WHAT IS MATTER?

What is matter? How is matter composed? How do components of the atom behave? Which are the states of matter?

Given the definition of “space” which is said it is a three-dimensional representation of everything we see and everything that occurs in the universe. Matter is any substance that occupies space.

Everything in the universe is made of energy that manifests itself in many ways. The matter is merely energy in a condensed form.
All physical objects are made of material which can be converted into energy and vice versa (see relativity Einstein formula where Energy = (mass) x (the square of the constant speed of light).

The atom is the smallest and chemically indivisible unit of matter maintaining the properties of an element. It consists of an atomic nucleus in the center of the atom (protons and neutrons).

A neutron is an uncharged particle in the nuclei of an atom. A proton is a charged particle in the nuclei of an atom which we call “positive” (1673 x 10\(^{-24}\) grams) while an electron has a mass of 9.10 x 10\(^{-28}\) grams. This means that the protons and neutrons have more than one thousand times the mass of electrons.

The nucleus is surrounded by electrons. The electron interacts with the nucleus of the atom by the electromagnetic charge and if there are several, are scattered in
different energy levels, for each level can only accept a certain amount of energy, displacing the other electrons further.

The matter of the universe changes naturally. As these changes occur, for example in the case of the matter, it will naturally release energy. When an electron changes of position in space and into or out of an electromagnetic field, this will emit or absorb photons of light.

To classify an atom, we count the number of particles that it has in its nucleus (the number of protons determines the atomic number and neutron number helps determine the isotope of the atom).

Thus, an atom can be classified on the periodic table of the elements.
If an atom has an equal number of protons and electrons, is said to be electronically neutral.

Several atoms of the same kind of protons are a type of matter which can be identified as an “element”. All atoms of a given element are identical, and atoms of different elements are different in size and properties.

The combination of elements by means of electromagnetic forces is called “compound”. The amount of matter in an object is determined by its mass.
Although matter is within the whole universe, so far humans have only been able to find only five states of matter, called “phases”: solids, liquids, gases, plasmas and a state called Bose-Einstein condensate.

1. In solids, the molecules are strongly bonded by molecular forces. A solid holds its shape and its volume is determined by the shape of the solid.

2. In the liquid phase molecular forces are weaker than in a solid. A liquid takes the shape of its container. Liquids have a fixed volume.
3. In the gas phase, the molecular forces are very weak. A gas fills, and takes the shape and volume of its container.

4. If a material is subjected to high temperatures and pressures (as in the sun), the atoms begin to unleash, shedding its electrons orbit and leaving a positive ion, thus becoming a “plasma”, which behaves like a fluid, which is responsive and generates electromagnetic forces. Most of the matter in the universe is plasma.
5. When matter approaches the absolute zero of temperature (-459.67°Farenheit, -273.15 degrees Celsius), the thousands of atoms of a substance condense into a single quantum state, forming the fifth state of matter, the Bose-Einstein condensate. Particles of this state of matter are fragile and light travels through them very slowly.

The states of matter are related to the physical state of the molecules and atoms. Such states can be switched from one to another, maintaining the same molecular structure.

When matter receives sufficient heat, it becomes ionized (losing its electrons), usually over 5,000 °C (9000°F), thus emitting a photon. This is the cause of the emission of light from stars like the sun.

Source: http://www.artinaid.com/2013/04/what-is-matter/