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# Here are 20 isotope-related questions for your worksheet:

1. Define an isotope.
2. What are isotopes used for in various fields?
3. How do isotopes of an element differ from each other?
4. Give an example of an isotope commonly used in medical imaging.
5. Explain the concept of atomic mass in relation to isotopes.
6. Name the three isotopes of hydrogen and their symbols.
7. Why do isotopes of the same element have similar chemical properties?
8. Describe the process of carbon-14 dating and its significance.
9. Compare stable isotopes to radioactive isotopes.
10. Why do radioactive isotopes decay over time?
11. Give an example of an element that has multiple stable isotopes.
12. How are isotopes separated in processes like isotope enrichment?
13. What isotope is commonly used as fuel in nuclear reactors?
14. Explain the concept of half-life in radioactive decay.
15. Describe the uses of isotopes in agriculture and food preservation.
16. How do isotopes play a role in studying climate change?
17. Discuss the risks and benefits of using radioactive isotopes in medicine.
18. Name an isotope used in smoke detectors and explain its role.
19. What are some challenges in handling and disposing of radioactive isotopes?
20. How can scientists determine the isotopic composition of a sample?

Feel free to adjust or modify these questions as needed for your worksheet.

**Answers**

1. Define an isotope.
- **Answer:** An isotope is a variant of an element with the same number of protons but a different number of neutrons in its nucleus.

2. What are isotopes used for in various fields?
- **Answer:** Isotopes are used in fields like medicine, industry, agriculture, and environmental science for purposes such as imaging, tracing, dating, and analysis.

3. How do isotopes of an element differ from each other?
- **Answer:** Isotopes of an element have the same number of protons (and thus the same atomic number), but different numbers of neutrons (resulting in different atomic masses).

4. Give an example of an isotope commonly used in medical imaging.
- **Answer:** Technetium-99m is commonly used in medical imaging procedures like SPECT scans.

5. Explain the concept of atomic mass in relation to isotopes.
- **Answer:** Atomic mass is the average mass of all the naturally occurring isotopes of an element, taking into account their abundance.

6. Name the three isotopes of hydrogen and their symbols.
- **Answer:** Hydrogen-1 (H), Hydrogen-2 (deuterium, D), Hydrogen-3 (tritium, T).

7. Why do isotopes of the same element have similar chemical properties?
- **Answer:** Isotopes of the same element have the same number of electrons, which determines their chemical behavior.

8. Describe the process of carbon-14 dating and its significance.
- **Answer:** Carbon-14 dating measures the decay of radioactive carbon-14 isotopes to determine the age of organic materials, helping in archaeological and geological dating.

9. Compare stable isotopes to radioactive isotopes.
- **Answer:** Stable isotopes have a stable nucleus and do not undergo radioactive decay, while radioactive isotopes have an unstable nucleus that spontaneously decays.

10. Why do radioactive isotopes decay over time?
- **Answer:** Radioactive isotopes decay due to the instability of their nucleus, which aims to achieve a more balanced and stable state.