

## Isotope Worksheet

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### Part 1: Building a Foundation

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#### What is an isotope?

*Hint: Consider the definition related to neutrons.*

- An element with a different number of electrons
- An element with a different number of protons
- An element with a different number of neutrons
- An element with a different number of atoms

#### Which of the following statements are true about isotopes?

*Hint: Think about atomic number and mass number.*

- Isotopes have the same atomic number.
- Isotopes have different mass numbers.
- Isotopes have different numbers of protons.
- Isotopes have the same number of neutrons.

#### Explain how isotopes of the same element differ from each other.

*Hint: Focus on neutrons and mass.*

#### List two applications of isotopes in the real world.

Hint: Think about medicine and industry.

1. Application 1

2. Application 2

## Part 2: Comprehension and Application

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**Which isotope notation correctly represents an isotope of carbon with 7 neutrons?**

Hint: Consider the mass number and atomic number.

- $^{13}_6\text{C}$
- $^{12}_6\text{C}$
- $^{14}_6\text{C}$
- $^{13}_7\text{C}$

**Which of the following are characteristics of radioactive isotopes?**

Hint: Think about stability and radiation.

- They are stable over time.
- They emit radiation as they decay.
- They have the same number of neutrons as stable isotopes.
- They can be used in medical imaging.

**Describe how the average atomic mass of an element is calculated using its isotopes.**

Hint: Consider the contributions of each isotope's mass and abundance.

**If an element has two isotopes with masses of 10 amu (90% abundance) and 11 amu (10% abundance), what is the average atomic mass?**

*Hint: Use the formula for average atomic mass.*

- 10.1 amu
- 10.5 amu
- 10.9 amu
- 11.0 amu

**Provide an example of how isotopes are used in medicine and explain their role.**

*Hint: Think about specific isotopes and their applications.*

### Part 3: Analysis, Evaluation, and Creation

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**Which factor is most critical in determining whether an isotope is stable or radioactive?**

*Hint: Consider the relationship between neutrons and protons.*

- The number of electrons
- The number of protons
- The neutron-to-proton ratio
- The atomic mass

**Analyze the following isotopes and determine which are likely to be radioactive:**

*Hint: Consider the common knowledge of isotopes.*

- Carbon-14
- Uranium-238
- Hydrogen-1
- Oxygen-16

**Compare and contrast the uses of stable and radioactive isotopes in scientific research.**

*Hint: Think about their applications and safety.*

**Which isotope would be most suitable for use in a smoke detector?**

*Hint: Consider the properties of isotopes used in detection.*

- Carbon-12
- Americium-241
- Iodine-131
- Hydrogen-2

**Evaluate the following scenarios and select the most appropriate isotopes for medical imaging:**

*Hint: Think about the properties of isotopes used in imaging.*

- Technetium-99m
- Carbon-14
- Iodine-123
- Strontium-90

**Design a simple experiment using isotopes to trace the movement of nutrients in a plant system. Describe the steps and expected outcomes.**

*Hint: Consider how isotopes can be tracked in biological systems.*