Metals, Non-Metals and Valence Electrons

Octet Rule

Valence Electrons

Hydrogen 1

1p

1 valence electron

Lithium 6

3p
3n

1 valence electron

Hydrogen and Lithium are both in
Group 1A—both have 1 valence electrons.

Oxygen 17

8p
9n

Inner shells are **not** valence electrons

6 valence electrons
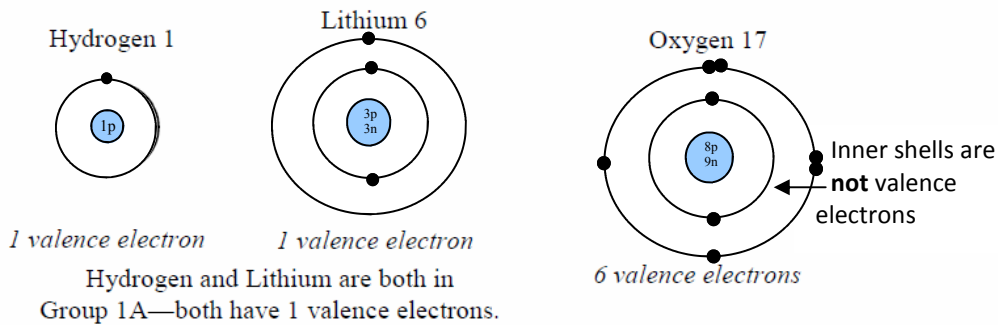
Elements with the same valence electrons have

Valence Electrons

	1A				13A	14A	15A	16A	17A	18A	
1	1 H	2A ← Groups		Groups →						2 He	
Electron Levels 2 (Periods)	3 Li	4 Be	*Divides metals and non-metals*		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	
4	19 K	20 Ca	Transition Metals (valence electrons vary)		31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	

Exception: *Helium only has 2 valence electrons!*
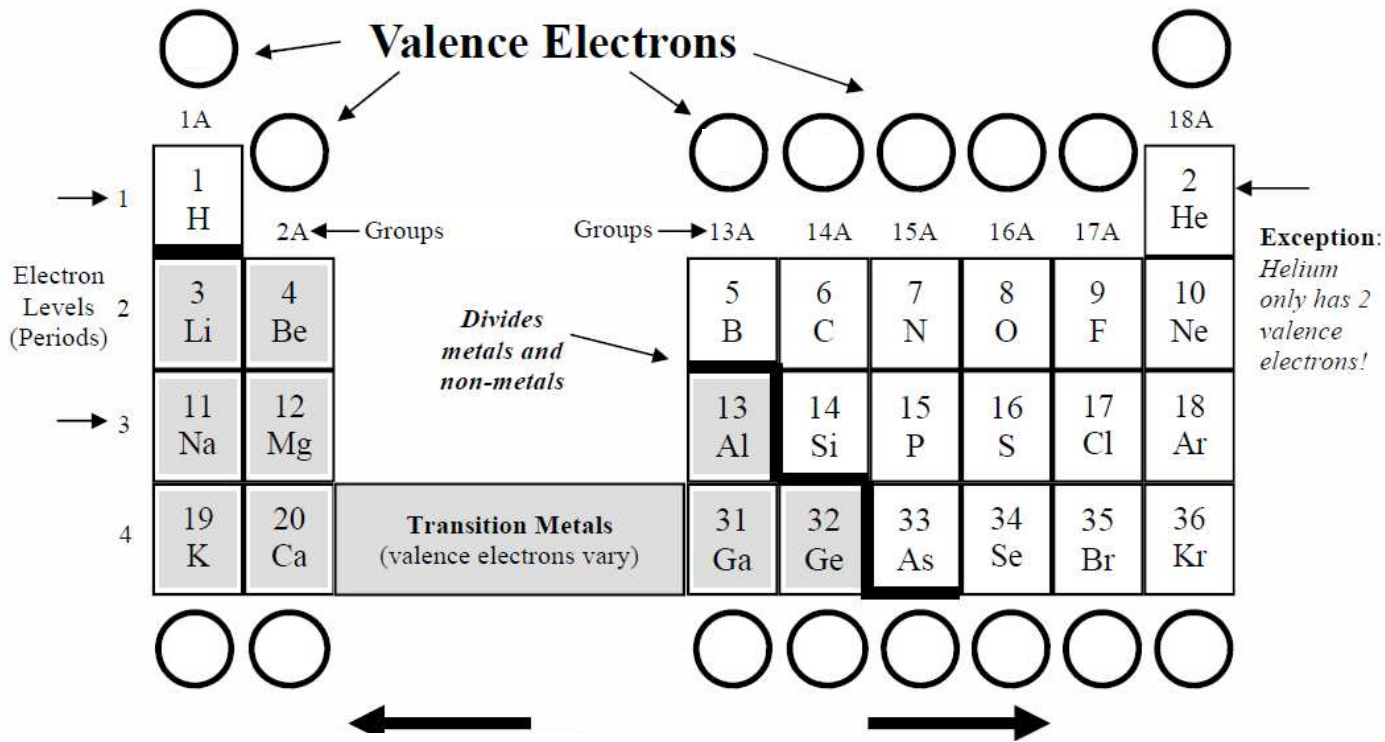
Metals and Nonmetals

Metals or Non-metal?

Calcium (Ca):

Bromine (Br):

Going Farther

Along the separation line are the *semimetals* or *metalloids*: Boron (B), Silicon (Si), Germanium (Ge), Arsenic (As), Antimony (Sb). These have properties of both metals and non-metals.

Groups

Periods

1. Octet Rule	A. Elements found on the right side of the periodic table.	
2. Metals	B. Elements found on the left side of the periodic table.	
3. Valence electrons	C. Says that atoms tend to be more stable with eight valence electrons.	
4. Non-metals	D. Electrons in the outermost electron level. Involved in chemical bonding.	

How many valence electrons?

Calcium (*Ca*) ___2___.   Hydrogen (___) _____

Potassium (___) _____   Helium (___) _____

Oxygen (___) _____   Aluminum(___) _____

Argon (___) _____   Sodium (___) _____

Boron (___) _____   Nitrogen (___) _____

Metal or Non-metal?

__M__ Aluminum (*Al*)   ____ Iron (___)

____ Oxygen (___)   ____ Fluorine (___)

____ Gold (___)   ____ Tin (___)

____ Nitrogen (___)   ____ Lithium (___)

____ Bromine (___)   ____ Chromium (___)

____ Krypton (___)   ____ Lead (___)

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7 protons and 10 electrons.   *Neutral atom or ion?*
15 protons and 15 electrons.   *Neutral atom or ion?*
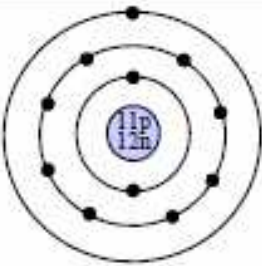35 protons and 37 electrons.   *Neutral atom or ion?*

Give the element abbreviation and charge.
5 protons and 2 electrons: Element: _B_ Charge: __+3__.

16 protons and 18 electrons: Element: ___ Charge: _____.

35 protons and 36 electrons: Element: ___ Charge: _____.

(11p 12n)

Element: _____
# of neutrons: _____
Mass #: _____
# of electrons: _____
# of valence electrons: ____
It is an ion? _____

(2p 2n)

Element: _____
# of neutrons: _____
Mass #: _____
# of electrons: _____
# of valence electrons: ____
It is an ion? _____

(10p 11n)

Element: _____
# of neutrons: _____
Mass #: _____
# of electrons: _____
# of valence electrons: ____
It is an ion? _____

Connect the element on the left with the element on the right that has similar reactivity.

Chlorine	Beryllium
Phosphorous	Potassium
Magnesium	Iodine
Sodium	Aluminum
Boron	Oxygen
Sulfur	Nitrogen

Elements with the same # of _____ have the same reactivity.

Are these elements isotopes of one another?
Element A: 12 protons; 11 electrons; 13 neutrons.
Element B: 13 protons; 12 electrons; 13 neutrons.

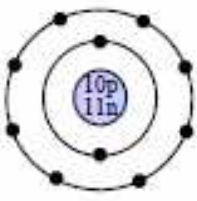*Are these elements isotopes of one another?*
Element A: 14 protons; 15 electrons; 13 neutrons.
Element B: 14 protons; 14 electrons; 15 neutrons.

Are these elements isotopes of one another?
Element A: 12 protons; 11 electrons; 13 neutrons.
Element B: 12 protons; 12 electrons; 13 neutrons.

Are these elements isotopes of one another?
Element A: 18 protons; 18 electrons; 18 neutrons.
Element B: 18 protons; 18 electrons; 19 neutrons.

Sulfur (_S_) is in row __3__. Sulfur has __2__ complete electron levels and __6__ valence electrons in level __3__.

Magnesium (___) is in row ____. Magnesium has _____ complete electron levels and _____ valence electrons in level _____.

Carbon (___) is in row ____. Carbon has _____ complete electron levels and _____ valence electrons in level _____.

Potassium (___) is in row ____. Potassium has ____ complete electron levels and _____ valence electrons in level _____.

Argon (___) is in row ____. Argon has _____ complete electron levels and _____ valence electrons in level _____.