

Post-trip Lesson for The Unseen World

Cutting It Down To Nano

Engagement

Explain to the student that "nano" means "one billionth" and that a nanometer is one billionth of a meter. If necessary, remind them that a centimeter is one hundredth of a meter and millimeter is one thousandth to help them get it.

Exploration

Give each student the 150mm x 5mm (5.9" x 0.2") piece of paper and a pair of scissors. Tell the student what the paper's dimensions are. Mention that they also have a calculator and ruler to use if they want.

Ask the student to guess how many times they would have to cut the paper in half to make a 10 nanometer long piece. Ask them how many times they think they can cut the paper before it becomes impossible to cut with the scissors. Tell the students to begin cutting the strip of paper crosswise and to continue cutting it in half as many times as they can. Remind them to keep track of the number of cuts they make.

Explanation

Once the student has made as many cuts as possible, have them measure the dimensions of the paper. Discuss the following questions:

- Were their predictions accurate? (It takes 24 cuts to make a 9nm-long piece.)
- How many times did they cut the paper?
- How close was the smallest piece to the nanoscale?
- Why did they have to stop cutting?
- Can macroscale objects, like scissors, be used on the nanoscale?
- Can they think of any way to cut the paper any smaller?

As a closing point, emphasize that the demonstration shows how small nano really is, and how inadequate macro scale tools, like scissors, are for dealing with the nanoscale.

Credits

Lesson from NISEnet.org – Cutting it Down to Nano

Other resources: <http://whatisnano.org>

Nevada Academic Content Standards in Science (NGSS): 5-PS1-1.

Common Core: SL.5.1

What You Will Need:

- Scissors
- A strip of paper (dimensions 150mm x 5mm, or 5.9" x 0.2")
- "Cutting It Down to Nano" work sheet
- Ruler
- Pen or pencil*
- Calculator*
- Tape*

