Inside a Pencil Line

Read, mark, and build a model of an atom.

P.7.5C.1 "Develop and use models that explain the structure of an atom."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline statements that tell where particles belong in an atom model, circle the particle counts for carbon, and write 1 and 2 beside the first and second electron regions. Use your marks to help you build a model.

Zooming In on Carbon

1. A pencil's dark line contains graphite, a form of carbon. Imagine zooming in until one carbon atom fills your page. A useful model puts a tiny, dense nucleus at the center. The nucleus holds protons, which have positive charge, and neutrons, which have no charge. Electrons have negative charge and occupy regions outside the nucleus. These regions are often called shells. A sketch uses circles to show the regions, but electrons are not tiny planets following fixed circular tracks. The sketch is a tool for showing where particles belong.

2. A common carbon atom has 6 protons and 6 neutrons in its nucleus. It also has 6 electrons outside the nucleus. In a simple shell model, the first region holds up to 2 electrons; the next holds up to 8. For carbon, put 2 electrons in the first region and the other 4 in the second. The number of protons identifies an element: an atom with 6 protons is carbon. Neutrons add mass, but changing their number does not turn carbon into another element.

3. A model can also help explain electric charge. In a neutral atom, the number of electrons equals the number of protons, so their negative and positive charges balance. If a carbon atom loses 1 electron, its nucleus stays the same, but the atom has one more proton than electron and becomes positively charged. In any shell sketch, the nucleus and electrons may look similar in size or close together. Real nuclei are far smaller than atoms, and most of an atom's volume is space outside the nucleus.

2 ANSWER WITH EVIDENCE

Use the passage

1. You are starting a model of the common carbon atom in the passage. What will you put in the nucleus, and why must its proton count be correct?

2. How would you place carbon's electrons in the two regions of a simple shell model?

3. A carbon atom loses 1 electron. What must change in its model, what stays the same, and what charge does it have?

4. A student's model shows the nucleus filling most of the atom. What is misleading about that part of the model?

3 YOUR TURN

Your own words

Draw a simple shell model of a neutral atom with 8 protons and 8 neutrons. Label the particles, place its electrons in two regions, and write one sentence explaining how your model shows that the atom is neutral.

ANSWER KEY

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GRADE 7 · P.7.5C.1

PART 1 · READ AND MARK

Underline statements that tell where particles belong in an atom model, circle the particle counts for carbon, and write 1 and 2 beside the first and second electron regions. Use your marks to help you build a model. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	You are starting a model of the common carbon atom in the passage. What will you put in the nucleus, and why must its proton count be correct?	**Put 6 protons and 6 neutrons in the nucleus. The 6 protons identify the atom as carbon.**
2	How would you place carbon's electrons in the two regions of a simple shell model?	**Place 2 electrons in the first region and 4 in the second region.**
3	A carbon atom loses 1 electron. What must change in its model, what stays the same, and what charge does it have?	**The model must show 5 electrons instead of 6. Its nucleus stays the same, and the atom has a positive charge.**
4	A student's model shows the nucleus filling most of the atom. What is misleading about that part of the model?	**A real nucleus is far smaller than the atom. Most of the atom's volume is space outside the nucleus.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The drawing shows a nucleus labeled 8 protons and 8 neutrons, with 2 electrons in the first region and 6 electrons in the second. The atom is neutral because its 8 positive protons balance its 8 negative electrons.

Accept clear particle labels or symbols. Electron regions may be drawn as circles, but students should not claim that electrons follow fixed circular tracks.