



12.2 Electrons and Energy Levels

READ



Danish physicist Neils Bohr (1885–1962) proposed the concept of energy levels to explain electron behavior in atoms. While we know today that his model doesn't explain everything about how electrons behave, it is still a useful starting point for understanding what is happening inside atoms.

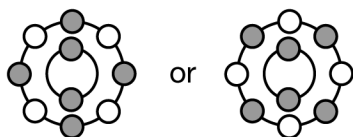
The number of electrons in an atom is equal to the number of protons in the nucleus. That means each element has a different number of electrons and therefore fills the energy levels to a different point. The innermost energy level is filled first, and then each additional electron occupies the lowest unfilled energy level in the atom.

EXAMPLE



An atom of the element carbon has six electrons. Show how the electrons are arranged in energy levels.

Solution



Note: remember that atoms are actually three-dimensional, and that it is impossible to show the exact location of a particular electron within the electron cloud. Therefore, as long as the entire first energy level is filled, and four of the spaces in the second level are filled, the answer is acceptable. However, because electrons repel each other, it is standard procedure to show the electrons evenly spaced within the energy level.

PRACTICE



Answer the following questions about electrons and energy levels. Use section 12.2 of your text if needed.

- Who proposed the concept of energy levels inside atoms?
- Explain how energy levels are like a set of stairs. Where can electrons exist?
- In a stable atom, how are the energy levels filled?
- Show how the electrons of the following atoms are arranged in energy levels.

<p>a. Chlorine-17 electrons</p>	<p>b. Oxygen-8 electrons</p>	<p>c. Aluminum- 13 electrons</p>	<p>d. Argon- 18 electrons</p>
<p>e. Copper- 29 electrons</p> <div style="border: 1px solid black; padding: 5px;"> <p>4 ○○○○○○○○○○</p> <p>3 ○○○○○○○○○○</p> <p>2 ○○○○○○○○○○</p> <p>1 ○○</p> </div>		<p>f. Calcium-20 electrons</p> <div style="border: 1px solid black; padding: 5px;"> <p>4 ○○○○○○○○○○</p> <p>3 ○○○○○○○○○○</p> <p>2 ○○○○○○○○○○</p> <p>1 ○○</p> </div>	