

Hydrogen Reading Comprehension

Name _____

Hydrogen is the first element on the Periodic Table. It has one proton and one electron, making it the simplest element on the Periodic Table. Hydrogen is a colorless, odorless gas that was first discovered in 1766 by Henry Cavendish. We most commonly identify it as a component in the water we drink, which has the chemical formula H_2O . In fact, the word hydrogen comes from the two Greek roots “hydro” and “genes,” which together mean “water-forming.” Hydrogen is also essential for life; in addition to being found in water, it also appears in almost every molecule that living things have.

While hydrogen is mostly found in our environment as water, it can also exist in the form of hydrogen gas, or H_2 . Hydrogen gas is the smallest molecule in the universe, giving it the rare ability to diffuse through very selective cellular barriers into the body’s organs, tissues, and cells. This could give the gas an important role in modern medicine: very frequently, the body’s defense mechanisms can reject critical medicines that aren’t able to get past biological barriers. Hydrogen has a high bioavailability, meaning that a very high fraction of the gas that enters the body actually makes into bodily circulation and is not rejected—making it a promising element for future medicinal study.

Another of hydrogen’s uses has to do with fueling. Since hydrogen is the simplest element, and has the lowest density out of all gases, it was initially used to fill balloons and airships and prepare them for flight. However, the element’s high reactivity with oxygen to form water made it very flammable. In 1937, an airship called the Hindenburg filled with hydrogen caught fire and crashed while trying to land in New Jersey—leading scientists to conclude that a different gas might be better to fill their airborne vessels.

One of hydrogen’s most exciting potential uses has to do with fusion, a method of creating energy. The process of fusion is used by stars in space to power up by bringing two small hydrogen nuclei together to form a larger one, releasing energy in the process. Fusion has intriguing prospects on earth because it does not release any pollution along with its energy, making it a very clean form of power production. Because of this, hydrogen-powered fuel cells and fusion power could be in our future—that is, if we are able to mimic the extremely high temperatures at which fusion occurs in outer space.

1. Which of the following statements is correct?

- a. Hydrogen was invented by Henry Cavendish.
- b. Hydrogen was discovered by Henry Cavendish.
- c. Hydrogen was discovered in 1676.
- d. Hydrogen was invented in 1676.

2. Why might hydrogen's size give it an advantage in permeating biological barriers?

- a. Smaller molecules face no barriers at all when attempting to enter cells.
- b. Hydrogen's size allows it to degrade and damage biological barriers upon entry.
- c. Cellular barriers prevent large molecules from easily entering cells.
- d. Hydrogen's size gives it a low bioavailability.

3. Which gas most likely fills airships and hot air balloons today?

- a. Hydrogen, because it is the simplest and lightest element
- b. Helium, because it is light like hydrogen but is not flammable
- c. Hydrogen, because it has the lowest density of all the elements
- d. Helium, because it easily reacts with oxygen to form water

4. Which of the following statements about fusion is incorrect?

- a. Fusion produces energy without releasing any pollution.
- b. Fusion releases energy by combining hydrogen nuclei.
- c. Fusion is easy to mimic at Earth's temperatures.
- d. Fusion occurs commonly in outer space.

5. Which of the following is not a use of hydrogen mentioned in the article?

- a. Medicinal
- b. Energy production
- c. Fission
- d. Water formation

6. Select the correct method of calculation for a bioavailability fraction.

- a. Gas that makes it to body circulation / gas that enters the body
- b. Gas that enters the body / gas that makes it to body circulation
- c. Gas that is rejected / gas that makes it to body circulation
- d. Gas that is rejected / gas that enters the body

7. Infer why the Hindenburg airship caught fire and crashed in 1937.

- a. The helium in the airship was too heavy and weighed the ship down, setting it on fire.
- b. The hydrogen in the airship was too dense and caused the Hindenburg to sink.
- c. The hydrogen in the airship reacted with water to form oxygen, producing a flammable compound.
- d. The hydrogen in the airship reacted with oxygen to form water, producing energy that caught the ship on fire.