**The Molecule**

A molecule is an [electrically](https://en.wikipedia.org/wiki/Electrically) neutral group of two or more [atoms](https://en.wikipedia.org/wiki/Atom) held together by [chemical bonds](https://en.wikipedia.org/wiki/Chemical_bond). Molecules are distinguished from [ions](https://en.wikipedia.org/wiki/Ion) by their lack of [electrical charge](https://en.wikipedia.org/wiki/Electrical_charge). However, in [quantum physics](https://en.wikipedia.org/wiki/Quantum_physics), [organic chemistry](https://en.wikipedia.org/wiki/Organic_chemistry), and [biochemistry](https://en.wikipedia.org/wiki/Biochemistry), the term molecule is often used less strictly, also being applied to [polyatomic ions](https://en.wikipedia.org/wiki/Polyatomic_ion).

In the [kinetic theory of gases](https://en.wikipedia.org/wiki/Kinetic_theory_of_gases), the term molecule is often used for any gaseous [particle](https://en.wikipedia.org/wiki/Particle) regardless of its composition. According to this definition, [noble gas](https://en.wikipedia.org/wiki/Noble_gas) atoms are considered molecules as they are monatomic molecules.

A molecule may be [homonuclear](https://en.wikipedia.org/wiki/Homonuclear), that is, it consists of atoms of one [chemical element](https://en.wikipedia.org/wiki/Chemical_element), as with [oxygen](https://en.wikipedia.org/wiki/Oxygen) (O2); or it may be [heteronuclear](https://en.wikipedia.org/wiki/Heteronuclear), a [chemical compound](https://en.wikipedia.org/wiki/Chemical_compound) composed of more than one element, as with [water](https://en.wikipedia.org/wiki/Water_(molecule)) (H2O). Atoms and complexes connected by [non-covalent interactions](https://en.wikipedia.org/wiki/Non-covalent_interactions), such as [hydrogen bonds](https://en.wikipedia.org/wiki/Hydrogen_bond) or [ionic bonds](https://en.wikipedia.org/wiki/Ionic_bond), are typically not considered single molecules.

Molecules as components of matter are common in organic substances (and therefore biochemistry). They also make up most of the oceans and atmosphere. However, the majority of familiar solid substances on Earth, including most of the minerals that make up the [crust](https://en.wikipedia.org/wiki/Crust_(geology)), [mantle](https://en.wikipedia.org/wiki/Mantle_(geology)), and [core of the Earth](https://en.wikipedia.org/wiki/Earth_core), contain many chemical bonds, but are not made of identifiable molecules. Also, no typical molecule can be defined for [ionic crystals](https://en.wikipedia.org/wiki/Ionic_crystal) ([salts](https://en.wikipedia.org/wiki/Salt_(chemistry))) and covalent crystals ([network solids](https://en.wikipedia.org/wiki/Network_solid)), although these are often composed of repeating [unit cells](https://en.wikipedia.org/wiki/Unit_cell) that extend either in a [plane](https://en.wikipedia.org/wiki/Plane_(mathematics)) (such as in [graphene](https://en.wikipedia.org/wiki/Graphene)) or three-dimensionally (such as in [diamond](https://en.wikipedia.org/wiki/Diamond), [quartz](https://en.wikipedia.org/wiki/Quartz), or [sodium chloride](https://en.wikipedia.org/wiki/Sodium_chloride)). The theme of repeated unit-cellular-structure also holds for most condensed phases with [metallic bonding](https://en.wikipedia.org/wiki/Metallic_bond), which means that solid metals are also not made of molecules. In [glasses](https://en.wikipedia.org/wiki/Glass) (solids that exist in a vitreous disordered state), atoms may also be held together by chemical bonds with no presence of any definable molecule, nor any of the regularity of repeating units that characterizes crystals.

Most molecules are far too small to be seen with the naked eye, but there are exceptions. [DNA](https://en.wikipedia.org/wiki/DNA), a [macromolecule](https://en.wikipedia.org/wiki/Macromolecule), can reach [macroscopic](https://en.wikipedia.org/wiki/Macroscopic) sizes, as can molecules of many [polymers](https://en.wikipedia.org/wiki/Polymer). Molecules commonly used as building blocks for organic synthesis have a dimension of a few [angstroms](https://en.wikipedia.org/wiki/Angstrom) (Å) to several dozen Å, or around one billionth of a meter. Single molecules cannot usually be observed by [light](https://en.wikipedia.org/wiki/Light) (as noted above), but small molecules and even the outlines of individual atoms may be traced in some circumstances by use of an [atomic force microscope](https://en.wikipedia.org/wiki/Atomic_force_microscope). Some of the largest molecules are [macromolecules](https://en.wikipedia.org/wiki/Macromolecule) or [supermolecules](https://en.wikipedia.org/wiki/Supermolecule).

Whether or not an arrangement of atoms is sufficiently stable to be considered a molecule is inherently an operational definition. Philosophically, therefore, a molecule is not a fundamental entity (in contrast, for instance, to an [elementary particle](https://en.wikipedia.org/wiki/Elementary_particle)); rather, the concept of a molecule is the chemist's way of making a useful statement about the strengths of atomic-scale interactions in the world that we observe.