

# Atoms

By Sharon Fabian

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<sup>1</sup> The really strange thing about atoms is that most of us will never see one. Ever. Atoms are so small that it's impossible to see one with just our eyes. In fact, atoms are so small, that it's impossible to see one with any ordinary microscope.

<sup>2</sup> How small is an atom? An atom is about one one-millionth the thickness of a human hair! The tiniest speck of dust that you could see under an ordinary microscope would still contain about ten billion atoms!

<sup>3</sup> Atoms are the smallest possible part of any material. For example, if you took a copper penny and cut it in half, and then kept cutting it in half until you were down to the smallest possible bit of copper, that would be an atom.

<sup>4</sup> Atoms may seem like science fiction, but they're not. Scientists have found ways to study atoms and to prove that they exist. Do you ever wonder how scientists study something so small that no one can see it? First of all, there is one way to see atoms. With a very powerful microscope, called an electron microscope, scientists can look at atoms. You may have seen pictures of atoms as seen through an electron microscope. The atoms that you see in this type of picture have been colored so that you can see them. Since an atom has no color, it would be invisible without added color.

<sup>5</sup> Scientists also use x-rays to study some atoms. They sometimes use a spectrometer to study the light waves that an atom gives off. The spectrometer separates the light into its colors, and the pattern of colors can be used to help study an atom's energy levels. The most amazing tool for studying atoms is called a particle accelerator. A particle accelerator blasts a tiny particle at the center of an atom with tremendous force. This causes other tiny particles to shoot off of the atom. By studying these little particles that popped off, scientists discovered nuclear fission. Scientists usually don't expect to see any practical uses for their discoveries for a long time. But one use was quickly found for nuclear fission in 1945. Nuclear fission was used to make the atomic bomb that was dropped on Japan at the end of World War II.

<sup>6</sup> When scientists first discover a new idea, it is called a theory. Later, after it has been proven over and over again, it is called a fact. Here are some theories and facts that scientists have discovered about atoms.

- Atoms have tiny particles called electrons. Joseph John Thomson discovered this in 1897.
- Atoms have a heavy middle part, called the nucleus. There are particles in the nucleus called protons. This was discovered by Ernest Rutherford in 1908.
- Electrons are arranged in levels around the atom. Niels Bohr won the Nobel Prize in 1922 for this discovery.
- There are also other particles, called neutrons, in the nucleus. This was discovered by James Chadwick in 1932.
- There are particles in the nucleus that are smaller than protons or neutrons. These were discovered in the 1960s and named quarks by Murray Gell-Mann. Protons and neutrons each have three quarks. Quarks can also be combined in the laboratory to form other particles, but these particles stay together for only a fraction of a second. These subatomic particles have names that sound like they're straight out of science fiction too; some of them are Antineutron, Gluon, Psi Particle, Meson, Muon, Neutrino, and Tachyon.

<sup>7</sup> Scientists keep learning more and more about atoms all the time. Each new discovery brings up more new questions. My favorite atom question comes from the fact that atoms are colorless. If all the colorful things in the world are made up of atoms, and atoms are all colorless, where do all the colors come from? Hmmm.



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<p>1. The smallest possible part of a material, such as copper, is called</p> <p><input type="radio"/> A An electron</p> <p><input type="radio"/> B An atom</p> <p><input type="radio"/> C A quark</p> <p><input type="radio"/> D A neutron</p>	<p>2. The particle that was discovered most recently is</p> <p><input type="radio"/> A An electron</p> <p><input type="radio"/> B An atom</p> <p><input type="radio"/> C A quark</p> <p><input type="radio"/> D A neutron</p>
<p>3. The particles in the center of an atom are</p> <p><input type="radio"/> A Electrons and quarks</p> <p><input type="radio"/> B Mesons and Muons</p> <p><input type="radio"/> C Protons and neutrons</p> <p><input type="radio"/> D Electrons and protons</p>	<p>4. Who made the earliest discovery about atoms?</p> <p><input type="radio"/> A Joseph John Thomson</p> <p><input type="radio"/> B Albert Einstein</p> <p><input type="radio"/> C Murray Gell-Mann</p> <p><input type="radio"/> D Niels Bohr</p>
<p>5. A particle accelerator</p> <p><input type="radio"/> A Provides the power for an electron microscope</p> <p><input type="radio"/> B Combines atoms</p> <p><input type="radio"/> C Makes your car run faster</p> <p><input type="radio"/> D Splits atoms</p>	<p>6. The atomic bomb works by</p> <p><input type="radio"/> A Counting atoms</p> <p><input type="radio"/> B Splitting atoms</p> <p><input type="radio"/> C Measuring atoms</p> <p><input type="radio"/> D Combining atoms</p>
<p>7. Which of the following also involves splitting atoms?</p> <p><input type="radio"/> A Splitting firewood</p> <p><input type="radio"/> B Measuring in millimeters</p> <p><input type="radio"/> C Hitting a baseball</p> <p><input type="radio"/> D Nuclear energy</p>	<p>8. Quarks are</p> <p><input type="radio"/> A Fact</p> <p><input type="radio"/> B Fiction</p> <p><input type="radio"/> C Both of the above</p> <p><input type="radio"/> D Neither of the above</p>

