Activity 7 How Electrons Determine Chemical Behavior

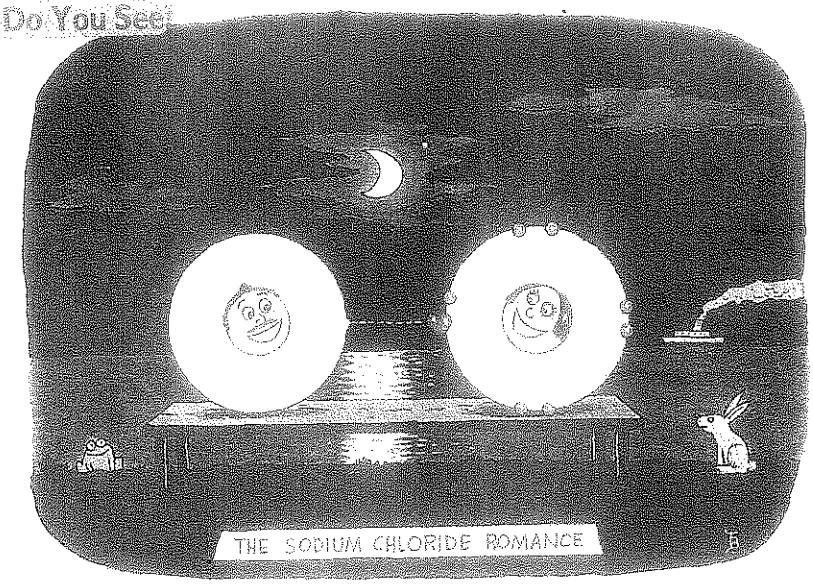
Field Notes

A sodium atom
walks onto the scene,
His valence electron's
feeling keen,
Positive that he will
ionically bond
With a halogen of
whom he is fond.

He spots chlorine
on the other side,
Sporting her valence
shell with pride.
Sodium's attraction
he just cannot hide,
So the duo walk out
as sodium chloride.

—Mala Radhakrishnan

What Do You See?



GOALS

In this activity you will:

- Investigate more patterns in the electron arrangements of atoms.
- Relate the positions of elements on the periodic table, their electron arrangements, and their distances from the nearest noble gas, to chemical properties of the elements.
- Relate electron arrangements to ionization energies.
- Assign valence numbers to elements and organize the periodic table according to valence numbers.

What Do You Think?

You have learned that electron configurations determine an atom's chemical behavior. You have also learned how these electrons are labeled according to a series of energy sublevels.

- How does the arrangement of electrons in an atom determine its chemical behavior?

Record your ideas about this question in your *Active Chemistry* log. Be prepared to discuss your responses with your small group and the class.

Investigate

1. In *Activity* 6 you learned that elements with relatively high ionization energies have stable arrangements of electrons. One particular group of elements, located in the column at the extreme right of the table, exhibit high ionization energies and therefore have stable arrangements of electrons. They are called the noble gases.

   Look at the periodic table on the inside back cover for the assignment of electrons to energy sublevels for atoms of each of these elements. Focus on the sublevel at the end of the electron arrangement where the last electron is assigned.

ACC1-A7 Charts for Investigate

Chart 1a	Column A	Column B	Column C	Column D
Element	Energy level (number) to which the last electron is assigned	Sublevel (letter) to which the last electron is assigned	Number of electrons in the sublevel to which the last electron is assigned	Total number of all electrons of the energy level in Column A
helium				
neon				
argon	3	*p*	6	8
krypton				
xenon				
radon				

Chart 2a

Element being compared	Number of electrons *more* than those found in closest noble gas (He)	Energy level (number) to which the last electron is assigned	Energy sublevel (letter) to which the last electron is assigned	Location of element (row) in the periodic table	Location of element (column) in the periodic table
Lithium	1	2	s	Row 2	Column 1
Beryllium					
boron					

Chart 2b

Element being compared	Number of electrons *more* than those found in closest noble gas (Ne)	Energy level (number) to which the last electron is assigned	Energy sublevel (letter) to which the last electron is assigned	Location of element (row) in the periodic table	Location of element (column) in the periodic table
sodium					
magnesium					
aluminum					

Chart 2d

Element being compared	Number of electrons *less* than those found in closest noble gas (Ne)	Energy level (number) to which the last electron is assigned	Energy sublevel (letter) to which the last electron is assigned	Location of element (row) in the periodic table	Location of element (column) in the periodic table
nitrogen	3	2	p	Row 2	Column 5
oxygen					
fluorine					

Chart 2e

Element being compared	Number of electrons *less* than those found in closest noble gas (Ar)	Energy level (number) to which the last electron is assigned	Energy sublevel (letter) to which the last electron is assigned	Location of element (row) in the periodic table	Location of element (column) in the periodic table
phosphorus	3	3	p	Row 3	Column 5
sulfur					
chlorine					

Use for question 3 (3a done already)

IA	IIA	IIIA	IVA	VA	VIA	VIIA	VIIIA
H							He
Li	Be	B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar