Name _____

The Atomic Mystery: Why Don't Atoms Collapse?

Open-Ended Response Answer Key

1. Dalton's atomic model proposed that atoms were indivisible and had no subatomic particles. Thomson's model introduced the idea of the electron as a subatomic particle. Rutherford's model revealed the existence of the nucleus and the mostly empty space in atoms. Bohr's model added energy levels and quantized electron orbits, leading to our current understanding of atomic structure.
2. Quantum mechanics has numerous applications in technology and everyday life. For example, it plays a crucial role in the functioning of transistors in electronic devices, enabling modern computing. Quantum mechanics also explains phenomena like superconductivity and the behavior of particles in particle accelerators.
3. The number of electrons in an atom's outermost shell determines its chemical reactivity. Elements with the same number of electrons in their outermost shell exhibit similar reactivity. For instance, all elements in the same group of the periodic table have the same number of valence electrons and often react similarly.
4. In an atom with one proton, one neutron, and one electron, the electromagnetic force between the proton and electron would keep the electron in orbit around the nucleus. However, due to the Heisenberg Uncertainty Principle and quantum mechanics, the electron's precise position and velocity would remain uncertain, resulting in an electron cloud-like distribution around the nucleus. The atom would be relatively stable but exhibit some degree of uncertainty in the electron's location.