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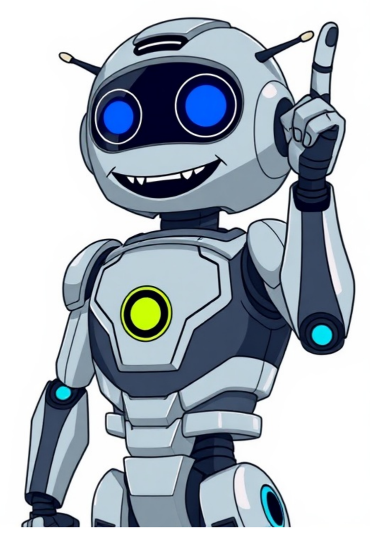

Learn about the three main states of matter: solids, liquids, and gases. This article provides a comprehensive overview of each state of matter, including examples of everyday objects that exist in each form. Solids have a fixed shape and volume. They do not change shape when placed in a different container or environment. Examples of solids include rocks, metals, and ice. Liquids take the shape of their container and have a fixed volume. They can flow and change shape easily. Examples of liquids include water, oil, and juice. Gases have neither a fixed shape nor a fixed volume. They expand to fill any container they are in and can be compressed. Examples of gases include air, helium, and oxygen. Bromine in both liquid and gas state encased inside acrylic in solid stateHelium's orange glow in its plasma stateA simplified phase diagram for water showing whether solid ice liquid water or gaseous water vapor is most stable at different combinations of temperature and pressure In physics state of matter or phase of matter is one of distinct forms in which matter can exist Four states are observable everyday life: solid liquid gas and plasma. Different states distinguished by ways component particles atoms molecules ions and electrons arranged and behave collectively. In solid particles tightly packed held fixed positions giving material definite shape volume. In liquid particles close together move past one another allowing substance maintain fixed volume adapting shape container. In gas particles far apart move freely allowing substance expand fill both shape volume of container. Plasma similar to gas but contains charged particles ions and free electrons move independently respond electric magnetic fields. Beyond classical states matter wide variety additional states known exist Some these lie between traditional categories liquid crystals exhibit properties solids liquids. Others represent entirely different kinds of ordering Magnetic states do not depend spatial arrangement atoms rather alignment intrinsic magnetic moments spins Even solid where atoms fixed position spins organize distinct ways giving rise magnetic states ferromagnetism antiferromagnetism Some states occur extreme conditions Bose–Einstein condensates Fermionic condensates extreme cold neutron-degenerate matter extreme density quark–gluon plasma extremely high energy Phase sometimes used synonym state matter but possible single compound form different phases same state matter For example ice solid state water multiple phases ice with different crystal structures formed at pressures temperatures Main article Solid Simple illustration particles in solid state they closely packed to each other In solid constituent particles ions atoms molecules closely packed together forces between particles so strong particles cannot move freely can only vibrate Resulting solid has stable definite shape and volume Solids change shape outside force as when broken cut. Crystalline solids particles packed regularly ordered repeating pattern Various different crystal structures substance can have more solid phase For example iron body-centred cubic structure temperatures below °C face-centred cubic structure between °C ice fifteen known crystal structures solid phases exist various temperatures pressures Glasses non-crystalline amorphous solids without long-range order not thermal equilibrium ground states described below as nonclassical states matter Solids can be transformed liquids by melting liquids can be transformed solids freezing. Solids can change directly gases sublimation gases can change directly solids deposition Main article Liquid Simple illustration particles in liquid state they can flow and change shape Liquid nearly incompressible fluid conforms shape container retains constant volume independent pressure Volume definite temperature pressure constant When solid heated above melting point becomes liquid given pressure higher triple point substance Intermolecular forces still important molecules have enough energy move relative to each other structure is mobile Shape of liquid not definite determined by container Volume usually greater than corresponding solid best known exception water H2O Highest temperature liquid exist critical temperature Main article Gas Simple illustration particles in gas state reality these particles much further apart Gas compressible fluid Not only will gas conform shape container but also expand fill container. In gas molecules have enough kinetic energy effect intermolecular forces small zero ideal gas typical distance neighboring molecules much greater molecular size Gas has no definite shape volume occupies entire container which is confined Liquid may be converted gas heating constant pressure boiling point reducing pressure constant temperature A vapor exist equilibrium liquid solid case gas pressure equals vapor pressure liquid solid Vapor can exist in equilibrium with liquid solid temperature below critical temperature gas is also called vapor can be liquefied compression alone cooling. Vapor exist equilibrium liquid vapor temperature above critical temperature gas distinction between liquid and disappears Supercritical fluid SCF gas whose temperature and pressure above critical temperature critical pressure respectively In this state distinction between liquid gas disappears supercritical fluid has physical properties gas but high density confers solvent properties useful applications For example supercritical carbon dioxide used extract caffeine manufacture decaffeinated coffee Main article Plasma Artificial plasma produced air Jacob's Ladder extremely strong potential difference two rods ionize particles air creating plasma Gas usually converted plasma exposure extremely high temperatures Heating matter high temperatures ###ARTICLEplasma states are formed when electrons are freed from their parent atoms, resulting in the presence of free electrons and creating a partially ionised plasma. At very high temperatures, such as those present in stars, it is assumed that essentially all electrons are "free", and that a very high-energy plasma is essentially bare nuclei swimming in a sea of electrons, forming a fully ionised plasma. This state of matter is often misunderstood, but it is commonly generated by lightning, electric sparks, fluorescent lights, neon lights or in plasma televisions. The Sun's corona, some types of flame, and stars are all examples of illuminated matter in the plasma state. plasma is by far the most abundant of the four fundamental states, as 99% of all ordinary matter in the universe is plasma, composing all stars. A phase transition indicates a change in structure and can be recognized by an abrupt change in properties. Distinct states of matter are defined as any set of states distinguished from any other set of states by a phase transition. water can be said to have several distinct solid states, and the appearance of superconductivity is associated with a phase transition, so there are superconductive states. Likewise, ferromagnetic states are demarcated by phase transitions and have distinctive properties. Liquid helium in a superfluid phase exhibits peculiar behavior, where it "creeps" up on the walls of a container and eventually drips out. This phenomenon occurs at very low temperatures, similar to that of Bose-Einstein condensation. In a gas of rubidium, cooling leads to the formation of a Bose-Einstein condensate, where particles occupy the same lowest energy state. Bose-Einstein condensation was predicted by Albert Einstein in 1925 and is observed when bosonic particles are cooled close to absolute zero. At this temperature, a large fraction of particles occupies the same quantum state, resulting in a condensation effect. Similarities exist between Bose-Einstein condensation and water condensation. Superfluidity, a property of liquid helium-4 below 2.17 K, allows it to flow without friction and has infinite thermal conductivity. When placed in a spinning container, quantized vortices are formed. Research groups have experimentally confirmed the existence of Bose-Einstein condensates with rubidium and sodium atoms. Fermionic condensates, composed of fermions, exhibit similar properties but with distinct differences due to the Pauli exclusion principle. These condensates include superconductors and certain phases of helium-3. Superconductivity is a phenomenon where materials have zero electrical resistivity, perfect conductivity, and exclude magnetic fields. Degenerate matter, formed under high pressure in stellar cores, exhibits unique properties, such as degenerate stars collapsing into high densities. Electron-degenerate matter is found in white dwarf stars, while neutron-degenerate matter is found in neutron stars. Cold degenerate matter is also present in planets like Jupiter and brown dwarfs. Quark matter or quantum chromodynamical (QCD) matter occurs at extremely high densities or temperatures, where quarks are deconfined and free to move. Strange matter, suspected to exist inside some neutron stars, has part of its energy available for other processes. Quark–Gluon Plasma, Color-Glass Condensate, and Other Exotic Matter States The provided text appears to be a collection of academic and educational materials, including questions and answers about states of matter, and information about various scientific topics. Here is a rewritten version with some of the information rephrased: Matter exists in different states, including solid, liquid, and gas. These states can change under various conditions, such as temperature and pressure. 1. When a substance is heated, the particles gain energy, move faster, and spread out. This increased motion causes the particles to move farther apart. 2. An example of a physical change in matter is when a candle is burned, and the wax melts. This change can be observed as the wax transforms from a solid to a liquid state. 3. A practical application of the expansion of matter due to temperature is in thermometers. As the temperature increases, the mercury inside the thermometer expands, allowing for temperature measurements. 4. Chemical changes in matter occur when a substance transforms into a new substance. An example of this is baking a cake, where the ingredients undergo chemical reactions to produce a different texture and taste. 5. The different states of matter can be described as follows: - Evaporation: Liquid to Gas - Melting: Solid to Liquid - Condensation: Gas to Liquid - Freezing: Liquid to Solid These changes in states of matter are essential concepts in understanding various scientific phenomena and are applied in different fields, including physics and chemistry.

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