LESSON MAKER PRO

Particles With Purpose

Calculate isotope masses and ion charges in real-world settings.

HIGH SCHOOL · PS.4

PS.4 "Evaluate the effects of using ions or isotopes of elements as a solution to a complex real-world problem, including cost, safety, trade-offs, and environmental impacts. a. Obtain, evaluate..."

NAME _____ DATE _____

COUNT THE PARTICLES

The number of protons identifies an element. Add protons and neutrons to find mass number. Subtract electrons from protons to find charge: a positive result is a positive ion, a negative result is a negative ion, and zero means the atom is neutral.

WORKED EXAMPLE

An atom has 8 protons, 9 neutrons, and 10 electrons. Find its mass number and charge.

1. Mass number = protons + neutrons = 8 + 9 = 17.
2. Charge = protons - electrons = 8 - 10 = -2.

Answer: Mass number 17; charge -2.

PRACTICE 6 problems

1 An atom has 3 protons, 4 neutrons, and 2 electrons. Find its mass number and charge.

ANSWER _____

2 An atom has 11 protons, 12 neutrons, and 11 electrons. Find its mass number and charge.

ANSWER _____

3 An atom has 17 protons, 18 neutrons, and 18 electrons. Find its mass number and charge.

ANSWER _____

4 An atom has 20 protons, 22 neutrons, and 18 electrons. Find its mass number and charge.

ANSWER _____

5 An atom has 6 protons, 7 neutrons, and 6 electrons. Find its mass number and charge.

ANSWER _____

6 An ion has 15 protons, 16 neutrons, and a charge of -3. Find its mass number and number of electrons.

ANSWER _____

APPLY IT Show your work

1 A sports drink contains potassium ions. One potassium ion has 19 protons, 20 neutrons, and 18 electrons. What are its mass number and charge?

WORK SPACE

ANSWER _____

2 A hospital uses iodine-131 to treat some thyroid conditions. An iodine-131 atom has 53 protons, 78 neutrons, and 53 electrons. Find its mass number and charge. Is it an ion?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Two iron atoms each have 26 protons. Atom A has 30 neutrons and 24 electrons. Atom B has 32 neutrons and 23 electrons. Find the mass number and charge of each. How many electrons must Atom B gain to have the same charge as Atom A? Explain why.

WORK SPACE AND ANSWER

Particles With Purpose

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	An atom has 3 protons, 4 neutrons, and 2 electrons. Find its mass number and charge.	**Mass number 7; charge +1.**
2	An atom has 11 protons, 12 neutrons, and 11 electrons. Find its mass number and charge.	**Mass number 23; charge 0.**
3	An atom has 17 protons, 18 neutrons, and 18 electrons. Find its mass number and charge.	**Mass number 35; charge -1.**
4	An atom has 20 protons, 22 neutrons, and 18 electrons. Find its mass number and charge.	**Mass number 42; charge +2.**
5	An atom has 6 protons, 7 neutrons, and 6 electrons. Find its mass number and charge.	**Mass number 13; charge 0.**
6	An ion has 15 protons, 16 neutrons, and a charge of -3. Find its mass number and number of electrons.	**Mass number 31; 18 electrons.**

PART 2 · APPLY IT

1. **Mass number 39; charge +1.** Add 19 + 20 to get mass number 39. Subtract 18 from 19 to get charge +1.
2. **Mass number 131; charge 0. It is not an ion.** Add 53 + 78 to get 131. Since it has equal numbers of protons and electrons, its charge is 0.

CHALLENGE

Atom A has mass number 56 and charge +2. Atom B has mass number 58 and charge +3. Atom B must gain 1 electron, bringing it to 24 electrons and a charge of +2.

Accept ion charges written with the sign before or after the number, such as +2 or 2+. A charge of 0 may also be written as neutral.