SCIENCE FOUNDATIONS

Atomic number and mass number

Difficulty level: Intermediate

Science Foundations

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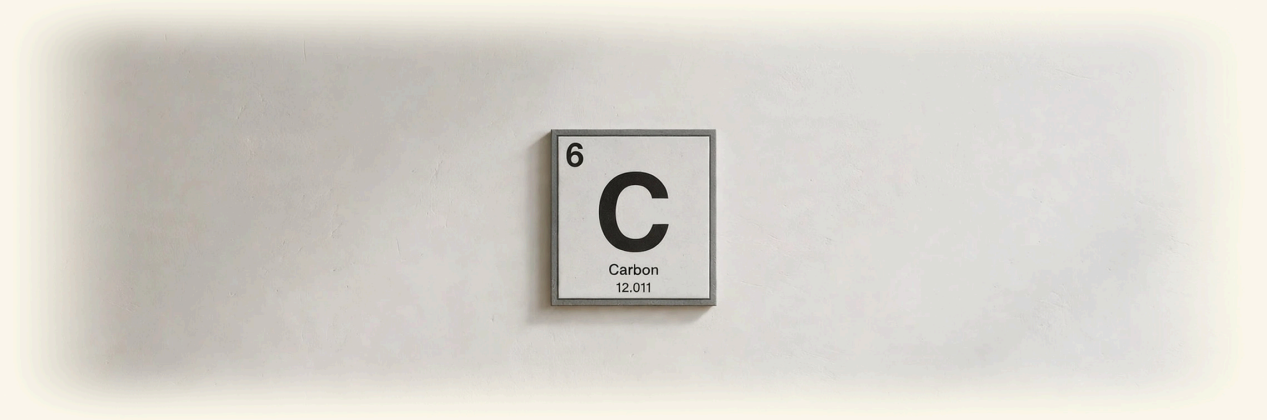
Overview of the concept

This is how you identify any element and count its particles, like reading a label that tells you exactly what an atom is made of. The atomic number tells you how many protons an atom has, and that number is what makes carbon carbon and oxygen oxygen. The mass number tells you the total of protons and neutrons, so you can work out how many neutrons are inside. A periodic table is really a set of labels, and these two numbers are what each label says.



Rule

Atomic number and mass number: the atomic number is the number of protons in an atom, and the mass number is the number of protons plus neutrons. Neutrons = mass number - atomic number.

In a neutral atom the number of electrons equals the number of protons.

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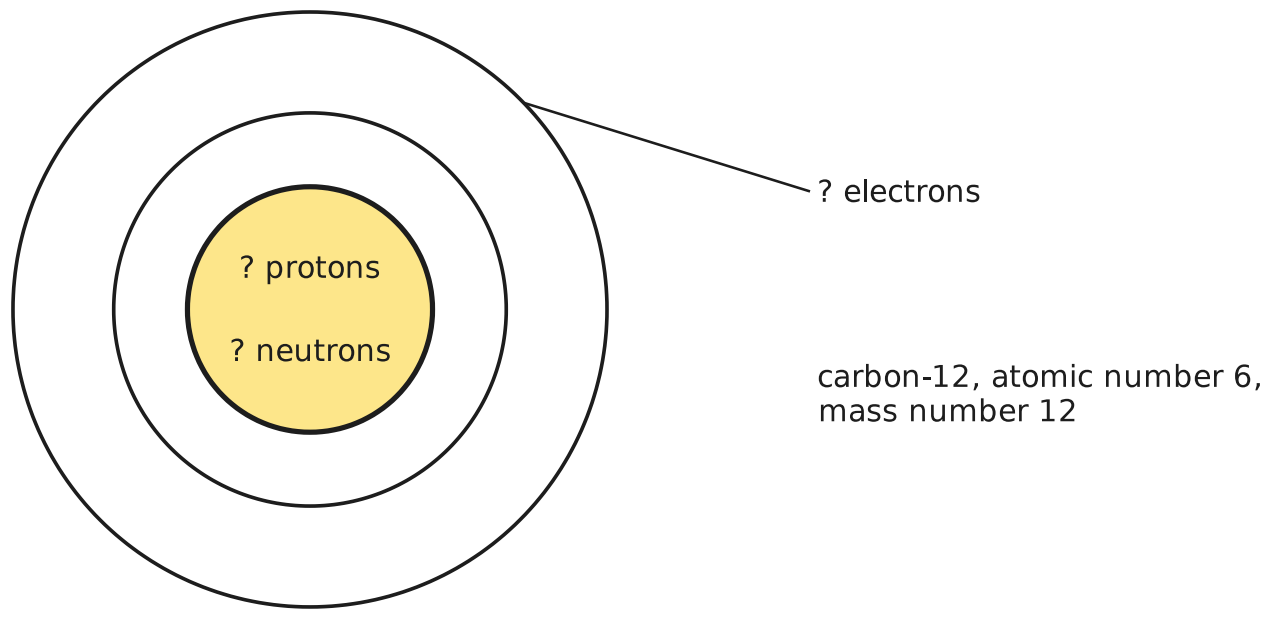
Worked examples

EXAMPLE 1

Q Find the particles in carbon-12 (atomic number 6, mass number 12).



SOLUTION

Protons equal the atomic number: 6

Electrons equal protons in a neutral atom: 6

Neutrons = mass number - atomic number:

12 - 6 = 6

The result is 6 protons, 6 neutrons, 6 electrons.

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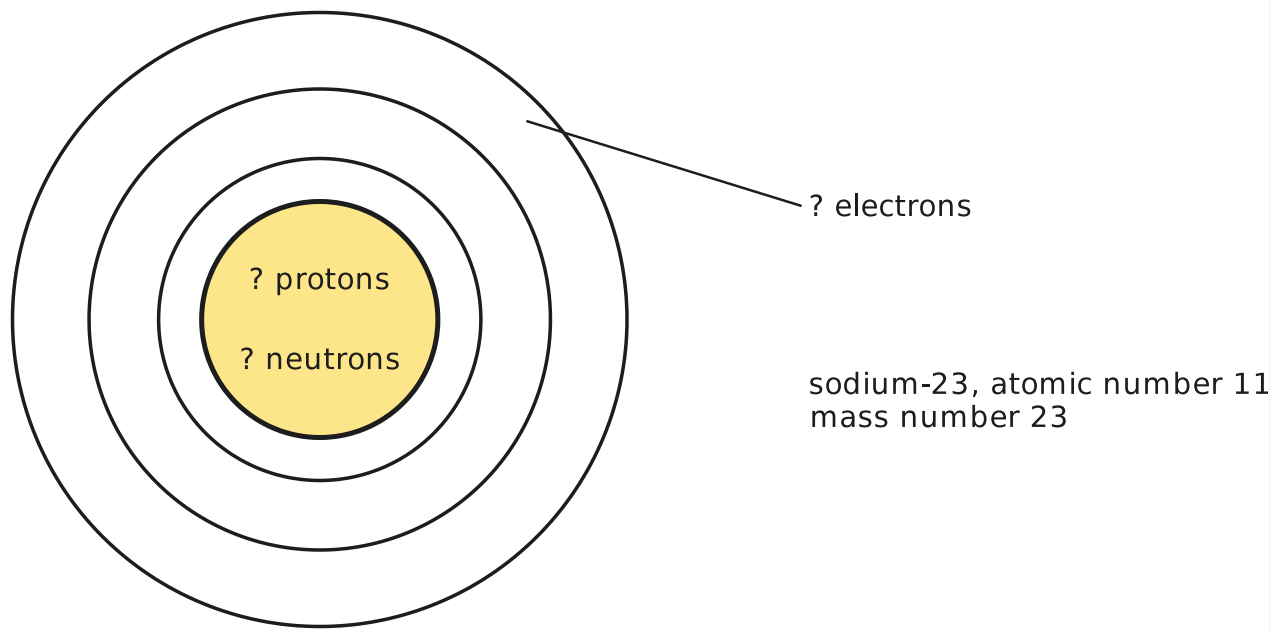
EXAMPLE 2

Q Find the particles in sodium-23 (atomic number 11, mass number 23).



SOLUTION

Protons equal the atomic number: 11

Electrons equal protons in a neutral atom: 11

Neutrons: 23 - 11 = 12

The result is 11 protons, 12 neutrons, 11 electrons.

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Practice questions

1 Nitrogen-14 has atomic number 7 and mass number 14. How many protons, neutrons and electrons does a neutral nitrogen-14 atom have?

- **A** 7 protons, 7 neutrons, 7 electrons
- **B** 7 protons, 14 neutrons, 7 electrons
- **C** 14 protons, 7 neutrons, 7 electrons
- **D** 7 protons, 7 neutrons, 14 electrons

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2 An atom has 8 protons and 8 neutrons. What is its mass number?

- **A** 8
- **B** 16
- **C** 0
- **D** 24

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3 An atom has mass number 19 and 10 neutrons. How many protons does it have?

- A 9
- B 10
- C 19
- D 29

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4 Two atoms have the same atomic number but different mass numbers. What are they called?

- A Isotopes
- B Ions
- C Molecules
- D Elements

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5 What does the atomic number tell you?

- **A** The number of neutrons
- **B** The number of protons
- **C** The number of protons plus neutrons
- **D** The number of electrons in the outer shell

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6 What does the mass number tell you?

- **A** Protons plus neutrons
- **B** The number of protons
- **C** The number of electrons
- **D** Protons minus neutrons

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7 How do you find the number of neutrons in an atom?

- A Atomic number minus mass number
- B Mass number plus atomic number
- C Atomic number times mass number
- D Mass number minus atomic number

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8 What identifies an element?

- A Its atomic number
- B Its mass number
- C Its number of neutrons
- D Its number of electrons

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9 **A neutral atom has 9 protons. How many electrons does it have?**

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10 **An atom has atomic number 8 and mass number 18. How many neutrons does it have?**

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ANSWER KEY

1. 7 protons, 7 neutrons, 7 electrons

2. 16

3. 9

4. Isotopes

5. The number of protons

6. Protons plus neutrons

7. Mass number minus atomic number

8. Its atomic number

9. 9

10. 10

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