

Inside Every Element

Read closely to trace how atoms and their particles are organized.

SC.8.P.8.7 "Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons)."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each sentence that explains what an atom is or where a subatomic particle is found, then circle the words *protons*, *neutrons*, and *electrons*.

Matter at the Atomic Scale

- ① At a recycling center, workers sort copper wire from aluminum cans. Each material is an element, a substance made of only one kind of atom. An atom is the smallest unit of an element that still has that element's identity. Cutting a copper wire into tiny pieces does not turn one copper atom into a smaller copper unit. To explore below the atomic level, scientists describe particles inside atoms. Those particles help explain an atom's structure, but they are not smaller pieces that remain copper on their own.
- ② Every atom has a small, dense center called a nucleus. Protons and neutrons are found in the nucleus. Protons have a positive electric charge, neutrons have no electric charge, and electrons have a negative electric charge. Electrons move in the space surrounding the nucleus, often called the electron cloud. The cloud is not a solid shell. It describes regions where an electron is likely to be found. Because electrons surround the nucleus, an atomic model must place them outside the center.
- ③ Atoms of different elements contain different numbers of protons, so an atom's proton number identifies its element. A helium atom, for example, has two protons in its nucleus, while a carbon atom has six. Both kinds of atoms also have electrons surrounding their nuclei and may have neutrons in their nuclei. An uncharged atom has equal numbers of protons and electrons. Atomic theory describes this arrangement of subatomic particles and explains why each element is made of its own kind of atom.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 Imagine that a copper sample is divided again and again. What is the smallest unit that still has copper's identity?

2 A student's atomic model places an electron inside the nucleus. What change should the student make?

3 A student says that a proton or an electron is a smaller piece that is still the same element as the atom. Use the passage to explain the error.

4 An atom has the same number of protons and electrons. What can you conclude about its charge, and where are those particles located?

3 YOUR TURN _____ Your own words

Choose two elements. Complete the table to show the smallest unit of each element and where its subatomic particles are found.

ELEMENT	SMALLEST UNIT	IN THE NUCLEUS	SURROUNDING THE NUCLEUS

PART 1 • READ AND MARK

Underline each sentence that explains what an atom is or where a subatomic particle is found, then circle the words *protons*, *neutrons*, and *electrons*. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	Imagine that a copper sample is divided again and again. What is the smallest unit that still has copper's identity?	A copper atom is the smallest unit that still has copper's identity.
2	A student's atomic model places an electron inside the nucleus. What change should the student make?	Move the electron outside the nucleus, into the surrounding electron cloud.
3	A student says that a proton or an electron is a smaller piece that is still the same element as the atom. Use the passage to explain the error.	Subatomic particles help explain an atom's structure, but they are not smaller units that keep the identity of the element on their own.
4	An atom has the same number of protons and electrons. What can you conclude about its charge, and where are those particles located?	The atom is uncharged. Protons are in the nucleus, and electrons are in the space surrounding the nucleus.

PART 3 • YOUR TURN (SAMPLE ANSWER)

ELEMENT	SMALLEST UNIT	IN THE NUCLEUS	SURROUNDING THE NUCLEUS
Oxygen	An oxygen atom	Protons and neutrons	Electrons
Carbon	A carbon atom	Protons and neutrons	Electrons

Accept any two valid elements if each smallest unit is identified as an atom. Accept "electron cloud" or "space surrounding the nucleus" for the electron location.