

Isotope Worksheet Questions and Answers PDF

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Part 1: Building a Foundation

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

■ An isotope is defined as an element with a different number of neutrons.

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.

■ Isotopes have the same atomic number but different mass numbers.

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

Hint: Focus on neutrons and mass.

Isotopes of the same element differ in the number of neutrons, which affects their mass but not their chemical properties.

List two applications of isotopes in the real world.

Hint: Think about medicine and industry.

1. Application 1

Medical imaging

2. Application 2

Carbon dating

Isotopes are used in medical imaging and radiotherapy, as well as in carbon dating.

Part 2: Comprehension and Application

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

Hint: Consider the mass number and atomic number.

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

The correct notation is $^{14}_6\text{C}$, which indicates 6 protons and 8 neutrons.

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. ✓

Radioactive isotopes emit radiation as they decay and are not stable over time.

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.

The average atomic mass is calculated by taking the weighted average of the masses of all isotopes based on their relative abundances.

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

The average atomic mass is calculated to be 10.1 amu.

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

Hint: Think about specific isotopes and their applications.

Isotopes like Technetium-99m are used in medical imaging to visualize organs and tissues.

Part 3: Analysis, Evaluation, and Creation

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

The neutron-to-proton ratio is critical in determining the stability of an isotope.

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

Carbon-14 and Uranium-238 are likely to be radioactive isotopes.

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

Hint: Think about their applications and safety.

Stable isotopes are often used in tracing and labeling, while radioactive isotopes are used in imaging and treatment.

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

Americium-241 is commonly used in smoke detectors due to its radioactive properties.

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

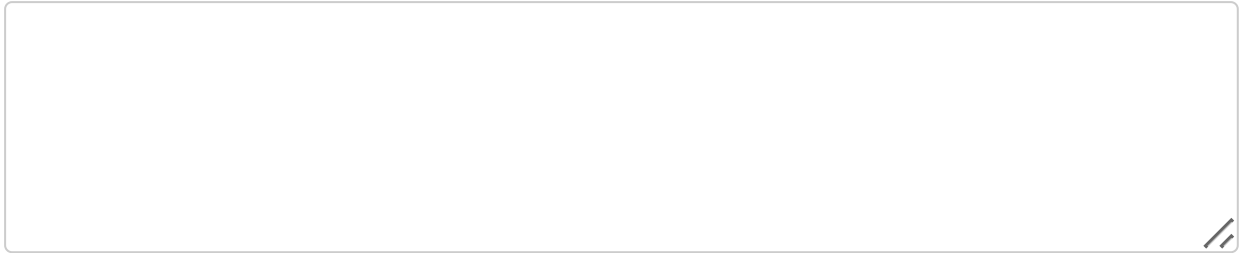
Hint: Think about the properties of isotopes used in imaging.

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

Technetium-99m and Iodine-123 are commonly used in medical imaging due to their properties.

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.



An experiment could involve using Carbon-14 to trace photosynthesis in plants, observing how it moves through the plant.