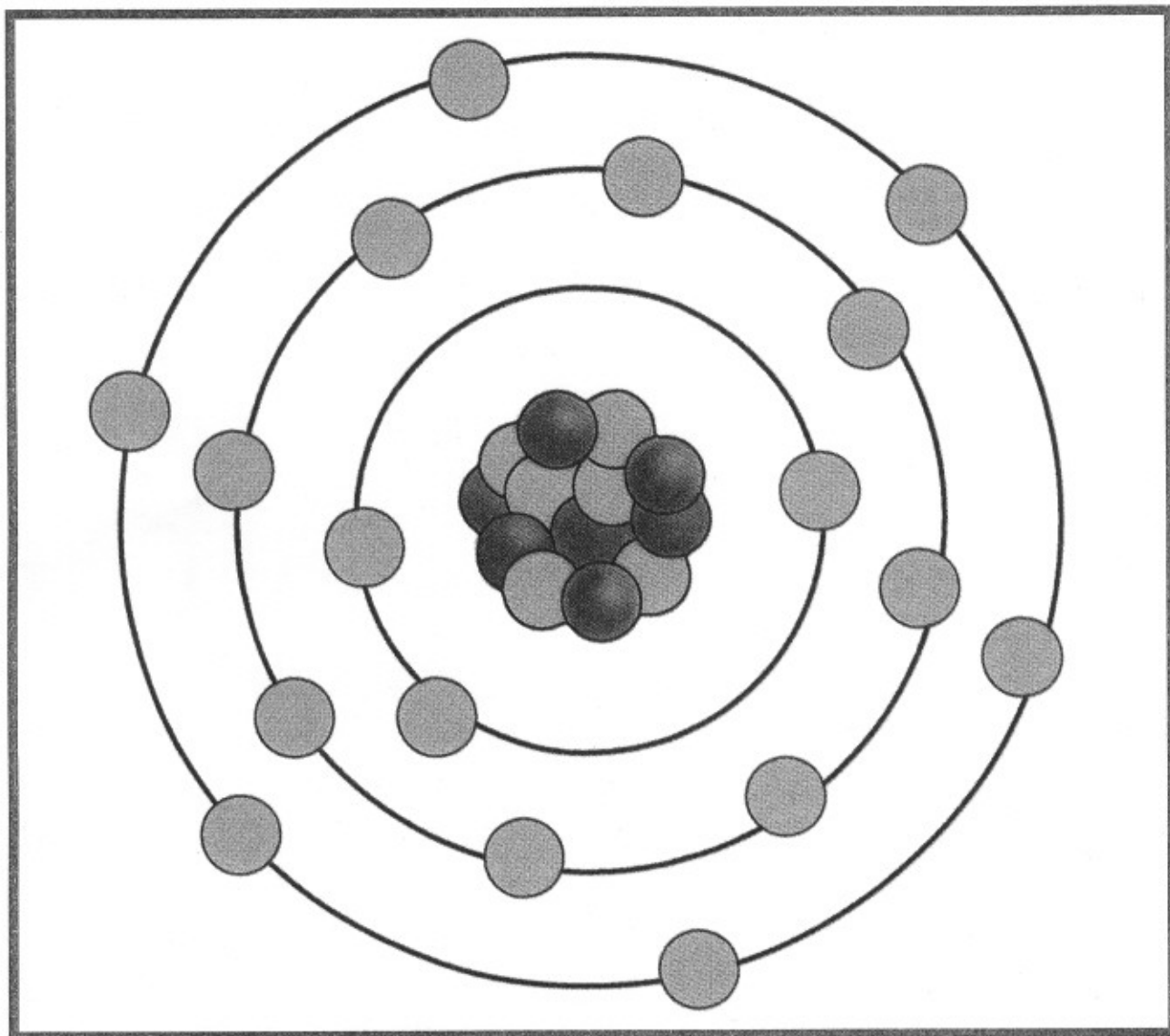


How are electrons arranged in an atom?



KEY TERM

shells: energy levels in which electrons are arranged around the nucleus

In the past, scientists believed that electrons circled the nucleus the same way the planets circled the sun. Today, however, scientists know that there is no exact path of an electron. Electrons orbit the nucleus in random fashion.

In modern atomic theory, electrons are arranged into energy levels, or **shells**. Each electron shell is labeled with a capital letter. The first shell is the "K" shell. It is the shell closest to the nucleus. The "K" shell has the least amount of energy. The next shell is the "L" shell. After the "L" shell comes the "M" shell, and so on.

Each shell can hold only a certain number of electrons.

- The "K" shell can hold up to 2 electrons.
- The "L" shell can hold up to 8 electrons.
- The "M" shell can hold up to 18 electrons.

The number of shells an atom has depends upon the number of electrons the atom has. In general, each shell must have its full number of electrons before a new shell starts. If there are more electrons than a shell can hold, a new shell starts.

The outermost shell of an atom is so important that it has a special name—the valence shell. If a shell is a valence shell, it can hold only up to 8 electrons, even if it is the M shell. The K shell, however, can hold only 1 or 2 electrons, even if it is a valence shell.

MORE ABOUT ELECTRONS

Each picture below shows how electrons are arranged in certain atoms. Look at each diagram. Then answer the questions.

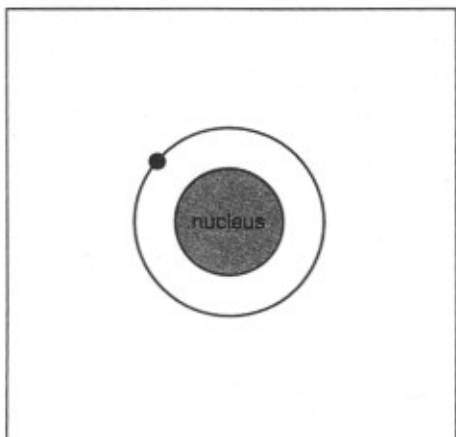


Figure A Hydrogen

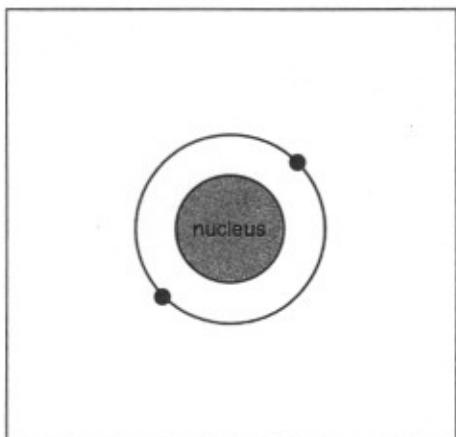


Figure B Helium

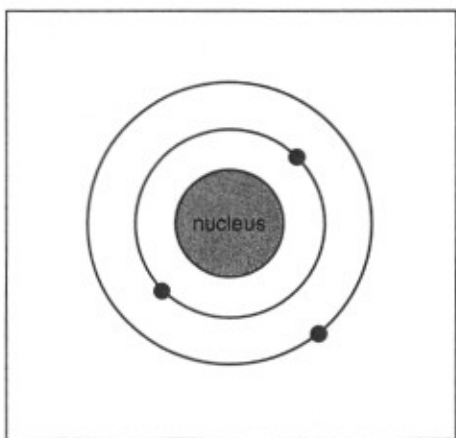


Figure C Lithium

A. Hydrogen is the simplest atom. It has only one electron.

1. How many electron shells does a hydrogen atom have? _____
2. What is this shell called? _____
3. Is the shell complete? _____

B. A helium atom has two electrons.

1. How many electron shells does a helium atom have? _____
2. What is this shell called? _____
3. Is the shell full? _____

C. A lithium atom has three electrons.

1. How many electron shells does a lithium atom have? _____
2. What are these shells called? _____
3. Which one is the inner shell? _____
4. Is the inner shell full? _____
5. Which is the outer shell? _____
6. Is the outer shell full? _____

WHAT DO THE PICTURES SHOW?

The pictures below show how electrons are arranged in two atoms. Look closely at each figure. Then answer the questions.

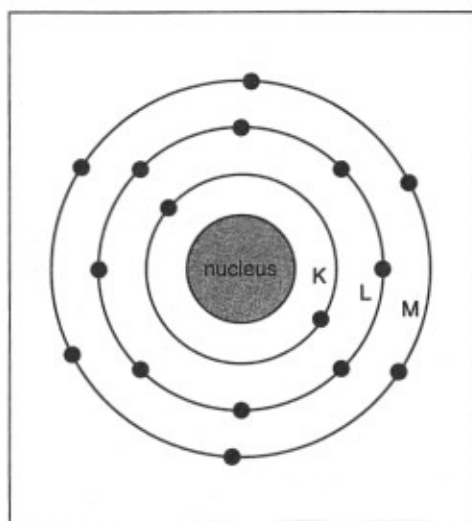


Figure D Sulfur

1. How many electron shells does sulfur have?

2. What is the first shell called? _____
3. How many electrons does this shell have? _____
4. Is this shell full? _____
5. What is the second shell called? _____
6. How many electrons does it have? _____
7. Is this second shell full? _____
8. What is the third shell called? _____
9. How many electrons does the third shell have? _____
10. Is this shell full? _____
11. How many electrons does sulfur have? _____

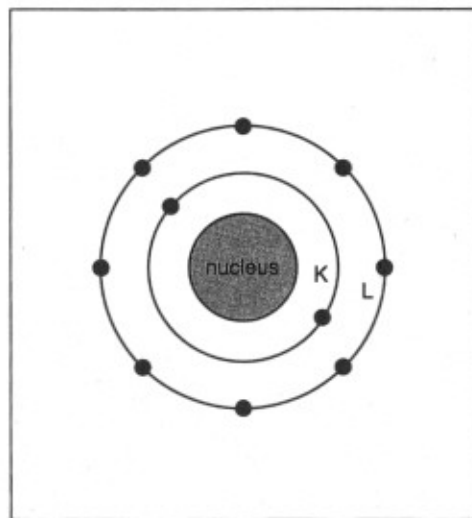


Figure E Neon

1. How many electron shells does neon have? _____
2. What is the first shell called? _____
3. How many electrons does this shell have? _____
4. Is this shell full? _____
5. What is the second shell called? _____
6. How many electrons does it have? _____
7. Is this second shell full? _____
8. How many electrons does neon have? _____

MATCHING

Match each term in Column A with its description in Column B. Write the correct letter in the space provided.

	Column A	Column B
_____	1. shell	a) closest shell
_____	2. 5 electrons	b) way electrons circle nucleus
_____	3. cloud	c) needs three shells
_____	4. 12 electrons	d) energy level
_____	5. "K" shell	e) needs two shells

HOW MANY SHELLS?

How many shells are needed for each of the following? Write your answer in the space.

1. How many shells do 2 electrons need? _____
2. 4 electrons need _____ shells.
3. 10 electrons need _____ shells.
4. 16 electrons need _____ shells.
5. 20 electrons need _____ shells.

FILL IN THE ELECTRONS

Draw in the electrons on their proper shells. Make a small ball [●] to show an electron. The first one is done for you.

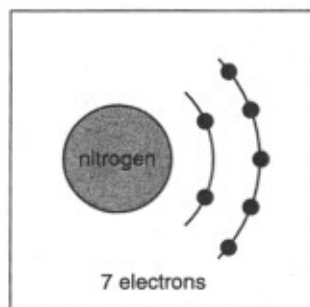


Figure F

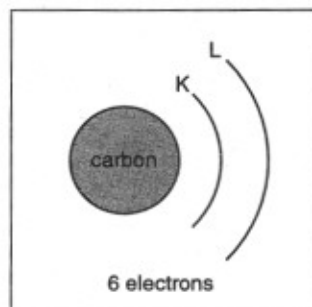


Figure G

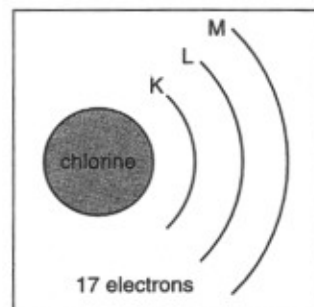


Figure H

TRUE OR FALSE

In the space provided, write "true" if the sentence is true. Write "false" if the sentence is false.

- _____ 1. Every atom has at least one electron.
- _____ 2. Every atom has at least two shells.
- _____ 3. The first electron shell is the "L" shell.
- _____ 4. The "L" shell can hold 8 electrons.
- _____ 5. The "L" shell always has 8 electrons.
- _____ 6. If there is an "L" shell, it means that the "K" shell is full.
- _____ 7. A full "K" shell has three electrons.
- _____ 8. A helium atom that has 2 electrons is a "full" atom.
- _____ 9. A shell must be full before a new shell is started.
- _____ 10. An atom with 10 electrons has 2 shells.

COMPLETE THE CHART

Complete the chart by filling in the missing information.

	Atom	Number of Electrons	Number of Electrons in Each Shell			Is Last Shell Complete? (Yes or No)
			K	L	M	
1.	Magnesium	12	2	8	2	No
2.	Carbon	6				
3.	Oxygen	8				
4.	Helium	2				
5.	Neon	10				
6.	Aluminum	13				
7.	Chlorine	17				
8.	Phosphorus	15				
9.	Argon	18				
10.	Beryllium	4				