

Mass and Energy Encyclopedia Article

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Mass and Energy

Mass and energy are terms often used in physics calculations. While they were assumed to be interrelated quantities from their inception, it was only with the development of Einstein's theory of relativity that their truly intertwined nature became known, with the famous equation $E = mc^2$.

The concept of mass can be dealt with in more than one way. Inertial mass is the reaction an object or particle has to being accelerated or decelerated. That is, it is the expression of Newton's concept of inertia. Gravitational mass expresses the reaction an object has to being in a gravitational **field**. While there is nothing in theory that says these two quantities must be the same, the most sensitive of physical tests have found that they are.

Energy also comes in several forms. Kinetic energy is the energy a particle has due to its **motion**. Potential energy is due to chemical bonds, gravitational attraction, electromagnetic attraction, and other considerations.

Conservation of mass and energy are separate principles at low speeds. At high speeds (near the speed of **light**) they become one unified principle. Either way, these conservation laws are essential to giving quantitative solutions to physical problems. Energy conservation **equations** exist in algebraic and differential forms, and are used regularly in almost all physics and engineering applications.