What Are Atomic Models?

Worksheet

Atomic models are theories describing atomic structure; they evolved from Dalton's solid sphere through Thomson's plum pudding and Rutherford's nuclear model to Bohr's planetary model and the modern quantum mechanical model.

Questions

1. Which scientist proposed that atoms are indivisible solid spheres?

A) J.J. Thomson
B) Ernest Rutherford
C) John Dalton
D) Niels Bohr

2. What did the gold foil experiment reveal?

A) Electrons orbit in fixed shells
B) Atoms have a dense, positively charged nucleus
C) Atoms are mostly solid matter
D) Protons and neutrons have equal mass

3. In Bohr's model, how do electrons emit light?

A) By colliding with the nucleus
B) By jumping from a higher to a lower energy level
C) By spinning faster
D) By leaving the atom permanently

4. What does the current quantum mechanical model describe?

A) Fixed circular orbits
B) Solid indivisible spheres
C) Probability clouds (orbitals) for electron position
D) Electrons embedded in a positive sphere

5. Which experiment led Rutherford to propose the nuclear model?

6. How did Bohr's model explain hydrogen's line spectrum?

7. Why did Thomson's plum pudding model get replaced?

8. Define: Who proposed the 'plum pudding' model?

9. Define: What did Rutherford's gold foil experiment prove?

10. Define: What is unique about Bohr's model?

Answer Key

1. C) John Dalton - Dalton's 1803 model described atoms as solid, indivisible spheres.

2. B) Atoms have a dense, positively charged nucleus - Rutherford's gold foil experiment showed a small, dense, positive nucleus at the atom's center.

3. B) By jumping from a higher to a lower energy level - Electrons emit photons when they drop from a higher to a lower quantized energy level.

4. C) Probability clouds (orbitals) for electron position - The quantum mechanical model describes electrons as existing in probability clouds called orbitals.

5. Rutherford fired alpha particles at thin gold foil. Most passed through, but a few bounced back sharply. This showed atoms have a tiny, dense, positively charged nucleus.

6. Electrons occupy fixed energy levels (n = 1, 2, 3). When an electron drops from n=3 to n=2, it emits a photon of specific energy. This produces the discrete spectral lines observed for hydrogen.

7. Thomson's model predicted alpha particles would pass through gold foil with only slight deflection. Rutherford's experiment showed some particles bounced straight back. A spread-out positive charge couldn't explain this - a concentrated nucleus could.

8. J.J. Thomson, in 1897, after discovering the electron.

9. Atoms have a small, dense, positively charged nucleus, with most of the atom being empty space.

10. Electrons move in fixed, quantized orbits (energy levels) around the nucleus.