

main points

- The universe is probably 12–15 billion years old, and was probably formed by an event known as the Big Bang. At the time of the Big Bang, the distinction between matter and energy was very blurred. Even today, matter and energy can be interconverted.
- All chemicals are composed of particles of matter, which can be atoms, molecules, or ions. Molecules and ions are derived from atoms.
- Nuclear fusion was (and is) responsible for the origin of elements. The process of nuclear fusion also releases incredible amounts of energy, such as the energy released by stars, including our Sun.
- Atoms are composed of subatomic particles called protons, neutrons, and electrons. Protons and neutrons themselves are made up of quarks. Protons have a positive electric charge. Electrons have a negative electric charge. Neutrons are electrically neutral.
- The electric force causes the attraction between protons and electrons (and between any objects with opposite signs of charge). The electric force also causes repulsion between objects with the same sign of charge (such as two electrons or two protons). Elements are the simplest type of substance, each one characterized by a unique number of protons. Compounds are substances made up of two or more elements chemically bonded together.
- Molecules are made of two or more atoms that are held together by the sharing of electrons; each molecule behaves as an independent unit.
- Ions are electrically charged particles, derived from atoms or molecules when the atoms or molecules either lose or gain one or more electrons. Life was probably formed on Earth as a result of natural chemical processes.
- Our understanding of chemistry is helping to shed light on the mysteries of the origin of the universe and of life.