

Previously

### Valence e<sup>-</sup> in Yellow

H	1s <sup>1</sup>		
He	1s <sup>2</sup>	full	Noble gas
Li	1s <sup>2</sup> ,2s <sup>1</sup>		
Be	1s <sup>2</sup> ,2s <sup>2</sup>		
B	1s <sup>2</sup> ,2s <sup>2</sup> p <sup>1</sup>		
C	1s <sup>2</sup> ,2s <sup>2</sup> p <sup>2</sup>		
N	1s <sup>2</sup> ,2s <sup>2</sup> p <sup>3</sup>		
O	1s <sup>2</sup> ,2s <sup>2</sup> p <sup>4</sup>		
F	1s <sup>2</sup> ,2s <sup>2</sup> p <sup>5</sup>		
Ne	1s <sup>2</sup> ,2s <sup>2</sup> p <sup>6</sup>	full	Noble gas

---

---

---

---

---

---

---

---

1

### The Octet Rule

Octet Rule- atoms will lose, gain, or share e<sup>-</sup> to achieve the e<sup>-</sup> configuration of the nearest noble gas in the periodic table (8 valence e<sup>-</sup>).

Special Case- He has only two e<sup>-</sup> (First principle energy level full) and thus H is happy just having two e<sup>-</sup>.

---

---

---

---

---

---

---

---

2

### Valence e<sup>-</sup> Are Used to Form Bonds

- 2 types bonds we will talk about
  - Ionic: metal-nonmetal
  - Covalent: nonmetal-nonmetal

---

---

---

---

---

---

---

---

3

## Ionic Bonds: Transferring e<sup>-</sup>

Ionization Energy- the amount of energy it takes to remove an e<sup>-</sup> from an atom.

Electronegativity- how strongly an atom pulls on another atoms e<sup>-</sup>.

Ions- atoms that have either lost (cations) or gained (anions) e<sup>-</sup>.

Ionic Compounds- form when a reaction takes place between two atoms with widely different ionization energies (metal and nonmetal).

---

---

---

---

---

---

---

---

4

## Ionic Bonds are Electrostatic Bonds

+ charge is attracted to - charge

A *crystal lattice* will form to spread out the charge.

Crystal lattice- large, regular shaped structure which forms when ions interact to form an electrically neutral structure.

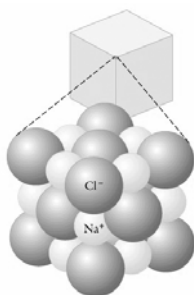


Fig 3.4 Blei and Odian

---

---

---

---

---

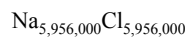
---

---

---

5

## Formulas



*Formula unit* is used since a crystal of NaCl is too big

Formula unit- the simplest whole-number ratio which will describe an ionic crystal

Use "criss-cross" method to determine formula

---

---

---

---

---

---

---

---

6

## Oxidation State

Do not forget how to determine oxidation state by looking at the periodic table!

---

---

---

---

---

---

---

---

7

## Sample Test Questions

1. What is the formula unit for the interaction of  $\text{Ca}^{2+}$  and  $\text{Cl}^-$ ?
2. What is the formula unit for the interaction of rubidium and oxygen?

---

---

---

---

---

---

---

---

8

## Nomenclature of Binary Ionic Compounds

Binary Ionic compounds- exactly two elements

Named: metal nonmetal root + ide

Sodium chloride

---

---

---

---

---

---

---

---

9

## Sample Test Question

What is the name of the ionic compound,  $\text{AlCl}_3$ ?

---



---



---



---



---



---



---

10

## Nomenclature of Ionic Compounds Containing Transition Elements

Common name of transition elements:

$\text{Fe}^{2+}/\text{Fe}^{3+}$  Ferrous                  Ferric

$\text{Sn}^{2+}/\text{Sn}^{4+}$  Stannous                Stannic

Systematic name easier.

$\text{Fe}^{2+}/\text{Fe}^{3+}$  Iron (II)                Iron (III)

$\text{FeCl}_2$

iron (II) chloride

$\text{SnCl}_4$

tin (IV) chloride

---



---



---



---



---



---



---

11

## Polyatomic Ions

Polyatomic Ionic compounds- two or more atoms can combine to act as a unit (two or more elements).

Table 3.2 lists ones you will run into often-

***LEARN the Ones Listed in Class***

TABLE 3.2 Some Important Polyatomic Ions

Ion	Name	Ion	Name
		$\text{HCO}_3^-$	hydrogen carbonate
$\text{NO}_2^-$	nitrite		
		$\text{HPO}_4^{2-}$	hydrogen phosphate
$\text{C}_2\text{H}_3\text{O}_2^-$	acetate	$\text{H}_2\text{PO}_4^-$	dihydrogen phosphate
$\text{CN}^-$	cyanide		
$\text{HSO}_4^-$	hydrogen sulfate	$\text{HSO}_3^-$	hydrogen sulfite

---



---



---



---



---



---



---

12

## Polyatomic Ions

Formula unit is determined by criss-cross method, using the polyatomic ion as a unit.

Named: polyatomic cation polyatomic anion

or polyatomic cation anion root + *ide*

or cation polyatomic anion

---

---

---

---

---

---

---

---

13

## Sample Test Questions

What is the formula unit for the interaction of  $\text{NH}_4^+$  and  $\text{F}^-$ ?

What is the formula unit for the interaction of ammonium and phosphate?

What is the name of  $\text{NH}_4\text{Br}$ ?

What is the name of  $\text{Ca}_3(\text{PO}_4)_2$ ?

---

---

---

---

---

---

---

---