

Name: _____

Period: _____

Ch. 19:1

Metals vs. Non-Metals; Dot Diagrams; Ions

Metals versus Non-Metals

*Metals are on the left side. Non-metals on the right.
Metals tend to lose electrons. Non-metals gain them tight.*

The dividing line is the red or bold black line from between Boron and Aluminum down and to the right. Everything to the left is a metal: to the right, non-metal. One exception (don't ya just hate that?!) is hydrogen – a non-metal.

Sodium (Na) is a metal.
Oxygen is a non-metal.

1 H									2 He
3 Li	4 Be	5 B	6 C	7 N	8 O	9 F	10 Ne		
11 Na	12 Mg	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar		
19 K	20 Ca	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr		

Non-metal (exception)

Dividing line

Non-Metals →

← Metals

Easy to remember by which side iron (Fe) is on—the left side!

On either side of the divide are the metalloids or semi-metals—they have characteristics of both: B, Si, Ge, As.

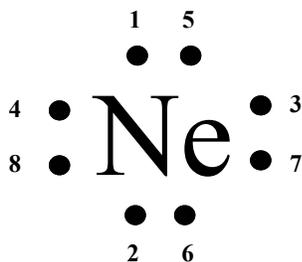
Metal or Non-metal?

Potassium: _____	Fluorine: _____
Bromine: _____	Hydrogen: _____
Beryllium: _____	Silver: _____
Helium: _____	Nitrogen: _____

Dot Diagrams

Dot Diagrams (sometimes known as Lewis dot diagrams) are a depiction of an atom's valence electrons. They are a powerful tool in helping you understand, see, and even predict molecular bonding.

Put the correct number of valence electrons around the chemical symbol in this order in pairs:



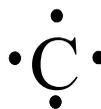
Neon has 8 valence electrons (in the right hand column).
Neon has no unoccupied spaces.
It is full.

Notice that the electrons are in pairs not a circle.

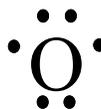
Why would the electrons spread out around the atom instead of bunching up?



Lithium, with 1 valence electron (first column).



Carbon has 4 valence electrons



Oxygen has 6 valence electrons. How many more before it's full?
_____.

Draw the Dot Diagrams for the following elements:

Beryllium

Sodium

Helium

Carbon

Boron

Name: _____

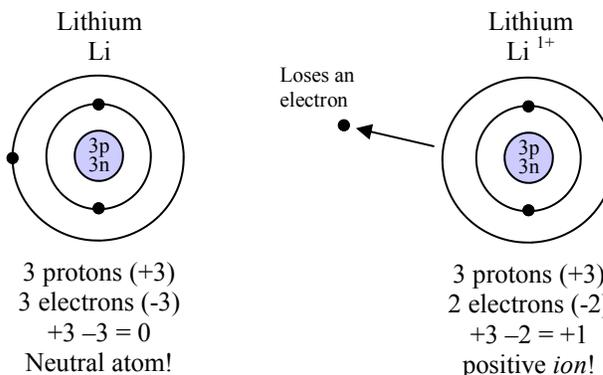
Period: _____

Ions

If you change the number of protons you change the *element*.
 If you change the number of neutrons you change the *isotope*.
 If you change the number of electrons you change the *ion*.

Neutral atoms have an equal number of protons and electrons. A neutral atom has a net electrical charge of zero.

Why would atoms gain or lose electrons? To fulfill the octet rule and end up with a full outer shell of electrons. Metals will lose electrons and make positive ions (cations); non-metals will gain electrons and make negative ions (anions).



An ion is an atom with a net charge; that has gained or lost electrons.

Protons – electrons = ion charge OR p – e = charge

Cations cough up electrons -
 Lose electrons (+ ion).
 METALS

Anions accept electrons -
 Gain electrons (- ion).
 NON-METALS

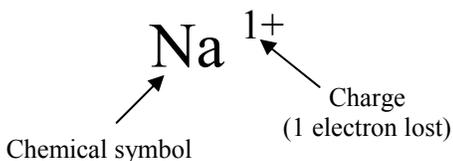
What is the charge of an atom with 16 protons and 18 electrons?	If Oxygen gains 2 electrons what charge will it have?	If Beryllium loses 2 electrons what charge will it have?
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Ion Notation

Ex. How many electrons does Mg²⁺ have?

$$\begin{aligned}
 p - e &= \text{charge} \\
 12 (\text{Mg}) - e &= +2 \\
 12 &= 2 + e \\
 12 - 2 &= e \\
 e &= 10 \text{ electrons}
 \end{aligned}$$

You also could have found this by knowing Mg has 12 protons and electrons if neutral. A 2+ charge means it is a cation—it lost 2 electrons = 12 – 2 = 10 electrons.



How many electrons does Cl ¹⁻ have?	How many electrons does N ³⁻ have?	How many electrons does Al ³⁺ have?
Give the ion notation for an atom with 20 protons and 18 electrons.	Give the ion notation for an atom with 6 protons and 2 electrons.	Give the ion notation for an atom with 15 protons and 18 electrons.