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Multi-purpose academic vocabulary and details on matter
Physical Sciences

*Not intended for memorization; see assignments for usage instructions

General

Matter - Anything that has mass and takes up space.

Mass - The amount of matter in an object.

Volume - The amount of space an object occupies.

Density - Mass per unit volume of a substance.

Energy - The ability to do work or cause change.

Force - A push or pull on an object that can cause it to move or change direction.

Gravity - A force (some argue) that pulls objects toward each other.

Weight - The force of gravity acting on an object's mass.

Motion and Mechanics

Speed - The distance an object travels per unit of time.

Velocity - Speed in a specific direction.

Acceleration - The rate of change of velocity.

Inertia - The tendency of an object to resist changes in its motion.

Friction - A force that opposes motion between two surfaces in contact.

Momentum - The quantity of motion of a moving body, calculated as mass times velocity.

Work - The result of a force moving an object over a distance.

Power - The rate at which work is done or energy is transferred.

Waves and Sound

Wave - A disturbance that transfers energy from place to place.

Frequency - The number of waves that pass a point in a given period of time.

Amplitude - The height of a wave from its midpoint to its crest or trough.

Wavelength - The distance between two consecutive crests or troughs of a wave.

Sound - A type of wave that is produced by vibrating objects and travels through a medium.

Electricity and Magnetism

Charge - A property of a particle that causes it to experience a force in an electric field.

Current - The flow of electric charge in a circuit.

Voltage - The difference in electric potential energy between two points.

Resistance - A material's opposition to the flow of electric current.

Magnetism - The force of attraction or repulsion between objects due to their magnetic fields.

Electromagnetic Spectrum - The range of all types of electromagnetic radiation.

Atomic and Nuclear Physics

Atom - The basic unit of a chemical element, made of protons, neutrons, and electrons.

Nucleus - The dense center of an atom, containing protons and neutrons.

Proton - A positively charged particle in the nucleus of an atom.

Neutron - A neutral particle in the nucleus of an atom.

Electron - A negatively charged particle that orbits the nucleus of an atom.

Ion - An atom with a net electric charge due to the loss or gain of electrons.

Isotope - Atoms of the same element with different numbers of neutrons.

Thermal Physics

Temperature - A measure of the average kinetic energy of the particles in a substance.

Heat - The transfer of thermal energy from one object to another.

Thermal Energy - The total kinetic and potential energy of the particles in an object.

Conduction - The transfer of heat through direct contact.

Convection - The transfer of heat by the movement of fluids (liquids or gases).

Radiation - The transfer of energy by electromagnetic waves.



Quantum Mechanics and Modern Physics

Photon - A particle representing a quantum of light or other electromagnetic radiation.

Quantum - The minimum amount of any physical entity involved in an interaction.

Wave-Particle Duality - The concept that every particle or quantum entity may be partly described in terms not only of particles but also of waves.

Uncertainty Principle - The principle that one cannot precisely measure both the position and momentum of a particle at the same time.

Relativity - The theory developed by Einstein that describes how time and space are interconnected.

Space-Time - The four-dimensional continuum in which all objects are located and events occur, merging the dimensions of space and time.

Black Hole - A region in space where the gravitational pull is so strong that nothing, not even light, can escape it.

In science, **matter** is defined as any substance that has mass and takes up space. Basically, it's anything that can be touched. Yet, there are also phenomena that are not matter, such as light, sounds, and other forms of energy.

Examples

Anything you can touch, taste, or smell consists of matter: atoms, molecules, forks, people...

--> We can observe things which are not matter. Typically, these are forms of energy, such as sunlight, rainbows, thoughts, emotions, music, and radio waves.

States of Matter

You can identify matter by its chemical composition and its state. States of matter encountered in daily life include solids, liquids, gases, and plasma. Other states of matter exist near absolute zero and at extremely high temperatures.

Solid - State of matter with a defined shape and volume. Particles are packed close together.

Example: Ice

Liquid - State of matter with defined volume, but no defined shape. Space between particles allows this form of matter to flow. Example: Water

Gas - State of matter without a defined volume or shape. Particles can adjust to the size and shape of their container. Example: Water vapor in clouds

Difference Between Matter and Mass

The terms "matter" and "mass" are related, but don't mean exactly the same thing.

Mass is a measure of the amount of matter in the sample. For example, you might have a block of carbon. It consists of carbon atoms (a form of matter). You could use a balance to measure the block's mass to obtain a mass in units of grams or pounds. Mass is a property of a sample of matter.

What Is Matter Made Of?

Matter consists of building blocks. In chemistry, atoms and ions are the smallest units of matter that cannot be broken down using any chemical reaction. But, nuclear reactions can break atoms into their subunits. The basic subunits of atoms and ions are protons, neutrons, and electrons. The number of protons in an atom identifies its element.

Protons, neutrons, and electrons are subatomic particles, but there are even smaller units of matter. Protons and neutrons are examples of subatomic particles called baryons, which are made of quarks. Electrons are examples of subatomic particles called leptons. So, in physics, one definition of matter is that it consists of leptons or quarks.