LESSON MAKER PRO

Particle Count

Find an ion's charge and an isotope's mass number.

HIGH SCHOOL · PS.4.d

PS.4.d "Use mathematics and computational thinking to determine the charge of an ion and the mass number of an isotope based on the number of subatomic particles."

NAME _____ DATE _____

COUNT THE PARTICLES

Protons have a positive charge, electrons have a negative charge, and neutrons have no charge. Subtract electrons from protons to find an ion's charge. Add protons and neutrons to find an isotope's mass number.

WORKED EXAMPLE

An aluminum ion has 13 protons, 14 neutrons, and 10 electrons. Find its charge and mass number.

1. Charge: 13 protons - 10 electrons = 3+.
2. Mass number: 13 protons + 14 neutrons = 27.

Answer: Charge: 3+; mass number: 27

PRACTICE 6 problems

1 An atom has 8 protons, 9 neutrons, and 8 electrons. What is its mass number?

ANSWER _____

2 An ion has 17 protons and 18 electrons. What is its charge?

ANSWER _____

3 An ion has 20 protons, 20 neutrons, and 18 electrons. Find its charge and mass number.

ANSWER _____

_____

4 A carbon isotope has 6 protons and a mass number of 12. How many neutrons does it have?

ANSWER _____

5 An ion has 16 protons, 16 neutrons, and 18 electrons. Find its charge and mass number.

ANSWER _____

_____

6 An ion has 19 protons, 21 neutrons, and a 1+ charge. How many electrons does it have, and what is its mass number?

ANSWER _____

_____

APPLY IT Show your work

1 A lithium ion in a rechargeable phone battery has 3 protons, 4 neutrons, and 2 electrons. What are its charge and mass number?

WORK SPACE

ANSWER _____

2 In zinc oxide sunscreen, a zinc ion has 30 protons, 36 neutrons, and 28 electrons. What are its charge and mass number?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Particles A and B are ions of the same element. Which has the greater mass number? Do they have the same charge? Show your calculations.

PARTICLE COUNTS

Particle	Protons	Neutrons	Electrons
A	24	28	22
B	24	30	23

WORK SPACE AND ANSWER

ANSWER KEY

Particle Count

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	An atom has 8 protons, 9 neutrons, and 8 electrons. What is its mass number?	**17**
2	An ion has 17 protons and 18 electrons. What is its charge?	**1-**
3	An ion has 20 protons, 20 neutrons, and 18 electrons. Find its charge and mass number.	**Charge: 2+; mass number: 40**
4	A carbon isotope has 6 protons and a mass number of 12. How many neutrons does it have?	**6 neutrons**
5	An ion has 16 protons, 16 neutrons, and 18 electrons. Find its charge and mass number.	**Charge: 2-; mass number: 32**
6	An ion has 19 protons, 21 neutrons, and a 1+ charge. How many electrons does it have, and what is its mass number?	**18 electrons; mass number: 40**

PART 2 · APPLY IT

1. **Charge: 1+; mass number: 7** Subtract 2 electrons from 3 protons to get a 1+ charge. Add 3 protons and 4 neutrons to get a mass number of 7.
2. **Charge: 2+; mass number: 66** Subtract 28 electrons from 30 protons to get a 2+ charge. Add 30 protons and 36 neutrons to get a mass number of 66.

CHALLENGE

B has the greater mass number: A is 24 + 28 = 52, and B is 24 + 30 = 54. They do not have the same charge: A is 24 - 22 = 2+, and B is 24 - 23 = 1+.

Accept charges written as +1, -1, +2, or -2 instead of 1+, 1-, 2+, or 2-. For the challenge, look for both mass-number sums and both charge differences.