The Atom Lesson Plan

Time: 40 minutes

Goals: To gain an understanding of the atom including its structure. This includes an overview of the quantum mechanics involved.

Objectives: Students will:

- Watch "The Atom" segment of the "How small is it" video book
- Take a short quiz

Materials:

- Internet connection with a computer for viewing "The Atom" segment on YouTube. Use the settings to view in 1080p.

Directions:

- Introduce "The Atom" segment where we'll cover how atomic radiation helped us discover the atomic nucleus. Along the way we'll cover quantum mechanics with its Heisenberg Uncertainty Principle. We also cover Scanning Tunneling microscopes that can 'feel' atoms.
- Show the video.
- Review what they saw:
    - How our view of the atom changed over time as our ability to probe them increased.
    - How particles are spread out, and that is why we can't simultaneously tell exactly where they are and how fast they are moving.
    - How the quantum nature of particles like the electron enable the Tunneling Electron microscope.

Assessment:

Take a simple quiz. Print and distribute the quiz on page 2. Here are the answers:

- Do electrons orbit the atomic nucleus?
  Answer: b) No, they are standing waves.
- Are Alpha particles smaller than atoms?
  Answer: c) Yes. They were used to probe the atom and discover the nucleus.
- Which one of these is the Pauli Exclusion Principle?
  Answer: d) No two particles with half-integer spin can occupy the same quantum state.

The Atom quiz

- Do electrons orbit the atomic nucleus?

  a) Yes. They rotate like the plants around the sun.
  b) No. They are standing waves.
  c) Yes. But their distance from the center changes over time.
  d) No. They fall into the nucleus.

- Are Alpha particles smaller than atoms?

  a) Yes. They only contain electrons.
  b) No. They contain more parts than an atom.
  c) Yes. They were used to probe the atom and discover the nucleus.
  d) No. They are made out of atoms.

- Which one of these is the Pauli Exclusion Principle?

  a) Electrons cannot occupy the same quantum state, but protons can.
  b) No two particles can occupy the same quantum state.
  c) Photons cannot occupy the same quantum state.
  d) No two particles with half-integer spin can occupy the same quantum state.