

2.3 Isotopes

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS isotopes 同位素 • relative atomic mass 相对原子质量 • abundance 丰度 • electronic configuration 电子排布
• atom 原子

Objective

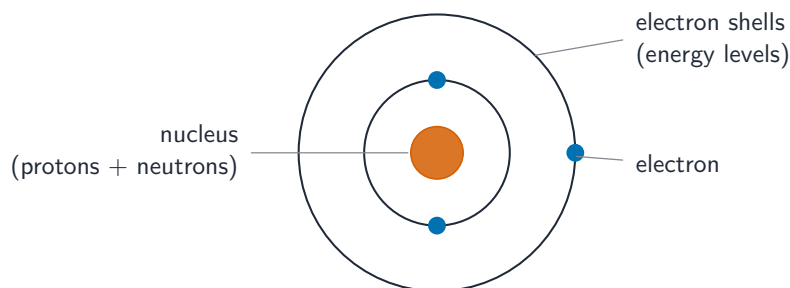
Build the skills to answer exam questions on **isotopes** 同位素 — what they are, why they share chemical properties, and calculating **relative atomic mass** 相对原子质量.

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]

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.