

# Hydrogen

**Hydrogen** is the [chemical element](#) with the [symbol](#) **H** and [atomic number](#) 1. With a [standard atomic weight](#) of 1.008, hydrogen is the lightest element in the [periodic table](#). Hydrogen is the [most abundant](#) chemical substance in the [universe](#), constituting roughly 75% of all [baryonic](#) mass.<sup>[7][note]</sup>

<sup>[1]</sup> Non-[remnant stars](#) are mainly composed of hydrogen in the [plasma state](#). The most common [isotope](#) of hydrogen, termed *protium* (name rarely used, symbol <sup>1</sup>H), has one [proton](#) and no [neutrons](#).

The universal emergence of atomic hydrogen first occurred during the [recombination epoch](#) ([Big Bang](#)). At [standard temperature and pressure](#), hydrogen is a [colorless](#), [odorless](#), [tasteless](#), non-toxic, [nonmetallic](#), highly [combustible diatomic gas](#) with the [molecular formula](#) H<sub>2</sub>. Since hydrogen readily forms [covalent](#) compounds with most nonmetallic elements, most of the hydrogen on Earth exists in [molecular forms](#) such as [water](#) or [organic compounds](#). Hydrogen plays a particularly important role in [acid–base reactions](#) because most acid–base reactions involve the exchange of protons between soluble molecules. In [ionic compounds](#), hydrogen can take the form of a negative charge (i.e., [anion](#)) when it is known as a [hydride](#), or as a positively charged (i.e., [cation](#)) [species](#) denoted by the symbol H<sup>+</sup>. The hydrogen cation is written as though composed of a bare proton, but in reality, hydrogen cations in ionic compounds are always more complex. As the only neutral atom for which the [Schrödinger equation](#) can be solved analytically,<sup>[8]</sup> study of the energetics and bonding of the hydrogen atom has played a key role in the development of [quantum mechanics](#).

Hydrogen gas was first artificially produced in the early 16th century by the reaction of acids on metals. In 1766–81, [Henry Cavendish](#) was the first to recognize that hydrogen gas was a discrete substance,<sup>[9]</sup> and that it produces water when burned, the property for which it was later named: in Greek, hydrogen means "water-former".

[Industrial production](#) is mainly from steam reforming natural gas, and less often from more energy-intensive methods such as the [electrolysis of water](#).<sup>[10]</sup> Most hydrogen is used near the site of its production, the two largest uses being [fossil fuel](#) processing (e.g., [hydrocracking](#)) and [ammonia](#) production, mostly for the fertilizer market. Hydrogen is problematic in [metallurgy](#) because it can [embrittle](#) many metals,<sup>[11]</sup> complicating the design of pipelines and storage tanks.<sup>[12]</sup>