

# BINARY IONIC BONDING WITH MANIPULATIVES VIRTUAL LAB

Type your name here

# LET'S REVIEW!

- IONS ARE ATOMS THAT HAVE Type here OR Type here VALENCE ELECTRONS SO THAT THEY ARE NO LONGER NEUTRAL AND HAVE A NET CHARGE.
- METALS TEND TO **LOSE/GAIN** VALENCE ELECTRONS TO FORM **CATIONS/ANIONS** WHICH ARE **POSITIVE/NEGATIVE**. (CIRCLE YOUR CHOICES)
- NONMETALS TEND TO **LOSE/GAIN** VALENCE ELECTRONS TO FORM **CATIONS/ANIONS** WHICH ARE **POSITIVE/NEGATIVE**. (CIRCLE YOUR CHOICES)



CLICK AND  
DRAG.  
RESIZE IF  
NEEDED

# LET'S REVIEW!

- NOBLE GASES HAVE A  Type  VALENCE SHELL SO THEY DO NOT FORM IONS.
- OPPOSITELY-CHARGED PARTICLES  Type here  EACH OTHER AND PARTICLES OF THE SAME CHARGE  Type here  ONE ANOTHER.
- WHEN IONS CHEMICALLY BOND THEY WILL BOND SO THE RATIO OF CATIONS TO ANIONS FORM NEUTRAL COMPOUNDS! IN OTHER WORDS, THE RATIO OF CATIONS AND ANIONS WILL MAKE THE POSITIVE AND NEGATIVE CHARGES WILL CANCEL OUT.

# LET'S REVIEW!

Use the drag and drop blocks to highlight the predictable charges of the groups by placing the block over the first element in the periodic column (family).

1 1, 008* <b>H</b> hydrogen																	18 4, 003 <b>He</b> helium																		
3 6,94* <b>Li</b> litium	4 9,012 <b>Be</b> beryllium																	13 10,81* <b>B</b> bor	14 12,01* <b>C</b> karbon	15 14,01* <b>N</b> nitrogen	16 16,00* <b>O</b> oksxygen	17 19,00 <b>F</b> fluor	18 20,18 <b>Ne</b> neon												
11 22,99 <b>Na</b> natrium	12 24,31* <b>Mg</b> magnesium																	13 26,98 <b>Al</b> aluminium	14 28,09* <b>Si</b> silisium	15 30,97 <b>P</b> fosfor	16 32,06* <b>S</b> svovel	17 35,45* <b>Cl</b> klor	18 39,95 <b>Ar</b> argon												
19 39,10 <b>K</b> kalium	20 40,08 <b>Ca</b> kalsium	21 44,96 <b>Sc</b> scandium	22 47,87 <b>Ti</b> titan	23 50,94 <b>V</b> vanadium	24 52,00 <b>Cr</b> krom	25 54,94 <b>Mn</b> mangan	26 55,85 <b>Fe</b> jern	27 58,93 <b>Co</b> kobolt	28 58,69 <b>Ni</b> nikkel	29 63,55 <b>Cu</b> kobber	30 65,38* <b>Zn</b> sink	31 69,72 <b>Ga</b> gallium	32 72,63 <b>Ge</b> germanium	33 74,92 <b>As</b> arsen	34 78,96* <b>Se</b> selen	35 79,90* <b>Br</b> brom	36 83,80 <b>Kr</b> krypton	37 85,47 <b>Rb</b> rubidium	38 87,62 <b>Sr</b> strontium	39 88,91 <b>Y</b> yttrium	40 91,22 <b>Zr</b> zirkonium	41 92,91 <b>Nb</b> niob	42 95,96* <b>Mo</b> molybden	43 [98] <b>Tc</b> technetium	44 101,1 <b>Ru</b> ruthenium	45 102,9 <b>Rh</b> rhodium	46 106,4 <b>Pd</b> palladium	47 107,9 <b>Ag</b> sølv	48 112,4 <b>Cd</b> kadmium	49 114,8 <b>In</b> indium	50 118,7 <b>Sn</b> tinn	51 121,8 <b>Sb</b> antimon	52 127,6 <b>Te</b> tellur	53 126,9 <b>I</b> jod	54 131,3 <b>Xe</b> xenon
55 132,9 <b>Cs</b> cesium	56 137,3 <b>Ba</b> barium	89-103 <div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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\*H: [1.00784, 1.00811]  
Li: [6.938, 6.997]  
B: [10.806, 10.821]  
C: [12.0096, 12.0116]  
N: [14.00643, 14.00728]  
O: [15.99903, 15.99977]  
Mg: [24.304, 24.307]  
Si: [26.084, 26.086]  
S: [32.059, 32.076]  
Cl: [35.446, 35.457]  
Br: [79.901, 79.907]  
Ti: [204.382, 204.385]  
Zn: 65.38(2)  
Se: 78.96(3)  
Mo: 95.96(2)

+1

+2

+3

+/-  
4

-3

-2

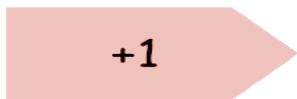
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# LET'S LEARN!

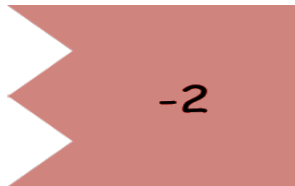
*How can we use puzzle pieces to help us visualize ions and ionic bonding?*

When Sodium (Na) forms an ion it Type its 1 valence electron to become a +1 cation (just like all other alkali metals).



The +1 charge is indicated by the single protruding puzzle point!

When Oxygen(O) forms an ion it Type two valence electrons so that it has a full valence shell, and becomes a -2 anion (just like all other group 16/6A elements).



The -2 charge is indicated by the two puzzle cut points.

# LET'S LEARN!

*How can we use puzzle pieces to help us visualize ions and ionic bonding?*

What happens when sodium and oxygen bond?

**Remember compounds are neutral. To make a perfect neutral puzzle (compound), the points need to match up so that all the valence electrons have a place!**

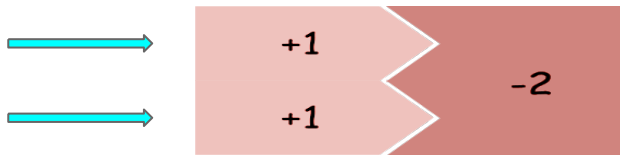


**1 Na ion and 1 O ion do not make a neutral compound. There is still a needed electron. So another Na ion will bond to donate its electron to oxygen and now all the charges are balanced. This makes a perfect neutral compound with the formula:**

**Na<sub>2</sub>O!** ← Notice that there is no subscript for O, since there is only 1!

Ratio → cations:  
anions

**2 Sodiums: 1 Oxygen**



We call this ionic compound

**sodium oxide.**

The metal keeps its elemental name and the end of the nonmetal is changed to “ide”.

# LET'S BOND!

## Magnesium + Oxygen

Use the pieces necessary to form a rectangle below.

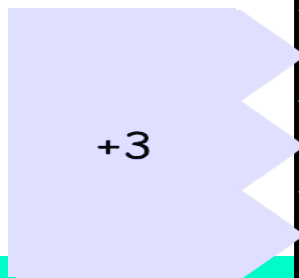
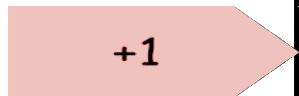
Write the formula!

Type Here

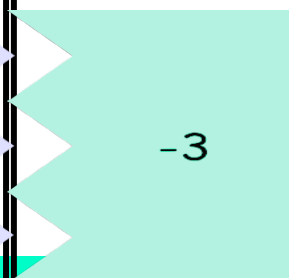
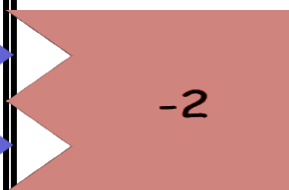
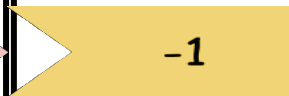
Name your compound!

Type Here

CATIONS



ANIONS



## Aluminum + Phosphorus

Use the pieces necessary to form a rectangle below.

Write the formula!

Type Here

Name your compound!

Type Here

# LET'S BOND!

## Calcium + Sulfur

Use the pieces necessary to form a rectangle below.

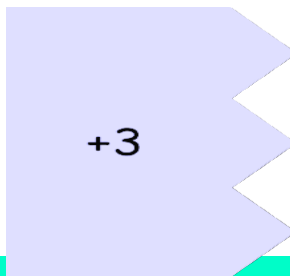
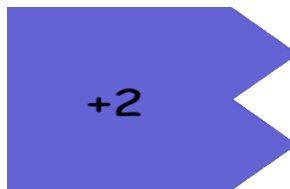
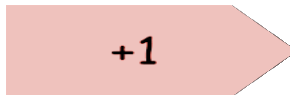
Write the formula!

Type Here

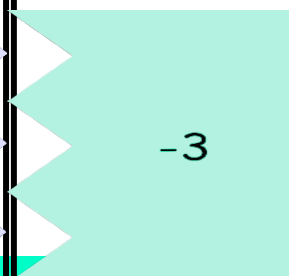
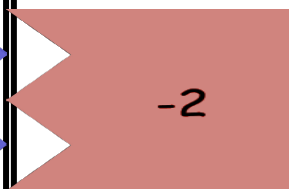
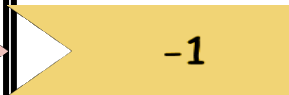
Name your compound!

Type Here

CATIONS



ANIONS



## Lithium + Chlorine

Use the pieces necessary to form a rectangle below.

Write the formula!

Type Here

Name your compound!

Type Here



# LET'S BOND!

## Aluminum + Fluorine

Use the pieces necessary to form a rectangle below.

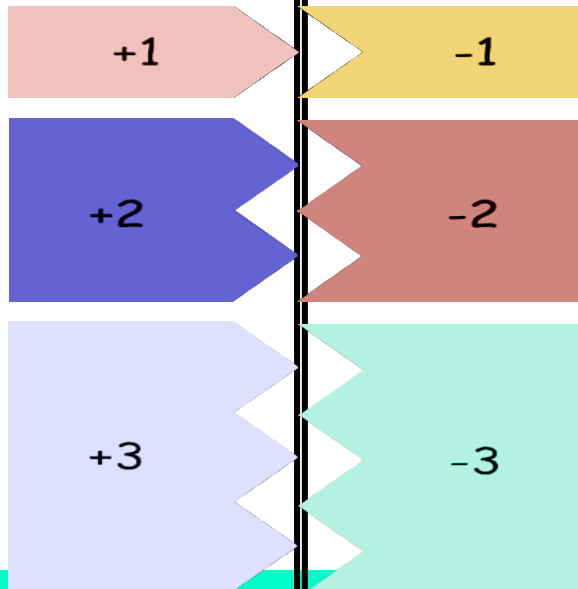
Write the formula!

Type Here

Name your compound!

Type Here

CATIONS



ANIONS

## Potassium + Nitrogen

Use the pieces necessary to form a rectangle below.

Write the formula!

Type Here

Name your compound!

Type Here

# LET'S BOND!

## Beryllium + Iodine

Use the pieces necessary to form a rectangle below.

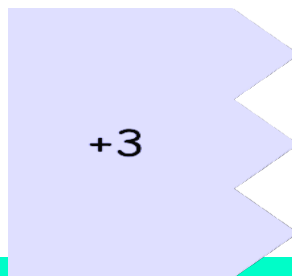
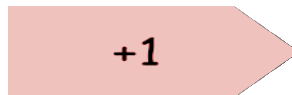
Write the formula!

Type Here

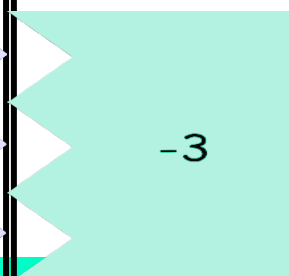
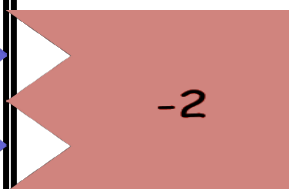
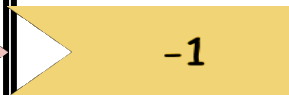
Name your compound!

Type Here

CATIONS



ANIONS



## Lithium + Phosphorus

Use the pieces necessary to form a rectangle below.

Write the formula!

Type Here

Name your compound!

Type Here

# LET'S BOND! CHALLENGE PROBLEMS!

## Calcium + Nitrogen

Use the pieces necessary to form a rectangle below.

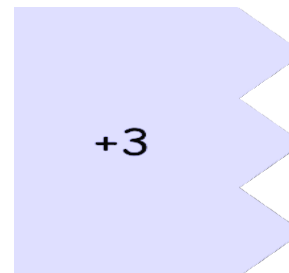
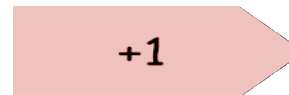
Write the formula!

Type Here

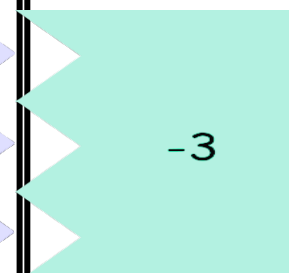
Name your compound!

Type Here

CATIONS



ANIONS



# LET'S BOND! CHALLENGE PROBLEMS!

## Aluminum + Oxygen

Use the pieces necessary to form a rectangle below.

Write the formula!

Type Here

Name your compound!

Type Here

CATIONS

+1

+2

+3

ANIONS

-1

-2

-3

# LET'S BOND! ACTIVITY REVIEW AND SUMMARY!

Consider the periodic table below:

group 1 2 13 14 15 16 17 18

metals nonmetals metalloids

***In general, which type of element forms positive cations?***

Type Here

***In general, which type of element forms negative anions?***

Type Here

# LET'S BOND! ACTIVITY REVIEW AND SUMMARY!

**What happens to the total charge of the compound after the ions bond together? (Hint: add together the charges of the ions in the compound).**

Type Here

**How many lithium ions are required to bond with one nitrogen ion? Why?**

Type Here

**How many chlorine ions are required to bond with one aluminum ion? Why?**

Type Here

**Why do you suppose there aren't any group 18 (VIIIA) elements included in this activity?**

Type Here

# LET'S BOND! ACTIVITY REVIEW AND SUMMARY!

Use your knowledge of the metal and nonmetal charges to determine the formula of ionic compounds formed from the following elements and name the compound:

**Rb + I**

Type Here

Formula \_\_\_\_\_

Type Here

Name \_\_\_\_\_

**Cs + P**

Type Here

Formula \_\_\_\_\_

Type Here

Name \_\_\_\_\_

**Ba + Se**

Type Here

Formula \_\_\_\_\_

Type Here

Name \_\_\_\_\_

**Sr + Br**

Type Here

Formula \_\_\_\_\_

Type Here

Name \_\_\_\_\_