

Periodic Trends: Continued

Elements in chemical groups have similar electron arrangements

- Atoms in the same group have the same number of _____ electrons
 - Group ____: One valence electron
 - Group ____: Two valence electrons
 - Groups ____: 3, 4, 5, 6, 7, 8 valence electrons
 - Exception: _____ has 2 valence electrons (other noble gases have 8 valence electrons)

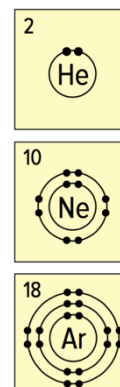
Atoms in the same period have the same number of occupied energy shells

- First period (hydrogen and helium): _____ occupied energy shell
- Second period: _____ occupied energy shells
- Third period: _____ occupied energy shells

	1								18
1	1 H								2 He
2	3 Li	4 Be	5 B	6 C	7 N	8 O	9 F	10 Ne	
3	11 Na	12 Mg	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	

Noble Gas Stability: A Full Valence Shell

- During a chemical reaction, atoms _____ valence electrons with other atoms
- Noble gases are stable (unreactive) because they have _____ valence shells
- Their atoms do _____ tend to gain, lose, or share electrons



How Other Elements Achieve Full Valence Shells

- Other elements can achieve a full valence shell by gaining or losing _____ during a chemical reaction
- When a neutral atom gains or loses an electron, it becomes an _____
 - _____ an electron: becomes positively charged ion
 - _____ an electron: becomes a negatively charged ion

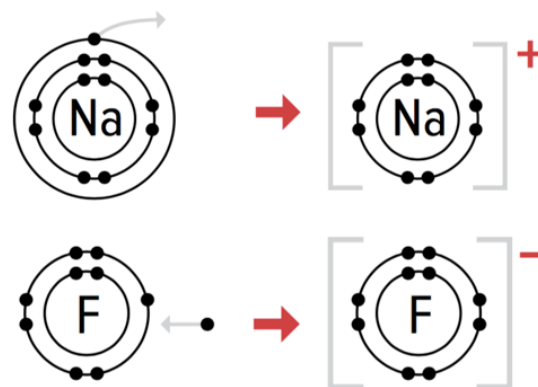


Figure 2.19: Formation of sodium (Na, top) and fluorine (F, bottom) ions.

Reactivity of an element is linked to how close it is to having a full valence shell

- Most reactive elements: Groups ____ and ____ (elements are only one electron away from a full valence shell)

Example: Sodium (group 1) easily _____ an electron

Example: Fluorine (group 17) readily _____ an electron to complete their valence shell

Discussion Questions

- Explain why metals tend to lose electrons and non-metals tend to gain them.
- Draw a chlorine atom/chloride ion
- Draw a potassium atom/ion

4. Draw an argon atom
5. Use diagrams to compare the electron arrangements of a chloride ion, a potassium ion, and an argon atom.

Time Out

Complete pages 74-75 in workbook

The periodic table shows how properties of elements change in predictable ways

Periodic trend:

- A regular variation in the _____ of elements based on their atomic structure
- Periodic table can analyze these trends because it can help you compare _____ in groups and periods

Atomic Size Trends: Atomic Size Increases Moving Down a Group

- Atomic size _____ moving down a group
- As you move down a group, elements have atoms with increasing numbers of energy _____
- The greater the number of shells, the _____ the valence electrons are from the nucleus, and the larger the atom

Atomic Size Decreases Moving Left to Right Across a Period

- Atomic size _____ moving left to right across a period
- Elements have increasing numbers of electrons across a period

- Number of occupied valence shells stay the same, but the number of protons in the nucleus _____

How does this result in decreasing atomic size across a period?

- Attraction between valence electrons and the nucleus _____ because a greater positive charge on the nucleus pulls more strongly on the electrons
- Therefore, the electrons are pulled more _____ towards the nucleus, leading to decreasing atomic size

	1								18
	H 37								He 31
1		2		13	14	15	16	17	
	Li 152	Be 112		B 85	C 77	N 75	O 73	F 72	Ne 71
2									
	Na 186	Mg 160		Al 143	Si 118	P 110	S 103	Cl 100	Ar 98
3									
	K 227	Ca 197		Ga 135	Ge 122	As 120	Se 119	Br 114	Kr 112
4									
	Rb 248	Sr 215		In 167	Sn 140	Sb 140	Te 142	I 133	Xe 131
5									
	Cs 265	Ba 222		Tl 170	Pb 146	Bi 150	Po 168	At 140	Rn 140
6									

Chemical symbol
Atomic radius (pm)
Relative size

Metal Reactivity and Atom Size

- Group 1 metals: Potassium is more reactive than sodium
- Both have one valence electron
- Potassium atom is _____ than sodium
- Potassium atom's valence electron is _____ away from the nucleus
- Pull of the positive charge on the nucleus is _____
- Valence electron is _____ to remove (less energy is needed to remove the electron)

Discussion Questions

1. Explain why atoms get larger down a group on the periodic table.
2. Explain why atoms get smaller from left to right across a period on the periodic table.
3. Explain why an alkali metal is more reactive than an alkaline-earth metal in the same period.
4. Explain why larger atoms are more reactive than smaller atoms

Time Out

Pages 76-80 in workbook

