

1.3 Atomic Structure

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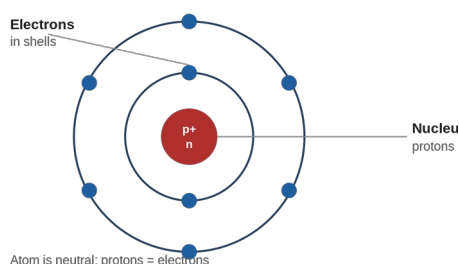
1. KEY VOCABULARY

TERM	MEANING
Nucleus	Central part of the atom — protons and neutrons.
Proton	Positive particle in the nucleus.
Neutron	Neutral particle in the nucleus.
Electron	Negative particle in shells around the nucleus.
Atomic number	Number of protons (defines the element).
Mass number	Number of protons + neutrons.
Isotopes	Atoms of the same element with different numbers of neutrons.

2. THE SUB-ATOMIC PARTICLES

PARTICLE	REL. MASS	REL. CHARGE	WHERE
Proton	1	+1	Nucleus
Neutron	1	0	Nucleus
Electron	1/1840 (≈0)	-1	Shells

3. STRUCTURE OF THE ATOM



Atoms are neutral: number of protons = number of electrons, so the charges cancel.

4. READING THE SYMBOL

Mass number (top) = protons + neutrons.

Atomic number (bottom) = number of protons.

Neutrons = mass number – atomic number.

Example — sodium: mass 23, atomic number 11 → 11 protons, 11 electrons, 12 neutrons.

5. ISOTOPES & RELATIVE ATOMIC MASS

Isotopes have the same protons (same element, same chemistry) but different neutrons (different mass).

Relative atomic mass (Ar) = the weighted mean mass of the isotopes.

$$A_r = \frac{\sum(\text{isotope mass} \times \% \text{ abundance})}{100}$$

6. ELECTRON CONFIGURATION

Electrons fill shells from the inside out: 2, then 8, then 8 (for the first 20 elements).

Example — chlorine (17 electrons) = 2, 8, 7.

Outer electrons = group number. Number of shells = period number.

7. COMMON EXAM MISTAKES

- ✗ "Isotopes have different numbers of protons."
- ✓ Same protons, different neutrons.
- ✗ "Electrons are in the nucleus."
- ✓ Electrons orbit in shells; only p and n are in the nucleus.
- ✗ "Mass number = number of neutrons."
- ✓ Mass number = protons + neutrons.

8. SELF-CHECK · cover & quiz

Can you...

1. State the mass and charge of each sub-atomic particle?
2. Work out protons, neutrons and electrons from a symbol?
3. Explain why an atom has no overall charge?
4. Define isotopes — and say why they react the same?
5. Calculate a relative atomic mass from isotope abundances?
6. Write the electron configuration of any element 1–20?