Reading Science

Name: _____ **Date:** _____ **Group:** _____

Protons and Electrons

1. Our current model of how the atom is made involves protons in a nucleus and orbiting electrons. This understanding was developed over many years and was built on the work of many scientists. A major step was made in 1911 by Ernest Rutherford. Building on the work of Eugen Goldstein, Wilhelm Wien, and J. J. Thomson, Rutherford discovered the nucleus. Rutherford is often called the father of nuclear science.
2. Rutherford studied Thomson's model of the atom and wanted to prove that it was right. Thomson's model said that electrons were mixed in the sphere of the atom, like raisins in plum pudding. While testing this theory, Rutherford did the "gold foil" experiment.
3. In the gold foil experiment, Rutherford discovered that the mass of the atom is not placed evenly throughout the atomic sphere, as Thomson thought. In this experiment, Rutherford shot radiation particles at a thin sheet of gold. He expected them to go straight through. Instead, a few particles bounced off the foil instead of passing through it. He figured out that the center of an atom is made of a dense, positively charged middle surrounded by negatively charged electrons.
4. Rutherford's nuclear model of the atom triggered other advances, including the naming of the proton and the realization of its importance. The word proton comes from the Greek word meaning "first." Goldstein and Wien had discovered the proton years before. However, no one realized what it was until Rutherford's work on the nucleus. Antonius van den Broek soon proposed that protons determined an element's identity. He then suggested that elements be placed into the periodic table based on the number of protons the element has.
5. Physicist Niels Bohr improved Rutherford's nuclear model of the atom. He recognized that electrons move around the nucleus in different energy levels. Part of his theory says that only valence electrons occupy the outermost shell of the electron cloud of an atom. Scientists had recognized that the chemical properties of elements are related to their electron configurations, which affects an element's reactivity. Bohr and G. N. Lewis found that valence electrons determine the way the atom will react with other atoms. In other words, valence electrons give an atom its chemical properties.
6. As with most scientific theory, many scientists have contributed through the years. They have come up with theories, performed experiments, and shared findings to help us understand how atoms are put together.

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1. Which of the following lists correctly places the scientists in order from earliest to latest based on their contribution to our understanding of atomic structure described in this passage?

   A. Lewis, Wien, Goldstein

   B. Rutherford, Goldstein, Bohr

   C. Bohr, Rutherford, Thomson

   D. Thomson, van den Broek, Lewis

2. Thomson's model suggested that electrons were mixed into the sphere of an atom much like raisins in _____.

   A. muffins

   B. plum pudding

   C. a box

   D. toast

3. What did Rutherford's experiment prove about the atomic nucleus?

   A. It is like a raisin muffin, with a positively charged core.

   B. It is densely clustered in the middle of the atom.

   C. It was unknown by the means that Rutherford had access to at the time of the experiment.

   D. It is made of electrons and neutrons.

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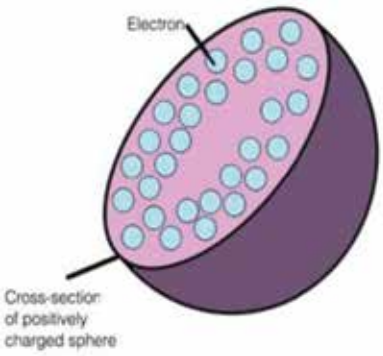

4. Based on the descriptions in the passage, which scientist proposed a model of the atom that matches the diagram?

   A. Ernest Rutherford

   B. Niels Bohr

   C. J. J. Thomson

   D. Antonius van den Broek

5. What is the main point of the passage?

   A. Scientific theories often come about as a result of many people.

   B. Atoms have only been identified in the past 100 years.

   C. Gold foil is the only type of material that can be used to find the mass of atoms.

   D. Scientists do not use others' work in forming their theories.