

# ATOMS

An atom is the small unit of which all matter is made. It consists of three types of particles: **NEUTRONS**, **PROTONS**, and **ELECTRONS**. The neutrons and protons are located in the center of the atom in what is called the nucleus. The electrons orbit the nucleus.

All of these particles are, of course, too small for us to see. But if we could see them, we would notice that the protons and neutrons are about the same size and that they are much larger than the electrons. Therefore, almost all the mass of an atom is in its nucleus.

Each proton in an atom's nucleus has a positive electric charge, and each electron circling around the nucleus has a negative charge. The neutrons carry no charge at all – that is, they are electrically neutral. When an atom has the same number of protons and electrons, which is usually the case, the positive and negative charges cancel each other, and the atom itself is electrically neutral.

All atoms of a particular element have the same number of protons in their nuclei. For example: All helium atoms have two protons in their nuclei. All carbon atoms have six protons. The number of protons in the atoms of an element is the **ATOMIC NUMBER** of that element.

While all atoms of a particular element have the same number of protons, they do not always have the same number of neutrons. Atoms of the same element with different number of neutrons are called **ISOTOPES** of the element. It is much like a family. The Smith family has several members. Each of them has a different name, for instance: dad is Bob; mom is Mary; the children are John, Alice, and Ted. Each of them has a different size and weight. They are all still Smiths.



## American Nuclear Society

An element could be considered to be a family. In uranium, all family members will have 92 protons, which makes them uranium. One member could have 92 protons and 143 neutrons. Its name would be uranium-235. Another member might have 92 protons and 146 neutrons. Its name would be uranium-238.

Element (Family)	Nucleus		Isotope (Name)
	Protons	Neutrons	
hydrogen	1	1	hydrogen-1
	1	1	hydrogen-2
	1	2	hydrogen-3
carbon	6	6	carbon-12
	6	7	carbon-13
uranium	92	143	uranium-235
	92	146	uranium-238

The sum of the number of neutrons and protons in an isotope is the atomic weight of the isotope.

- The atomic weight of uranium-235 is 235 (92 protons + 143 neutrons = 235)
- The atomic weight of uranium-238 is 238 (92 protons + 146 neutrons = 238)

If an atom gains or loses neutrons, it becomes a different isotope of the same element. If it gains or loses protons, it becomes an isotope of a different element.

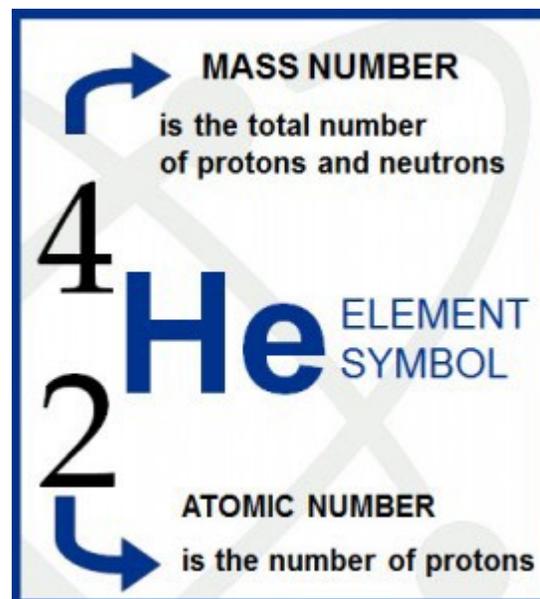
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## JUST FOR YOU

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Answer the following questions based on the reading passage. Don't forget to go back to the passage whenever necessary to confirm your answers.

1. The three types of particles in atoms are \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.
2. The atomic number of an element is equal to the number of \_\_\_\_\_ in its nucleus.
3. The atomic weight of an isotope of an element is the total number of \_\_\_\_\_ and \_\_\_\_\_ in the nuclei of its atoms.
4. If a uranium isotope has 92 protons and 146 neutrons, its atomic weight would be \_\_\_\_\_
5. An isotope of an element gets part of its name from the total number of \_\_\_\_\_ and \_\_\_\_\_ in its nuclei.
6. If the isotope helium-4 has 2 protons and 2 neutrons, the isotope helium-6 would have \_\_\_\_\_ protons and \_\_\_\_\_ neutrons.
7. One element changes into another element when it gains one or more \_\_\_\_\_.



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Answer the following questions based on the reading passage. Don't forget to go back to the passage whenever necessary to confirm your answers.

1. The three types of particles in atoms are **PROTONS**, **NEUTRONS**, and **ELECTRONS**.
2. The atomic number of an element is equal to the number of **PROTONS** in its nucleus.
3. The atomic weight of an isotope of an element is the total number of **PROTONS** and **NEUTRONS** in the nuclei of its atoms.
4. If a uranium isotope has 92 protons and 146 neutrons, its atomic weight would be **238**.
5. An isotope of an element gets part of its name from the total number of **PROTONS** and **NEUTRONS** in its nuclei.
6. If the isotope helium-4 has 2 protons and 2 neutrons, the isotope helium-6 would have **2 (two)** protons and **4 (four)** neutrons.
7. One element changes into another element when it gains one or more **PROTONS**.

