Matter, Conservation Of Encyclopedia Article

Matter, Conservation Of

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Matter, by definition, has mass and takes up space. Mass is generally defined as a quantitative measure of inertia. Inertia is the resistance of matter to a change in its speed or position as a result of the application of a force. The greater the mass of a object (matter), the smaller the change produced by an applied force.

Conservation Laws in physics state that physical properties (i.e. measurable quantities such as mass) do not change. These laws of conservation govern matter, energy, momentum and electric charge. Each such law states that fundamental, physical, measurable quantities of matter, energy, momentum and electric charge remain constant with the passage of time. An important function of conservation laws is that they make it possible to predict visible behavior without having to consider the microscopic details of the course of a physical process or chemical reaction.

Conservation of matter, therefore, implies that matter can be neither created nor destroyed--i.e., processes that change the physical or chemical properties of matter (such as change of state, from a solid to a liquid to a gas) leave the total mass of matter unchanged.

Einstein's recent theory of relativity has caused the notion of mass and the law of conservation of matter to undergo a radical revision. Matter has lost its absoluteness. The mass of an object is now seen to be equivalent to energy, to be inter convertible with energy, and to increase at very high speeds near that of light (about 186,000 miles per second). Matter, therefore is no longer understood to be constant, or unchangeable. In both chemical and nuclear reactions, some conversion between matter and energy occurs, so that the products of these reactions can have smaller or greater mass than the parts that caused the reaction. However, these inter conversions of matter and energy are too small to be detectable except in cases involving subatomic particles or speeds comparable to that of light. In these situations, conservation of matter is better defined as a special case of the more general law of conservation of mass-energy.