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The Puzzle Solvers: Pioneers of the Periodic Table

Open-Ended Response Answer Key

1. Mendeleev and Moseley approached the organization of the periodic table differently. Mendeleev organized the elements based on increasing atomic mass and observed patterns in their chemical properties, leading to the proposal of the periodic law. He left gaps for undiscovered elements and made predictions about their properties. In contrast, Moseley recognized the importance of atomic number as the fundamental property determining an element's position on the table. He reordered the elements based on atomic number, which improved the accuracy of the periodic table. While Mendeleev's approach was based on chemical properties and atomic mass, Moseley's approach relied on atomic number, which is a more precise and fundamental characteristic.

2. Henry Moseley's work significantly improved the accuracy and reliability of the periodic table. By proposing that atomic number, rather than atomic mass, should determine an element's position, he aligned the elements with their chemical properties more accurately. This reordering resolved inconsistencies in earlier versions of the table and provided a clearer understanding of periodicity. Moseley's work also laid the foundation for the modern periodic table, which is based on atomic number and reflects the underlying structure of atoms.

3. Glenn T. Seaborg played a crucial role in extending the periodic table to include the actinide series and synthesizing transuranium elements. His work expanded our understanding of the elements beyond uranium and led to the creation of elements with atomic numbers greater than that of uranium (e.g., plutonium and americium). These transuranium elements were synthesized in nuclear reactors and had unique properties. Seaborg's contributions were instrumental in updating the periodic table to accommodate these elements, and he also received the honor of having element 106, seaborgium (Sg), named after him.

4. Organizing the elements into a coherent periodic table in the late 19th century was a challenging endeavor. Scientists like Mendeleev faced the task of arranging elements based on limited knowledge of their properties and atomic masses. Mendeleev's innovative approach involved recognizing patterns in chemical properties and leaving gaps for undiscovered elements, making predictions about their properties. This process required careful observation and analysis of the available data. The periodic table created by Mendeleev became a crucial tool for understanding and predicting the behavior of elements, leading to advancements in chemistry.

