

2.3 Isotopes

Name: _____ Class: _____ Date: _____

Total: 9 marks

Objective

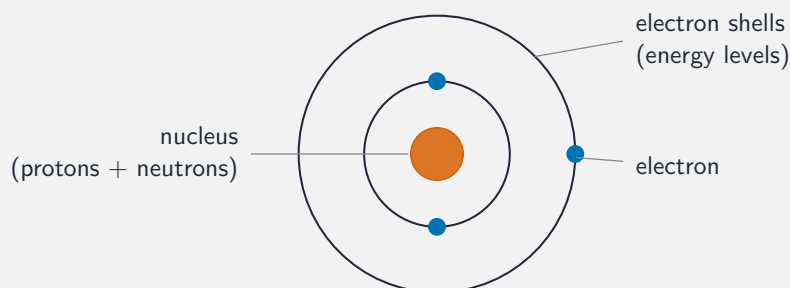
Build the skills to answer exam questions on **isotopes** 同位素—what they are, why they share chemical properties, and calculating **relative atomic mass** 相对原子质量.

You must be able to:

- define isotopes (same protons, different neutrons)
- explain why isotopes have the same chemical properties
- calculate A_r from isotope masses and abundances

1 Worked examples

■ Relative atomic mass



lithium, Li: 3 protons, 4 neutrons
electron configuration 2,1

Isotopes have the same protons (same element) but different numbers of neutrons

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

Chlorine, 75% ^{35}Cl , 25% ^{37}Cl : $A_r = \frac{(35 \times 75) + (37 \times 25)}{100} = 35.5$.

2 Practice

2.1 Define isotopes. [1]

2.2 State why isotopes of an element have the same chemical properties. [1]

3 Exam-style questions

3.1 Two isotopes of an element differ in their number of: [1]

- **A** protons
 - **B** electrons
 - **C** neutrons
 - **D** protons and electrons
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3.2 Boron has two isotopes: ^{10}B (20%) and ^{11}B (80%).

(a) Calculate the relative atomic mass of boron. [3]

(b) State the number of neutrons in an atom of ^{11}B (proton number 5). [1]

3.3 Explain, in terms of electrons, why isotopes react in the same way. [2]

4 Go further

You are now ready for the real exam questions on this subtopic. Open the **2.3 Isotopes** past-paper sheet in the Library, or try these in **Practice mode**:

- 0620/22 N25 —Q6 (isotopes)
- 0620/23 N25 —Q6 (relative atomic mass)

Solutions

2.1 atoms of the same element with the same number of protons but different numbers of neutrons.

2.2 they have the same number of electrons / the same electronic configuration.

3.1 C. Isotopes differ in the number of neutrons.

3.2 (a) $A_r = \frac{(10 \times 20) + (11 \times 80)}{100} = \frac{200 + 880}{100}; = 10.8.$

(b) $11 - 5 = 6$ neutrons.

3.3 chemical reactions only involve the electrons; isotopes have the same number of electrons / configuration, so they react identically.