

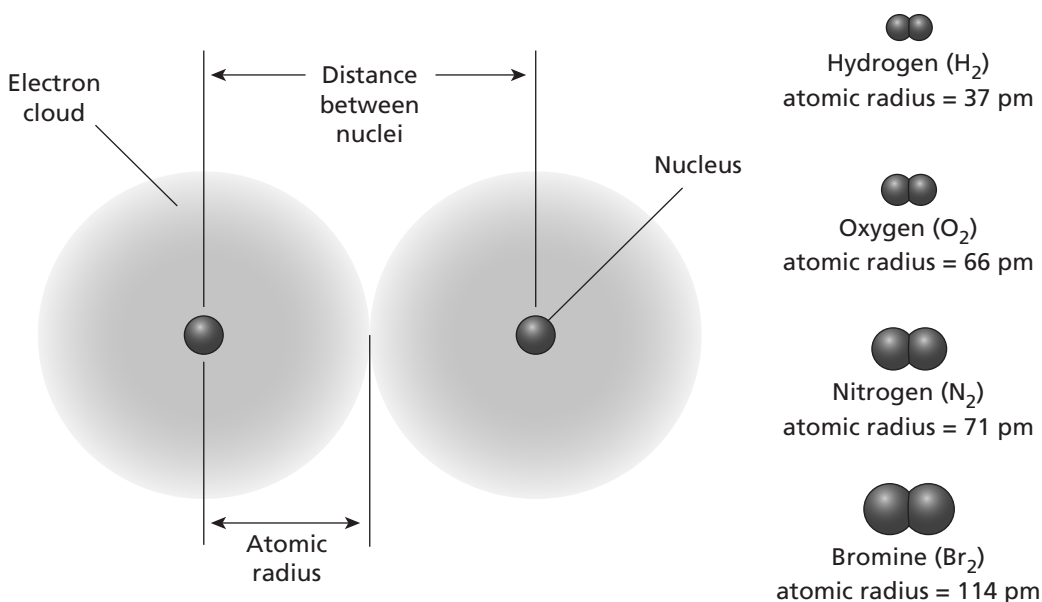
Elements and the Periodic Table ▪ 4.1 Enrich

Exactly How Small Is It?

Measuring the size of an atom is not easy. For one thing, an atom is very, very tiny. Scientists, however, have developed several ways to estimate the relative sizes of atoms. If the atoms are in a solid crystalline structure, scientists can use a technique called X-ray diffraction to estimate the distance between the nuclei of two adjacent atoms. For elements that exist as diatomic molecules, such as oxygen and hydrogen, scientists can estimate the distance between the nuclei of the two atoms bonded together. (Diatomic molecules are molecules that are made up of two atoms bonded together.)

Once scientists estimate the distance between two nuclei, they calculate the atomic radius, which is one-half the distance between the nuclei. It's important to remember that the atomic radius is not a measurement of a single atom's size but only its size relative to other atoms. In other words, scientists know that oxygen atoms are larger than hydrogen atoms, but they don't know the exact size of any single atom of oxygen. When comparing sizes of atoms, one must be careful to compare sizes based on similar measuring techniques.

The figure below shows the atomic radii of several elements. The atomic radius is given in units of picometers (pm). One picometer is equal to 0.000000000001 meter.



Answer the following questions on a separate sheet of paper.

1. What part of an atom determines its size?
2. Why is it difficult to measure the size of an atom?
3. What is the distance between nuclei in a hydrogen molecule (H₂)?
4. What would be the distance between nuclei of a bromine molecule (Br₂)?
5. What is the atomic radius of oxygen in meters?
6. Which atoms are relatively larger than oxygen atoms?