Particle Clues

Use subatomic counts and isotope data to identify particles.

CHE.1 "Use the periodic table as a model to predict the structure and properties of atoms and elements. a. Assess the merits and limitations of historic and modern atomic models pertaining to the presence, position, mass..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the rules for using particle counts, and circle the sentence that explains what the percentages in the table represent.

What Is in the Water Sample?

1. In a water-testing lab, a scientist sorts particles using clues hidden in their subatomic counts. The periodic table places chlorine at atomic number 17 in group 17 and argon at atomic number 18 in group 18. Atomic number equals proton count. Protons and neutrons occupy the nucleus, while electrons are found outside it.

2. The lab's table lists counts for four particle samples. Percent shares are given only for naturally occurring neutral chlorine atoms; the shares compare isotopes, not every particle collected in the lab. To interpret each row, use proton count to identify the element and compare protons with electrons to predict charge. Different neutron counts can reveal different isotopes.

PARTICLE SAMPLES

Sample	Protons	Neutrons	Electrons	Share of natural chlorine
A	17	18	17	75.8%
B	17	20	17	24.2%
C	17	18	18	Not listed
D	18	22	18	Not listed

3. A lithium atom with 3 protons and 4 neutrons has mass number 7. Losing an electron makes an atom positive; gaining one makes it negative. Periodic position also matters: group 18 elements have full outer electron levels and usually react less than group 17 elements, whose atoms often gain an electron.

2 ANSWER WITH EVIDENCE

Use the passage

1. Why are A and B isotopes of the same element? Name the element.

2. Is C neutral, positive, or negative? Use its particle counts to explain.

3. Is the average mass number of the naturally occurring chlorine atoms shown closer to 35 or 37? Use the percentages to explain.

4. Identify D and predict whether it usually reacts more or less readily than A. Explain using the passage.

3 YOUR TURN

Your own words

Create a chlorine particle not shown in the table with a mass number of 36 and a charge of 1−. State its proton, neutron, and electron counts, then explain how it differs from both A and C.

Particle Clues

PART 1 · READ AND MARK

Underline the rules for using particle counts, and circle the sentence that explains what the percentages in the table represent. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Why are A and B isotopes of the same element? Name the element.	**Both have 17 protons, so both are chlorine. They have different neutron counts, 18 and 20.**
2	Is C neutral, positive, or negative? Use its particle counts to explain.	**C is negative because it has 18 electrons but only 17 protons. Its charge is 1−.**
3	Is the average mass number of the naturally occurring chlorine atoms shown closer to 35 or 37? Use the percentages to explain.	**It is closer to 35. The isotope with mass number 35 makes up 75.8% of the natural chlorine shown.**
4	Identify D and predict whether it usually reacts more or less readily than A. Explain using the passage.	**D is argon because it has 18 protons. Argon is in group 18, whose elements usually react less readily than group 17 chlorine.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

My particle has 17 protons, 19 neutrons, and 18 electrons. Its mass number is 36, and its charge is 1− because it has one more electron than proton. It has one more neutron and one more electron than A, but it differs from C only in its neutron count.

Accept equivalent explanations that use proton count to identify the element and electron count to determine charge. For the open task, the counts must be 17 protons, 19 neutrons, and 18 electrons.