Lewis Dot Diagrams & Ions

S2-2-01 Relate an element's position on the periodic table to its combining capacity (valence).

Lewis dot diagrams…

In grade 9, you learned how to represent the atom by using Bohr Diagrams. Since Bohr diagrams can be a bit cumbersome to draw, we can use a shorter, more convenient notation.

Lewis Dot Diagrams (Electron Dot Diagrams)

- A Lewis dot diagram is a way to represent an element and its **VALENCE** electrons.

- In a Lewis dot diagram, **DOTS** or other small symbols are placed around the **CHEMICAL SYMBOL** of an element to represent the valence electrons.

- Electrons are either **PAIRED** or **UNPAIRED**. The first **4 ELECTRONS** will always be **UNPAIRED** (except Helium, which has two dots that are paired).

- **THE NEXT 4 ELECTRONS WILL PAIR UP WITH THE FIRST 4 DOTS**.

- All elements in the same group/family will have **SIMILAR** Lewis dot diagrams **EXCEPT He**.

Lewis dot diagrams…

Examples:

Draw Bohr AND Lewis Dot diagrams for the following elements.

Element	Bohr Diagram	Lewis Dot	Group #
Helium			
Potassium			

Lewis dot diagrams…

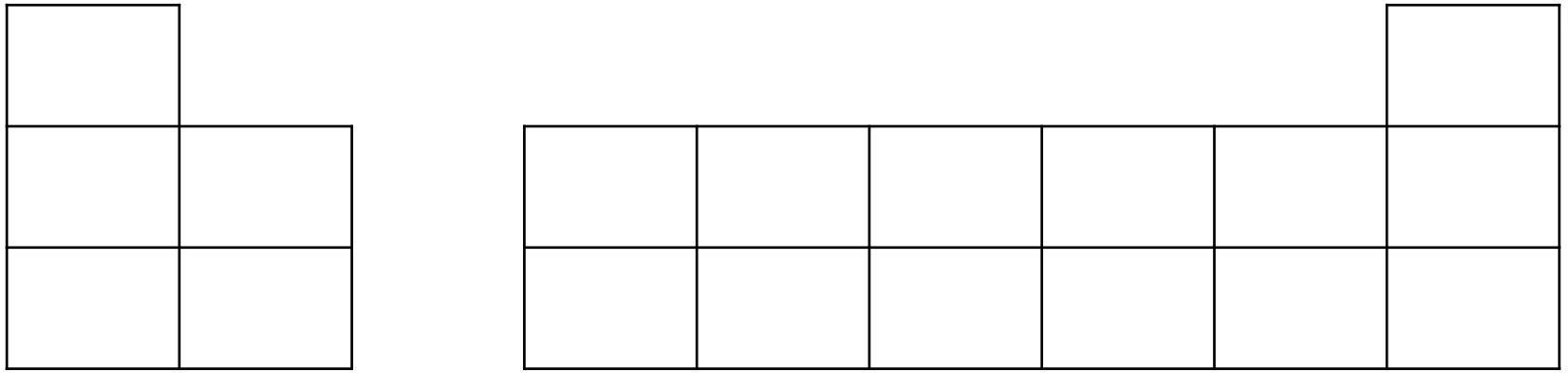
Examples:

Draw Bohr AND Lewis Dot diagrams for the following elements.

Element	Bohr Diagram	Lewis Dot	Group #
Carbon			
Phosphorus			

Lewis dot diagrams…

In the table below, Write the name of each family above its column and draw the Lewis dot diagram for the first 18 elements of the periodic table.



Questions?

1. Why might elements of the same group/family have similar properties?

Lewis dot diagrams…

Questions?

2. Which family is likely to want to:
   a) Lose 1 electron?

   b) Gain 2 electrons?

3. Choose 2 elements that you think may be likely to "combine". Give a reason for your answer.

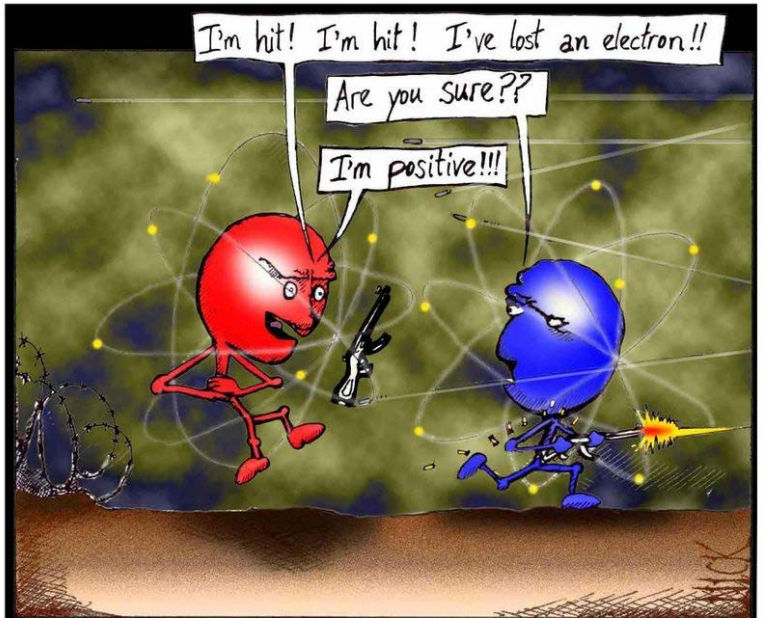
4. What do you think determines the "combining capacity" (how elements combine) of an element?

Charged Atoms…

Why is it so dangerous to use electricity around water???

→Tap water is not **PURE**! It contains **CHARGED ATOMS** that move in the solution and can carry **ELECTRIC CURRENT**.

We call these charged atoms **IONS**. An atom gets a charge by having a **DIFFERENT** amount of **ELECTRONS** than **PROTONS**.



Since **PROTONS** are **STUCK** in the nucleus, atoms can only gain or lose **ELECTRONS** to **FILL** the **OUTER SHELL** and get a charge.

Negative Ions…

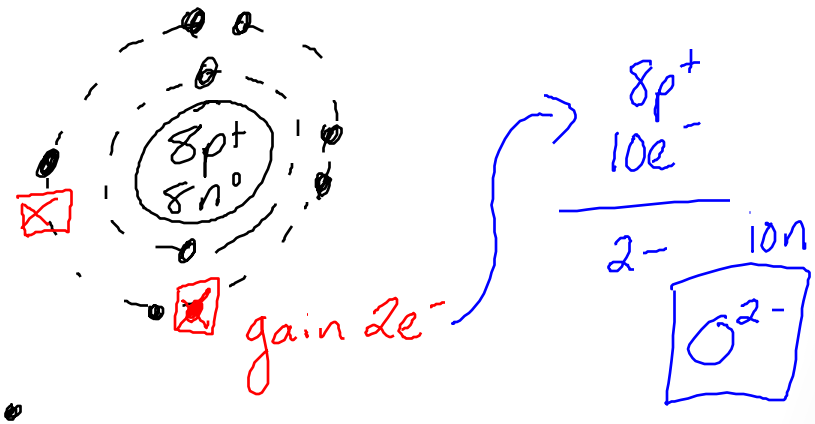
If an atom **GAINS ELECTRONS**, it becomes **MORE NEGATIVE**, and is a **NEGATIVE** ion.

Ex) Draw a bohr diagram for the following, and determine the ion that they would likely form:

1. Oxygen

#8
mass = 16

$8p^+$
$8e^-$
$8n^0$



2. Fluorine

#9
mass = 19

$9p^+$
$9e^-$
$10n^0$

Positive Ions…

If an atom **LOSES ELECTRONS**, it becomes **LESS NEGATIVE**, and is a **POSITIVE** ion.

Ex) Draw a bohr diagram for the following, and determine the ion that they would likely form:

1. Lithium

#3
mass = 7

3p+
3e-
4n°

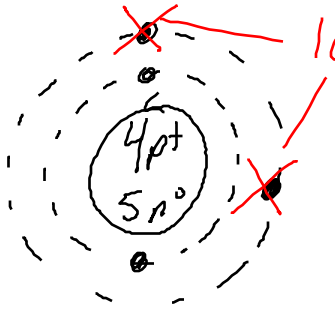
lose 1e- → 3p+, 2e-, 1+

Li^{+} ion

2. Beryllium

#4
mass = 9

4p+
4e-
5n°



lose 2e- → 4p+, 2e-, 2+

Be^{2+} ion

Examples...

1x

Determine the charge on each of the following, and write the symbol for the ion:

1. Chlorine

   7 valence e^- → gain 1e Cl^-

2. Sulphur

   6 valence e^- → gain 2e^- S^{2-}

3. Aluminum

   3 valence e^- → lose 3e^- Al^{3+}

4. Calcium

   2 valence e^- → lose 2e^- Ca^{2+}

5. Nitrogen

   5 valence e^- → gain 3e^- N^{3-}

Try these ones…

1. What is the ionic charge if Calcium loses its valence electrons? Write the ion using the chemical symbol with the charge properly.

Ca^{2+}

2. a) How would sulphur "fill" its outer electron shell?

gain $2e^-$

b) What would be the charge of the resulting ion?

$2-$

c) Write the correct symbol and charge for the sulphur ion.

S^{2-}

Things we need to consider…

- Do you notice what types of elements lose electrons and which ones gain electrons?

non-metals & metals

- Why don't atoms gain/lose protons? What would result if they did?

you would change the element

- What would happen if they gained or lost neutrons?

change mass