

# Elementary Chemistry

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## Tóm tắt nội dung

[EN] This text is a collection of problems, from easy to advanced, about *hydrogen & air*. This text is also a supplementary material for my lecture note on Elementary Chemistry grade 8, which is stored & downloadable at the following link: [GitHub/NQBH/hobby/elementary\\_chemistry/grade 8/lecture](https://github.com/NQBH/hobby/elementary_chemistry/grade_8/lecture)<sup>1</sup>. The latest version of this text has been stored & downloadable at the following link: [GitHub/NQBH/hobby/elementary\\_chemistry/grade 8/hydrogen](https://github.com/NQBH/hobby/elementary_chemistry/grade_8/hydrogen)<sup>2</sup>.

[VI] Tài liệu này là 1 bộ sưu tập các bài tập chọn lọc từ cơ bản đến nâng cao về *oxi & không khí*. Tài liệu này là phần bài tập bổ sung cho tài liệu chính – bài giảng [GitHub/NQBH/hobby/elementary\\_chemistry/grade 8/lecture](https://github.com/NQBH/hobby/elementary_chemistry/grade_8/lecture) của tác giả viết cho Hóa Sơ Cấp lớp 8. Phiên bản mới nhất của tài liệu này được lưu trữ & có thể tải xuống ở link sau: [GitHub/NQBH/hobby/elementary\\_chemistry/grade 8/hydrogen](https://github.com/NQBH/hobby/elementary_chemistry/grade_8/hydrogen).

## Mục lục

<b>1</b>	<b>Wikipedia/Hydrogen</b>	<b>2</b>
1.1	Properties	2
1.2	History	2
1.3	Cosmic Prevalence & Distribution	2
1.4	Production	2
1.5	Applications	2
1.6	Biological Reactions	2
1.7	Safety & Precautions	2
<b>2</b>	<b>Tính Chất của Hydro – Phản Ứng Oxi Hóa-Khử</b>	<b>2</b>

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<sup>1</sup>URL: [https://github.com/NQBH/hobby/blob/master/elementary\\_chemistry/grade\\_8/NQBH\\_elementary\\_chemistry\\_grade\\_8.pdf](https://github.com/NQBH/hobby/blob/master/elementary_chemistry/grade_8/NQBH_elementary_chemistry_grade_8.pdf).

<sup>2</sup>URL: [https://github.com/NQBH/hobby/blob/master/elementary\\_chemistry/grade\\_8/hydrogen/NQBH\\_hydrogen.pdf](https://github.com/NQBH/hobby/blob/master/elementary_chemistry/grade_8/hydrogen/NQBH_hydrogen.pdf).

# 1 Wikipedia/Hydrogen

“*Hydrogen* is the **chemical element** with the **symbol** H & **atomic number** 1. Hydrogen is the lightest element. At **standard conditions** hydrogen is a **gas** of **diatomic molecule** having the **formula** H<sub>2</sub>. It is **colorless**, **odorless**, **tasteless**, non-toxic, & highly **combustible**. Hydrogen is the **most abundant** chemical substance in the **universe**, constituting roughly 75% of all **normal matter**. **Stars** such as the **Sun** are mainly composed of hydrogen in the **plasma state**. Most of the hydrogen on Earth exists in **molecular forms** such as **water** & **organic compounds**. For the most common **isotope** of hydrogen (symbol <sup>1</sup>H) each **atom** has 1 **proton**, 1 **electron**, & no **neutrons**.

In the early **universe**, the formation of protons, the nuclei of hydrogen, occurred during the 1st second after the **Big Bang**. The emergence of neutral hydrogen atoms throughout the universe occurred about 370000 years later during the **recombination epoch**, when the **plasma** had cooled enough for **electrons** to remain bound to protons.

Hydrogen is **nonmetallic** (except it becomes **metallic** at extremely high pressures) & readily forms a single **covalent bond** with most nonmetallic elements, forming compounds such as water & nearly all **organic compounds**. Hydrogen plays a particularly important role in **acid–base reactions** because these reactions usually involve the exchange of protons between soluble molecules. In **ionic compounds**, hydrogen can take the form of a negative charge (i.e., **anion**) where it is known as a **hydride**, or as a positively charged (i.e., **cation**) **species** denoted by the symbol H<sup>+</sup>. The H<sup>+</sup> cation is simply a **proton** (symbol p) but its behavior in **aqueous solutions** & in **ionic compounds** involves **screening** of its **electric charge** by nearby **polar** molecules or anions. Because hydrogen is the only neutral atom for which the **Schrödinger equation** can be solved analytically, the study of its energetics & chemical bonding has played a key role in the development of **quantum mechanics**.

Hydrogen gas was 1st artificially produced in the early 16th century by the reaction of acids on metals. In 1766–1781, **Henry Cavendish** was the 1st to recognize that hydrogen gas was a discrete substance, & 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** of **natural gas**, oil reforming, or **coal gasification**. A small percentage is also produced using more energy-intensive methods such as the **electrolysis of water**. Most hydrogen is used near the site of its production, the 2 largest uses being **fossil fuel** processing (e.g., **hydrocracking**) & **ammonia** production, mostly for the fertilizer market. It can be burned to produce heat or combined with oxygen in **fuel cells** to generate electricity directly, with water being the only emissions at the point of usage. Hydrogen atoms (but not gaseous molecules) are problematic in **metallurgy** because they can **embrittle** many metals.” – Wikipedia/hydrogen

## 1.1 Properties

## 1.2 History

## 1.3 Cosmic Prevalence & Distribution

## 1.4 Production

## 1.5 Applications

## 1.6 Biological Reactions

## 1.7 Safety & Precautions