

Chemistry 1
 Chemical Bonding
 Formation of Binary Ionic Compounds

Name Key
 Block _____ Date _____

An ionic bond forms when a metallic element transfers its valence electrons to a nonmetallic element. The result is a binary compound that is held together by an electrostatic attraction between oppositely charged ions.

Assignment: Complete each table below. The first one is done for you.

1.

Metal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	Chemical name and formula of compound
sodium	3s ¹	Na [•]	Na ⁺	2s ² 2p ⁶	Sodium chloride NaCl (1)
Nonmetal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	
chlorine	3s ² 3p ⁵	$\begin{matrix} \times \times \\ \times \text{Cl} \times \\ \times \times \end{matrix}$	Cl ⁻	3s ² 3p ⁶	
Bonding model (2) <p>Before: Na[•] $\begin{matrix} \times \times \\ \times \text{Cl} \times \\ \times \times \end{matrix}$ → After: Na⁺ $\left[\begin{matrix} \times \times \\ \times \text{Cl} \times \\ \times \times \end{matrix} \right]^{-1}$</p>					

2.

Metal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	Chemical name and formula of compound
barium	6s ²	Ba ^{••}	Ba ²⁺	5s ² 5p ⁶	BaO Barium oxide
Nonmetal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	
oxygen	2s ² 2p ⁴	$\begin{matrix} \times \times \\ \times \text{O} \times \\ \times \times \end{matrix}$	O ²⁻	2s ² 2p ⁶	
Bonding model <p>Ba^{••} $\begin{matrix} \times \times \\ \times \text{O} \times \\ \times \times \end{matrix}$ → Ba²⁺ $\left[\begin{matrix} \times \times \\ \times \text{O} \times \\ \times \times \end{matrix} \right]^{-2}$</p>					

3.

Metal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	Chemical name and formula of compound
aluminum	$3s^2 3p^1$	$\overset{x}{\cdot}Al\overset{x}{\cdot}$	Al^{3+}	$2s^2 2p^6$	
Nonmetal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	
phosphorus	$3s^2 3p^3$	$\overset{xx}{\cdot}P\overset{x}{\cdot}$	P^{3-}	$3s^2 3p^6$	AlP aluminum phosphide
Bonding model					

4.

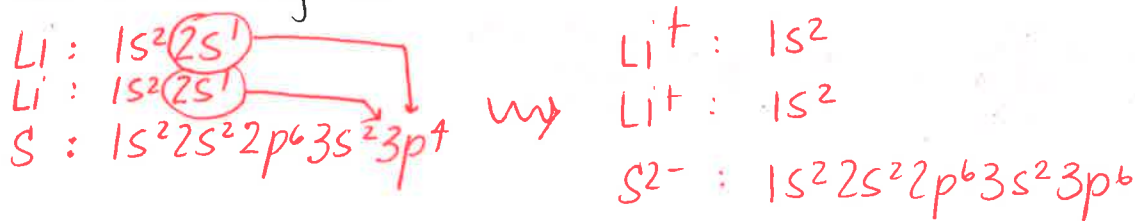
Metal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	Chemical name and formula of compound
calcium	$4s^2$	$Ca\cdot$	Ca^{2+}	$3s^2 3p^6$	
Nonmetal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	
fluorine	$2s^2 2p^5$	$\overset{xx}{\cdot}F\overset{x}{\cdot}$	F^{-1}	$2s^2 2p^6$	CaF_2 calcium fluoride
Bonding model					

5.

Metal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	Chemical name and formula of compound
lithium	2s ¹	Li	Li ⁺	1s ²	
Nonmetal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	Li ₂ S lithium sulfide
sulfur	3s ² 3p ⁴	$\begin{array}{c} \times \times \\ \times \text{S} \times \\ \times \times \end{array}$	S ⁻²	3s ² 3p ⁶	

Bonding model

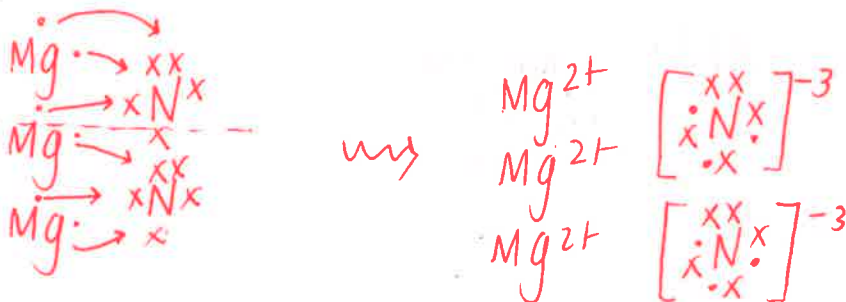
electron configuration



6.

Metal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	Chemical name and formula of compound
magnesium	3s ²	•Mg•	Mg ²⁺	2s ² 2p ⁶	
Nonmetal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	Mg ₃ N ₂ magnesium nitride
nitrogen	2s ² 2p ³	$\begin{array}{c} \times \times \\ \times \text{N} \times \\ \times \end{array}$	N ⁻³	2s ² 2p ⁶	

Bonding model



7.

Metal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	Chemical name and formula of compound
potassium	4s ¹	\dot{K}	K ⁺	3s ² 3p ⁶	KI potassium iodide
Nonmetal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	
iodine	5s ² 5p ⁵	$\begin{array}{c} \times \times \\ \times \text{I} \times \\ \times \times \end{array}$	I ⁻	5s ² 5p ⁶	
Bonding model					
$\begin{array}{c} \dot{K} \\ \rightarrow \end{array} \begin{array}{c} \times \times \\ \times \text{I} \times \\ \times \times \end{array} \rightarrow K^{+1} \left[\begin{array}{c} \times \times \\ \times \text{I} \times \\ \times \times \end{array} \right]^{-1}$					

8.

Metal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	Chemical name and formula of compound
rubidium	5s ¹	\dot{Rb}	Rb ⁺	4s ² 4p ⁶	Rb ₃ P Rubidium phosphide
Nonmetal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	
phosphorus	3s ² 3p ³	$\begin{array}{c} \times \times \\ \times \text{P} \times \\ \times \end{array}$	P ⁻³	3s ² 3p ⁶	
Bonding model					
$\begin{array}{c} \dot{Rb} \\ \dot{Rb} \\ \dot{Rb} \end{array} \begin{array}{c} \rightarrow \times \times \\ \rightarrow \times \text{P} \times \\ \rightarrow \times \end{array} \rightsquigarrow \begin{array}{c} Rb^{+1} \\ Rb^{+1} \\ Rb^{+1} \end{array} \left[\begin{array}{c} \times \times \\ \times \text{P} \times \\ \times \end{array} \right]^{-3}$					

9.

Metal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	Chemical name and formula of compound
aluminum	3s ² 3p ¹	Al [•]	Al ⁺³	2s ² 2p ⁶	AlBr ₃ Aluminum Bromide
Nonmetal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	
bromine	4s ² 4p ⁵	$\begin{matrix} \times & \times & \times \\ \times & \text{Br} & \times \\ \times & & \times \end{matrix}$	Br ⁻¹	4s ² 4p ⁶	
Bonding model 					

10.

Metal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	Chemical name and formula of compound
gallium	4s ² 4p ¹	Ga [•]	Ga ⁺³	3s ² 3p ⁶	GaCl ₃ gallium chloride
Nonmetal	Valence shell	e ⁻ dot symbol	Ion formed	Valence shell of ion	
chlorine	3s ² 3p ⁵	$\begin{matrix} \times & \times & \times \\ \times & \text{Cl} & \times \\ \times & & \times \end{matrix}$	Cl ⁻¹	3s ² 3p ⁶	
Bonding model electron configuration Ga: 1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 4s ² 3d ¹⁰ 4p ¹ Ga ⁺³ : 1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 3d ¹⁰ Cl: 1s ² 2s ² 2p ⁶ 3s ² 3p ⁵ Cl ⁻¹ : 1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ Cl: " Cl ⁻¹ : " Cl: " Cl ⁻¹ : "					