Isotope Worksheet Answer Key PDF

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Part 1: Building a Foundation

What is an isotope?

undefined. An element with a different number of electrons
undefined. An element with a different number of protons
undefined. An element with a different number of neutrons ✓
undefined. 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?

undefined. Isotopes have the same atomic number. ✓
undefined. Isotopes have different mass numbers. ✓
undefined. Isotopes have different numbers of protons.
undefined. 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.

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.

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?

undefined. ^13_6C
undefined. ^12_6C
undefined. ^14_6C ✓
undefined. ^13_7C

The correct notation is ^14_6C, which indicates 6 protons and 8 neutrons.

Which of the following are characteristics of radioactive isotopes?

undefined. They are stable over time.
undefined. They emit radiation as they decay. ✓
undefined. They have the same number of neutrons as stable isotopes. ✓
undefined. 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.

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?

undefined. 10.1 amu ✓
undefined. 10.5 amu
undefined. 10.9 amu
undefined. 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.

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?

undefined. The number of electrons
undefined. The number of protons
undefined. The neutron-to-proton ratio ✓
undefined. 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:

undefined. Carbon-14 ✓
undefined. Uranium-238 ✓
undefined. Hydrogen-1
undefined. 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.

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?

undefined. Carbon-12
undefined. Americium-241 ✓
undefined. Iodine-131

undefined. 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:

undefined. Technetium-99m ✓

undefined. Carbon-14

undefined. Iodine-123 ✓

undefined. 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.

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