

The following definitions are circular, they describe very fundamental concepts that are very hard to properly define. We take a relatively naive approach here, where space-time is Euclidean and matter is made up by elementary particles.

Definition 1 **Matter** is generally anything that has mass and extent. Matter is said to exist in four **states**: solid, liquid, gas, and plasma.

Definition 2 A (chemical) **substance** is a form of matter that has constant chemical composition and characteristic properties. It cannot be separated into components by physical separation methods, i.e. without breaking chemical bonds.

Definition 3 A **physical object** is a collection of particles (pieces of matter) taken to be one; an entity that can be perceived by the senses and acted upon. Physical objects are characterized by their extent in time and space and the matter they consists of.

Definition 4 The **extent** of a physical object is the space it takes up seen over time. This is taken to be a function from time into subsets of three-dimensional space.

Often the extent function is constant up to translations and rotations (moving the object around in space).

Definition 5 The **geometry** of a physical object (at a given point in time t) is the equivalence class of its extent at t under all euclidean translations and rotations.