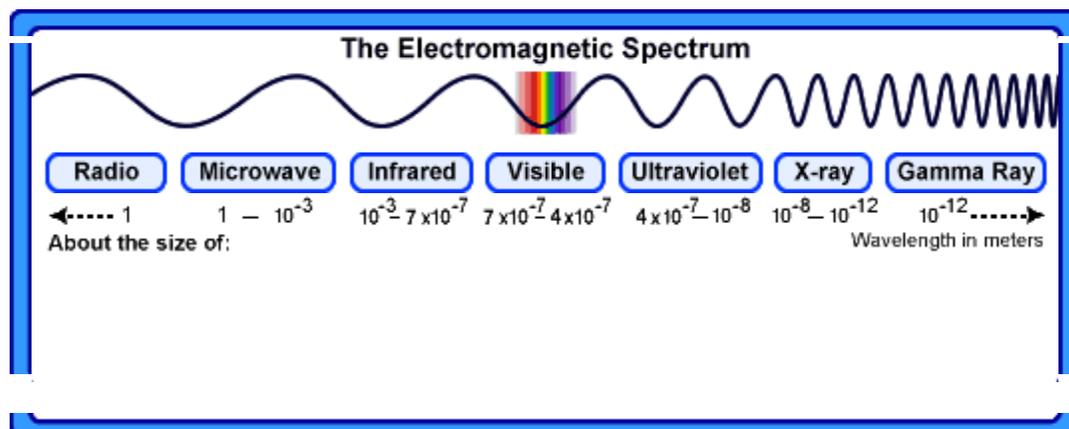
29. **Electromagnetic Waves:** do not need to travel through matter; they can pass through a vacuum (like outer space). There are many different types of electromagnetic waves, each type of electromagnetic wave has a different wave length. You can look at the **electromagnetic spectrum** to see the various types of electromagnetic waves and their different wavelengths. Examples of electromagnetic waves are light waves and radio waves.

30. **Longitudinal waves:** also called compression waves; these waves make matter move in the same direction as the wave is traveling. As the matter moves there will be areas of compressions (places where the atoms get mashed together) and areas of rarefactions (places where the atoms get spread out). Examples of longitudinal waves are sound waves.

31. **Transverse Waves:** these waves make matter move at right angles to the direction in which the wave is moving. Examples of transverse waves are light waves and radio waves.

32. **Sound:** A form of energy that travels as longitudinal / compression waves. Sound is caused by vibrations. Sound waves are mechanical waves, so they must travel through matter. Sound travels fastest through solids because in solids the atoms are closer together, so they will bump into each other faster, and make the sound wave travel faster.

33. **Electromagnetic Spectrum:** When the different types of electromagnetic waves are put in order based on their wavelengths, they form the electromagnetic spectrum. Below is a small portion of the electromagnetic spectrum. This diagram does not include all of the different types of electromagnetic waves, but it does show several of them.



**Radio waves**: electromagnetic waves with the lowest frequency and longest wavelength. Used for communication.

**Microwaves**: used for cooking and communication.

**Infrared waves**: also known as heat waves

**Visible light**: light that you can see. Red, Orange, yellow, green, blue, indigo, violet

**Ultra-violet light**: comes from the sun, helps your body produce vitamin D, causes skin cancer.

**X-rays**: Used to diagnose broken bones, cavities, etc.

**Gamma Rays**: Electromagnetic wave with the highest frequency and the shortest wavelength. This is the type of electromagnetic wave with the most energy. Gamma rays are the type of radiation released during nuclear reactions, and gamma rays may be used to treat cancer.

34. **Light**: a form of energy that travels as electromagnetic waves. Light travels in straight lines called rays. When a light ray bumps into an object, three different things can happen:

Light can be **Transmitted**: This happens when light passes through an object

Light can be **Reflected**: This happens when light bounces off of an object. Objects can be seen because light bounces off of them. The color of light that is being reflected by an object is the color of light that you see when you look at an object.

Ex: a blue shirt reflects blue light and absorbs all of the other colors of light.

Light can be **Absorbed**: This happens when light energy “soaks-into” an object and becomes heat energy.

35. **Emit**: To give off

36. **Transparent**: If an object is transparent you can see through it, and it allows light to pass through it clearly. Glass windows are transparent.

37. **Translucent**: If an object is translucent it allows light to pass through it, but not clearly. Lace or gauze curtains are translucent.

38. **Opaque**: If an object is opaque, light cannot pass through it. A wooden table is opaque.

39. **Refraction**: The bending of light when it changes speed as it passes through different types of mediums.