

Atomic Structure: Atoms consist of a central nucleus (protons & neutrons) orbited by electrons in shells.

Subatomic Particles: Protons (relative mass 1, charge +1), Neutrons (relative mass 1, charge 0), Electrons (relative mass negligible, charge -1).

Atomic Number (Z): The number of protons in an atom. This defines the element.

Mass Number (A): The total number of protons and neutrons in an atom's nucleus.

Isotopes: Atoms of the same element (same number of protons) but with different numbers of neutrons (and thus different mass numbers).

Nuclear Models: Plum Pudding (uniform positive sphere with embedded electrons) → Rutherford (dense, positive nucleus with orbiting electrons) → Bohr (electrons in specific energy shells) → Chadwick (discovery of neutron).

Section A: Key Terms & Atomic Structure

1. Complete the sentences below by filling in the blanks with the correct scientific term:

- The number of protons in an atom is called its _____.
- The total number of protons and neutrons in an atom's nucleus is its _____.
- Atoms of the same element with different numbers of neutrons are known as _____.
- A positively charged particle found in the nucleus is a _____.
- A negatively charged particle orbiting the nucleus is an _____.
- A neutral particle found in the nucleus is a _____.

2. Complete the following statements about subatomic particles:

- Protons have a relative charge of _____ and a relative mass of _____.
- Neutrons have a relative charge of _____ and a relative mass of _____.
- Electrons have a relative charge of _____ and a relative mass that is _____ compared to protons and neutrons.
- In a neutral atom, the number of protons is equal to the number of _____.

3. Draw a simple diagram of an atom, clearly labelling the nucleus, electron shells, protons, neutrons, and electrons.

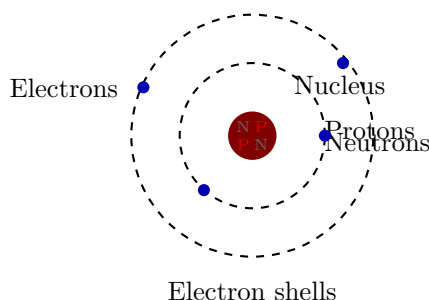


Figure 1: A simple atomic model

Section B: Core Concepts & Explanations

4. Answer the following questions in full sentences:

- Describe the key observations and conclusions from Rutherford's alpha particle scattering experiment regarding the structure of the atom.

b) Explain how the atomic number and mass number are used to identify an element and its isotopes.

c) Explain why all atoms are electrically neutral overall, despite containing charged particles.

d) Describe James Chadwick's contribution to the development of the atomic model.

Section C: Exam Application & Extended Writing

5. Consider the properties of subatomic particles and the historical development of atomic models.

a) Complete the table below, giving the relative mass, relative charge, and location of each subatomic particle.

Particle	Relative Mass	Relative Charge	Location
Proton	1	_____	_____
Neutron	_____	0	Nucleus
Electron	Negligible	-1	_____

b) Compare and contrast the plum pudding model with the Rutherford model of the atom. Explain how experimental evidence led to the rejection of the plum pudding model and the acceptance of the Rutherford model. (6 marks)