

Name _____

Creating the Unseen: The Science of Synthetic Elements

Open-Ended Response Answer Key

1. Nuclear stability is the balance between the forces that hold the nucleus together (strong nuclear force) and the forces that can break it apart (electrostatic repulsion between protons). Many synthetic elements are highly unstable because their nuclei contain an excess of protons, leading to increased electrostatic repulsion. This instability results in short half-lives as these elements decay via nuclear processes, such as alpha or beta decay.
2. The creation of synthetic elements presents both risks and benefits. Risks include the potential for radiation exposure, contamination, and the need for secure handling and disposal. Benefits include advancing our understanding of nuclear physics, potential applications in medicine and technology, and contributions to scientific knowledge. Scientists ensure safety through rigorous protocols, containment measures, and responsible research practices.
3. Synthetic elements may have unique properties that make them valuable in materials science and nanotechnology. For example, they could be used to create new materials with specific properties or applications, such as superconductors, advanced catalysts, or materials for energy storage.
4. Ethical considerations in synthetic element research involve transparency, safety, environmental impact, and responsible conduct. Scientists should openly share their findings, prioritize safety measures, minimize environmental harm, and adhere to ethical guidelines in research involving highly radioactive materials.

