Isotopes Worksheet

Name: _____ **Date:** _____

Quick Review

Isotopes are atoms of the **same element** that have the same number of protons but different numbers of neutrons.

Remember:

Atomic number = number of protons

Mass number = protons + neutrons

Neutrons = mass number − atomic number

For a neutral atom:

Electrons = protons

Example:

Carbon-14 has an atomic number of 6.

Protons = 6
Neutrons = 14 − 6 = 8
Electrons = 6

Part A — Multiple Choice

1. What are isotopes?

A. Atoms with different numbers of protons
B. Atoms of the same element with different numbers of neutrons
C. Atoms with different numbers of electrons only
D. Atoms of completely different elements

2. Two isotopes of the same element must have the same number of:

A. neutrons
B. nucleons
C. protons
D. protons and neutrons

3. Why do isotopes of an element have different masses?

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A. They have different numbers of protons.
B. They have different numbers of neutrons.
C. They have different chemical symbols.
D. They belong to different elements.

4. Why do isotopes of the same element have very similar chemical properties?

A. They have the same number of protons and, when neutral, the same electron arrangement.
B. They always have the same number of neutrons.
C. They have identical masses.
D. They have different atomic numbers.

5. Carbon-12 and carbon-14 are isotopes because they:

A. have different numbers of protons
B. have the same mass number
C. have the same number of protons but different numbers of neutrons
D. are different elements

Part B — Atomic Notation

Atomic notation can be written as: ${}^{A}_{Z}X$

where:

A = mass number
Z = atomic number
X = chemical symbol

Complete the table.

Isotope	Atomic Number	Mass Number	Protons	Neutrons	Electrons
Carbon-12	6	12	_____	_____	_____
Carbon-14	6	14	_____	_____	_____
Oxygen-16	8	16	_____	_____	_____
Oxygen-18	8	18	_____	_____	_____
Chlorine-35	17	35	_____	_____	_____
Chlorine-37	17	37	_____	_____	_____

Part C — Calculate the Particles

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Determine the number of **protons, neutrons, and electrons** in each neutral atom.

1. Sodium-23

Atomic number = 11

Protons = _____ Neutrons = _____ Electrons = _____

2. Magnesium-25

Atomic number = 12

Protons = _____ Neutrons = _____ Electrons = _____

3. Potassium-40

Atomic number = 19

Protons = _____ Neutrons = _____ Electrons = _____

4. Uranium-238

Atomic number = 92

Protons = _____ Neutrons = _____ Electrons = _____

Part D — Compare the Isotopes

Consider these two atoms:

Carbon-12: 6 protons, 6 neutrons **Carbon-14:** 6 protons, 8 neutrons

1. What is the same about these two atoms?

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2. What is different?

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3. Why are both atoms carbon?

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4. Which isotope has the greater mass? Why?

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Part E — Applications of Isotopes

Match each isotope with an important application.

Isotopes

A. Carbon-14
B. Iodine-131
C. Cobalt-60
D. Uranium-235

Applications

_____ Dating once-living archaeological materials

_____ Diagnosis and treatment involving the thyroid gland

_____ Radiation treatment and industrial applications

_____ Fuel used in nuclear reactors

Part F — Challenge

An unknown neutral isotope has:

- 17 protons
- 20 neutrons
- 17 electrons

1. What is its atomic number?

2. What is its mass number?

3. What element is it?

4. Write its isotope name.

5. Another atom has 17 protons and 18 neutrons. Is it an isotope of the same element? Explain.

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