The Microscopic Lesson Plan

Time: 40 minutes

Goals: To gain an understanding of the microscopic realm and 1) the limitations of light, 2) wave particle duality and 3) electron microscopes.

Objectives: Students will:

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

Materials:

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

Directions:

Introduce "The Microscopic' segment as our first segment in the How Small Is It video book. We'll cover the optical microscope; how diffraction limits what we can see; the wave nature of particles; and electron microscopes.

- Show the video.
- Review what they saw:
    - How a microscope works.
    - How diffraction limits an optical microscopes ability to see things smaller than the wavelength of light.
    - How we discovered that particles like electrons travel as waves like light does.
    - How using electrons instead of photons enables us to see down to the size of a carbon atom.

Assessment:

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

- What is the name of the light effect that limits the size of things we can see with light?
  Answer: c) Diffraction
- What happens when a particle travels through two slits placed close to each other?
  Answer: b) It goes through both slits and interferes with itself on the other side.
- Why can we see smaller things with electrons than we can see with photons?
  Answer: c) Electrons have a smaller wavelength.

The Microscopic quiz

- What is the name of the light effect that limits the size of things we can see with light?

  a) Airy Disks
  b) Radiation
  c) Diffraction
  d) Photons

- What happens when a particle travels through two slits placed close to each other?

  a) It only goes through one of the slits
  b) It goes through both slits and interferes with itself on the other side.
  c) It doesn't go through either slit
  d) It interferes with itself before reaching the slits

- Why can we see smaller things with electrons than we can see with photons?

  a) Electrons move slower than light
  b) Electrons have more mass than photons
  c) Electrons have a smaller wavelength
  d) Electrons carry an electric charge and photons do not