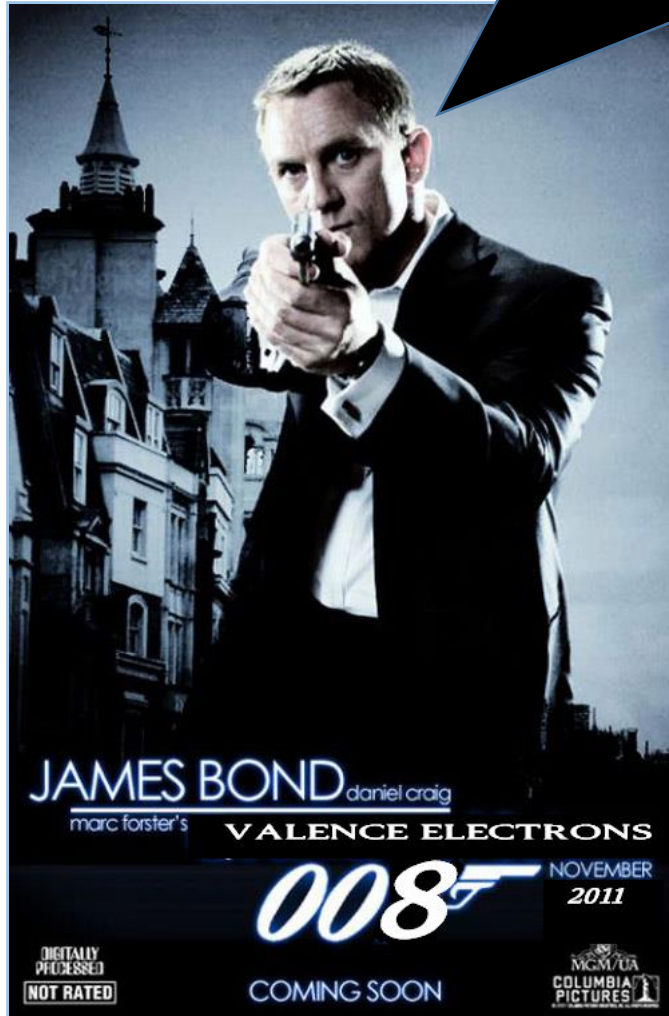


WHAT IS THE UNIT OBJECTIVE?



**FIGURE OUT HOW
& WHY ELEMENTS
COMBINE**

U6 BONDING – DAY 1

IONIC BONDING

WHY BONDING?

Noble Gas atoms are stable because their outer *s* and *p* orbitals are filled by a total of 8 e⁻s.

Other elements **have to bind** with other elements to fill their *s* and *p* orbitals.

They try to fill **THE OCTET RULE:** chemical compounds tend to form so that atoms (*by gaining, losing, or sharing*) have **8 e⁻s** in their outer E level

WHY BONDING

Noble Gas atoms are stable because their s and p orbitals are filled by a total of 8 electrons.



Other elements **have to bind** with other elements to fill their s and p orbitals.

They try to fill **THEIR** orbitals. Ionic compounds tend to form by *losing, or sharing* electrons.



Remember the Trends...

																		Noble gases 18 8A													
Alkaline earth metals																		Halogens 17 7A													
1 1A		2 2A																		13 3A		14 4A		15 5A		16 6A		17 7A		2 He	
1 H																				5 B		6 C		7 N		8 O		9 F		10 Ne	
Alkali metals	3 Li	4 Be																	13 Al		14 Si		15 P		16 S		17 Cl		18 Ar		
	11 Na	12 Mg	3	4	5	6	7	8	9	10	11	12																			
	Transition metals																														
	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr													
	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe													
	55 Cs	56 Ba	57 La*	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn													
	87 Fr	88 Ra	89 Ac†	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub																			
*Lanthanides			58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu															
†Actinides			90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr															

EXCEPTIONS TO THE RULE



Make a NOTE of THIS!

EXCEPTIONS!!



Exceptions
to the
Rule

H and He: need only **2 e⁻s** to fill their shell

B and Be: tend to form bonds so it has **6 e⁻s** around it

Elements w/ a “d” orbital

Elements past row 2 can use d-orbitals for bonding, which allows for bonding with **MORE** than 8 e⁻s

e⁻ DOT NOTATION

Valence e⁻s: the e⁻s that are in the
outermost shell

How do you know how many valence e⁻s an element has?

If it is **s** or **p** block, the group # tells you how many valence e⁻s it has. *If it is not s or p block, it can vary.*

e⁻ dot notation: a way to write an element showing the valence e⁻s on the **outside**

How do I draw a Lewis Dot Diagram? (for single atom)

For a **SINGLE** atom:

Step 1: Determine the # of valence e^-

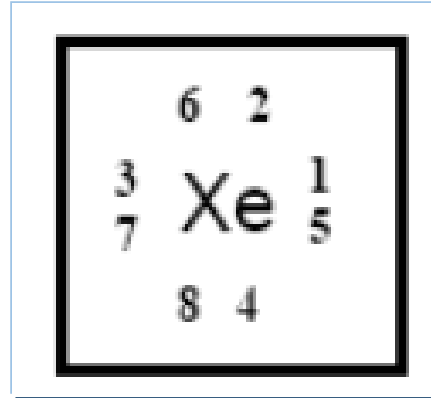
Recall: On “old school” P.T. the **group #** tells you the # of e^-
(except transition metals)

On “new school” P.T. groups 1 & 2 have 1 & 2 valence e^- .
For groups 13-18, the # of valence e^- is the **2nd # of the group #**.

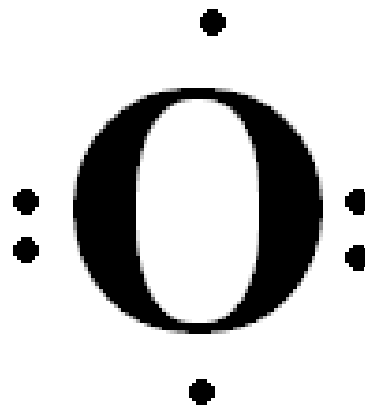
ex. Group 14 has 4 valence e^-

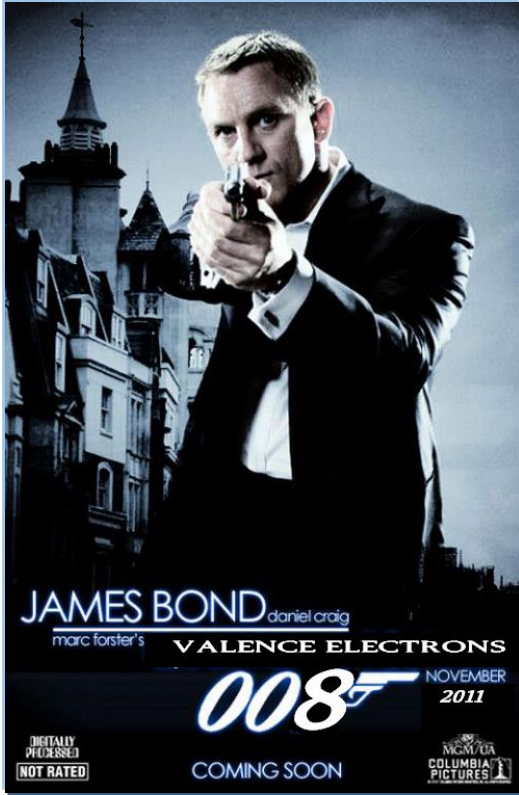
Step 2: Draw the diagram

+ Order of dots:



Ex. Oxygen (O), Group 16 = ___ valence e⁻





I WANT YOU
TO MEET A
FRIEND OF
MINE

Bonding: the way atoms are
attracted to each other to form
molecules

- *Determines nearly all of the chemical properties
we see*



TYPES OF CHEMICAL BONDS

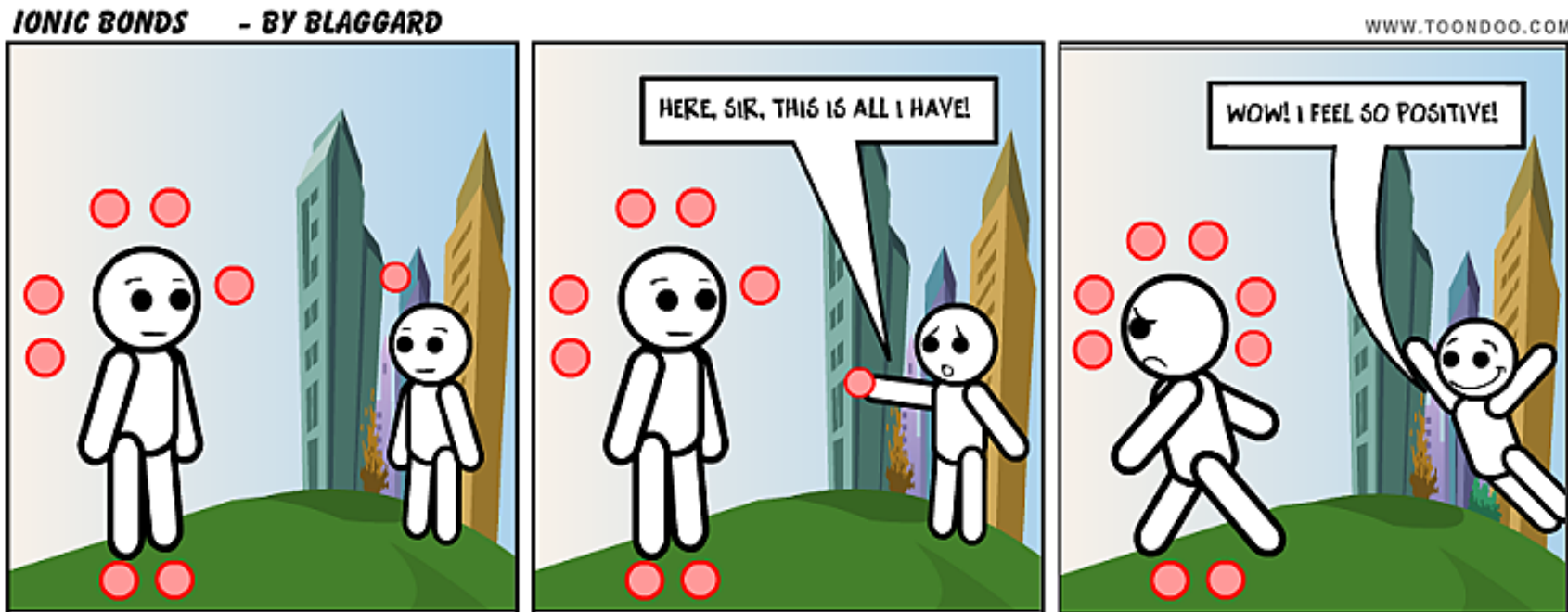
IONIC

COVALENT

METALLIC

IONIC BONDS

- Ionic Bonds are **electrostatic forces** that bind **metals** and **non-metals**
- Ionic Bonds form between a **positive ion (cation)** and a **negative ion (anion)**



IONIC BONDS

- Are formed by the **electrostatic attraction** between **positive** and **negative** ions after the **transfer** of an electron **from** a metal **to** a nonmetal

Periodic Table of the Elements

I	II											III	IV	V	VI	VII	0		
H ¹																		He ²	
Li ³	Be ⁴	Transition Metals										B ⁵	C ⁶	N ⁷	O ⁸	F ⁹	Ne ¹⁰		
Na ¹¹	Mg ¹²	IIIB	IVB	VB	VIB	VII B	VIII B					IB	IIB	Al ¹³	Si ¹⁴	P ¹⁵	S ¹⁶	Cl ¹⁷	Ar ¹⁸
K ¹⁹	Ca ²⁰	Sc ²¹	Ti ²²	V ²³	Cr ²⁴	Mn ²⁵	Fe ²⁶	Co ²⁷	Ni ²⁸	Cu ²⁹	Zn ³⁰	Ga ³¹	Ge ³²	As ³³	Se ³⁴	Br ³⁵	Kr ³⁶		
Rb ³⁷	Sr ³⁸	Y ³⁹	Zr ⁴⁰	Nb ⁴¹	Mo ⁴²	Tc ⁴³	Ru ⁴⁴	Rh ⁴⁵	Pd ⁴⁶	Ag ⁴⁷	Cd ⁴⁸	In ⁴⁹	Sn ⁵⁰	Sb ⁵¹	Te ⁵²	I ⁵³	Xe ⁵⁴		
Cs ⁵⁵	Ba ⁵⁶	La ⁵⁷⁻⁷¹		Hf ⁷²	Ta ⁷³	W ⁷⁴	Re ⁷⁵	Os ⁷⁶	Ir ⁷⁷	Pt ⁷⁸	Au ⁷⁹	Hg ⁸⁰	Tl ⁸¹	Pb ⁸²	Bi ⁸³	Po ⁸⁴	At ⁸⁵	Rn ⁸⁶	
Fr ⁸⁷	Ra ⁸⁸	Ac ⁸⁹⁻¹⁰³		Rf ¹⁰⁴	Ha ¹⁰⁵														
Lanthanides		La ⁵⁷ Ce ⁵⁸ Pr ⁵⁹ Nd ⁶⁰ Pm ⁶¹ Sm ⁶² Eu ⁶³ Gd ⁶⁴ Tb ⁶⁵ Dy ⁶⁶ Ho ⁶⁷ Er ⁶⁸ Tm ⁶⁹ Yb ⁷⁰ Lu ⁷¹																	
Actinides		Ac ⁸⁹ Th ⁹⁰ Pa ⁹¹ U ⁹² Np ⁹³ Pu ⁹⁴ Am ⁹⁵ Cm ⁹⁶ Bk ⁹⁷ Cf ⁹⁸ Es ⁹⁹ Fm ¹⁰⁰ Md ¹⁰¹ No ¹⁰² Lr ¹⁰³																	

Metal

Metalloid

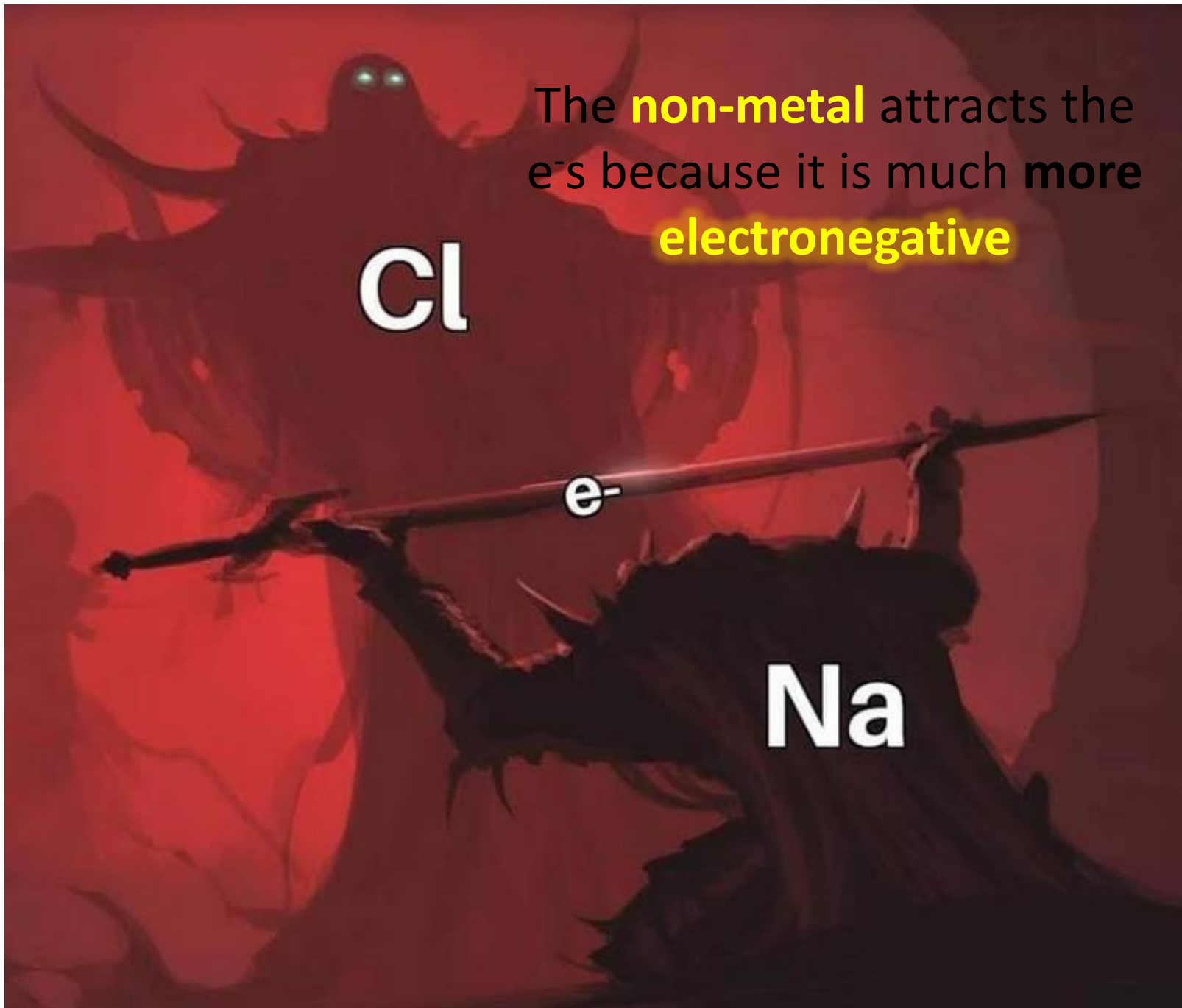
Nonmetal

The **non-metal** attracts the e^- s because it is much **more electronegative**

Cl

e^-

Na



RECALL

Electronegativity
Power to Attract Electrons



High Electronegativity

Highly reactive because of their strong tendency to capture electrons.

Periodic Table of the Elements

I	II	Transition Metals										III	IV	V	VI	VII	0												
H ¹												B ⁵	C ⁶	N ⁷	O ⁸	F ⁹	He ²												
Li ³	Be ⁴											Al ¹³	Si ¹⁴	P ¹⁵	S ¹⁶	Cl ¹⁷	Ar ¹⁸												
Na ¹¹	Mg ¹²	III B	IV B	V B	VI B	VII B	VIII B			IB	II B	K ¹⁹	Ca ²⁰	Sc ²¹	Ti ²²	V ²³	Cr ²⁴	Mn ²⁵	Fe ²⁶	Co ²⁷	Ni ²⁸	Cu ²⁹	Zn ³⁰	Ga ³¹	Ge ³²	As ³³	Se ³⁴	Br ³⁵	Kr ³⁶
K ¹⁹	Ca ²⁰	Sc ²¹	Ti ²²	V ²³	Cr ²⁴	Mn ²⁵	Fe ²⁶	Co ²⁷	Ni ²⁸	Cu ²⁹	Zn ³⁰	Ga ³¹	Ge ³²	As ³³	Se ³⁴	Br ³⁵	Kr ³⁶												
Rb ³⁷	Sr ³⁸	Y ³⁹	Zr ⁴⁰	Nb ⁴¹	Mo ⁴²	Tc ⁴³	Ru ⁴⁴	Rh ⁴⁵	Pd ⁴⁶	Ag ⁴⁷	Cd ⁴⁸	In ⁴⁹	Sn ⁵⁰	Sb ⁵¹	Te ⁵²	I ⁵³	Xe ⁵⁴												
Cs ⁵⁵	Ba ⁵⁶	La ⁵⁷		Hf ⁷²	Ta ⁷³	W ⁷⁴	Re ⁷⁵	Os ⁷⁶	Ir ⁷⁷	Pt ⁷⁸	Au ⁷⁹	Hg ⁸⁰	Tl ⁸¹	Pb ⁸²	Bi ⁸³	Po ⁸⁴	At ⁸⁵	Rn ⁸⁶											
Fr ⁸⁷	Ra ⁸⁸	La ⁵⁷		Rf ¹⁰⁴	Ha ¹⁰⁵	Ta ¹⁰³			Os ¹⁰⁶																				
		Lanthanides																Actinides											
		La ⁵⁷	Ce ⁵⁸	Pr ⁵⁹	Nd ⁶⁰	Pm ⁶¹	Sm ⁶²	Eu ⁶³	Gd ⁶⁴	Tb ⁶⁵	Dy ⁶⁶	Ho ⁶⁷	Er ⁶⁸	Tm ⁶⁹	Yb ⁷⁰	Lu ⁷¹													
		Ac ⁸⁹	Th ⁹⁰	Pa ⁹¹	U ⁹²	Np ⁹³	Pu ⁹⁴	Am ⁹⁵	Cm ⁹⁶	Bk ⁹⁷	Cf ⁹⁸	Es ⁹⁹	Fm ¹⁰⁰	Md ¹⁰¹	No ¹⁰²	Lr ¹⁰³													

Highly reactive because they yield electrons easily.

Low Ionization Energy

Rb 4.18 eV
Cs 3.89 eV

Metal Metalloid Nonmetal

The highly reactive corners of the Periodic Table

What is a chemical formula of an ionic compound?

ONE WAY: Use the Lewis Dot Structure to determine formula..... Ex: Sodium Fluoride

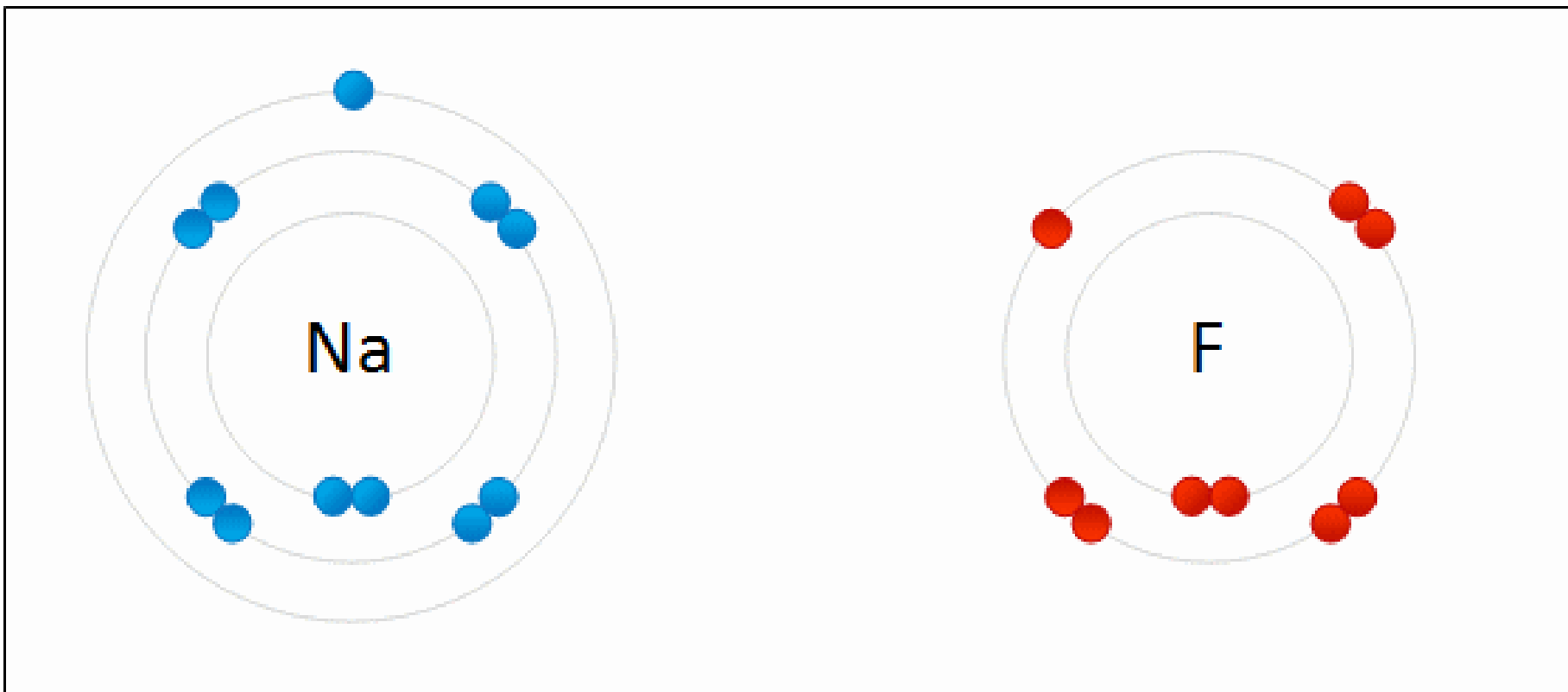
Step 1: Draw the Lewis Dot Structure of each atom



Na

F

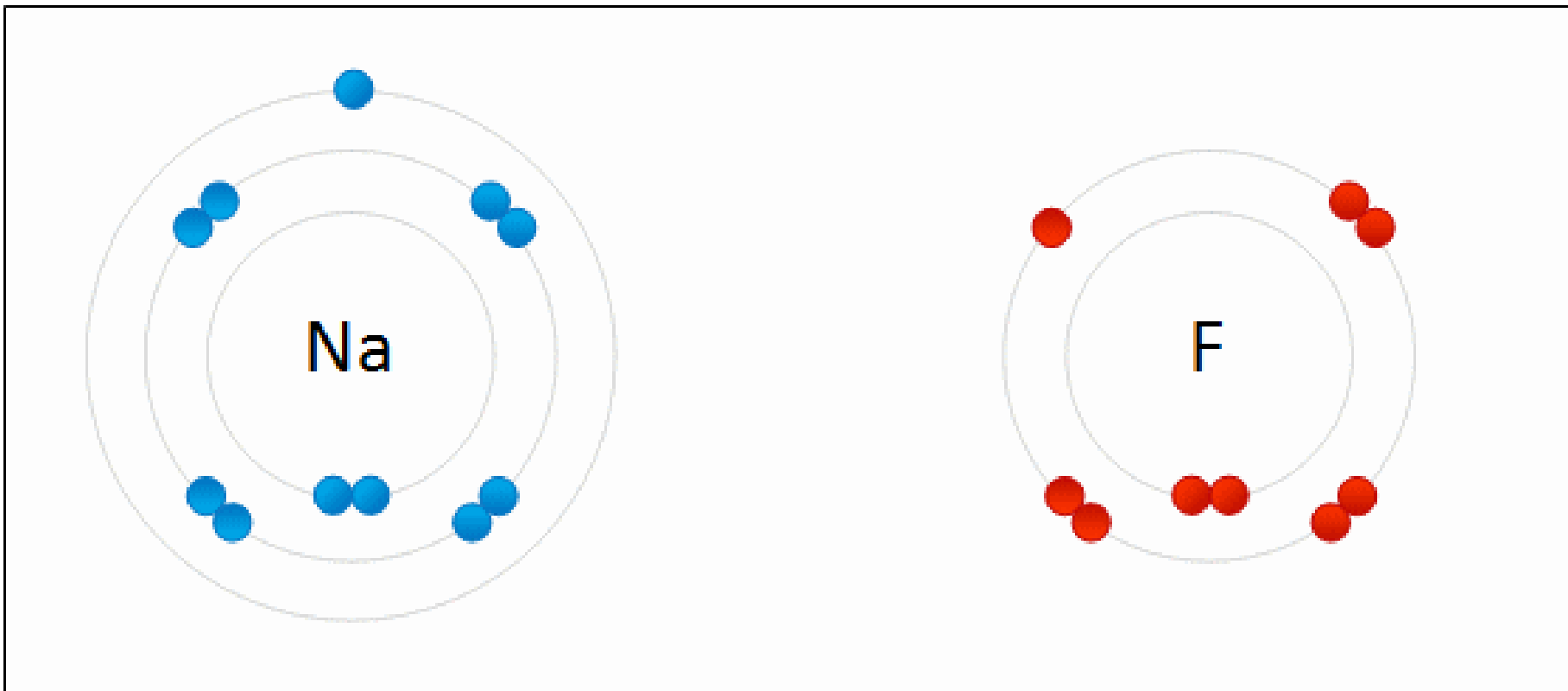
Step 2 : Draw arrows & move electrons to fulfill the Octet Rule



Make sure you
only write the
VALENCE e-s

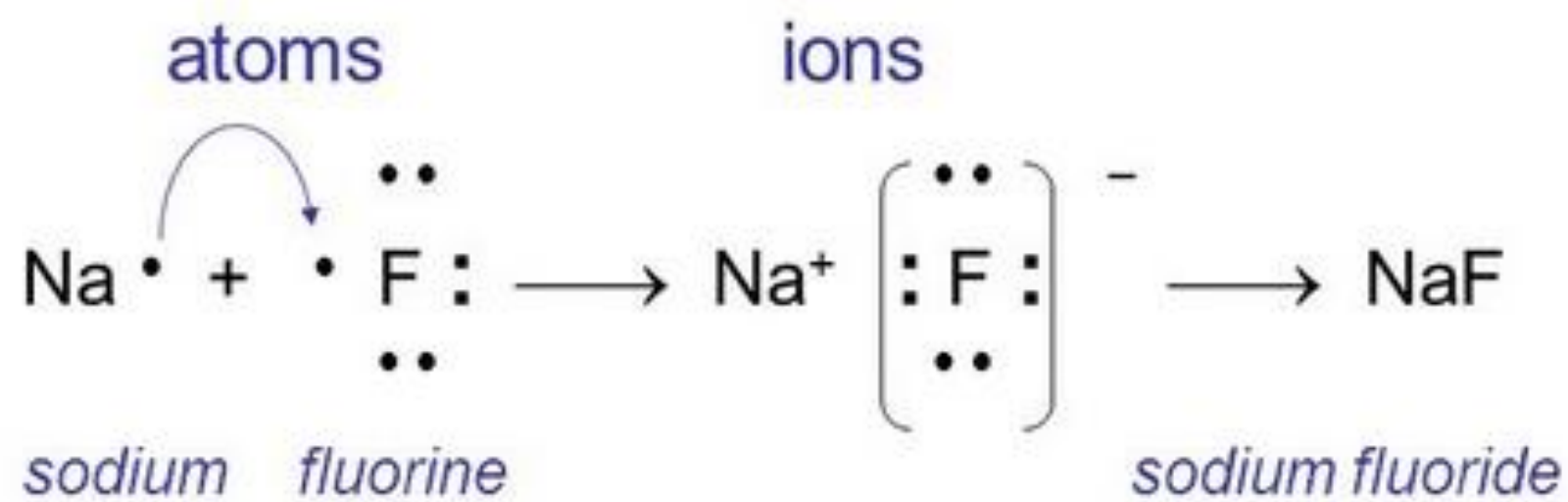


Step 3: Add brackets & charges to designate ionic



Make sure you
only write the
VALENCE e-s



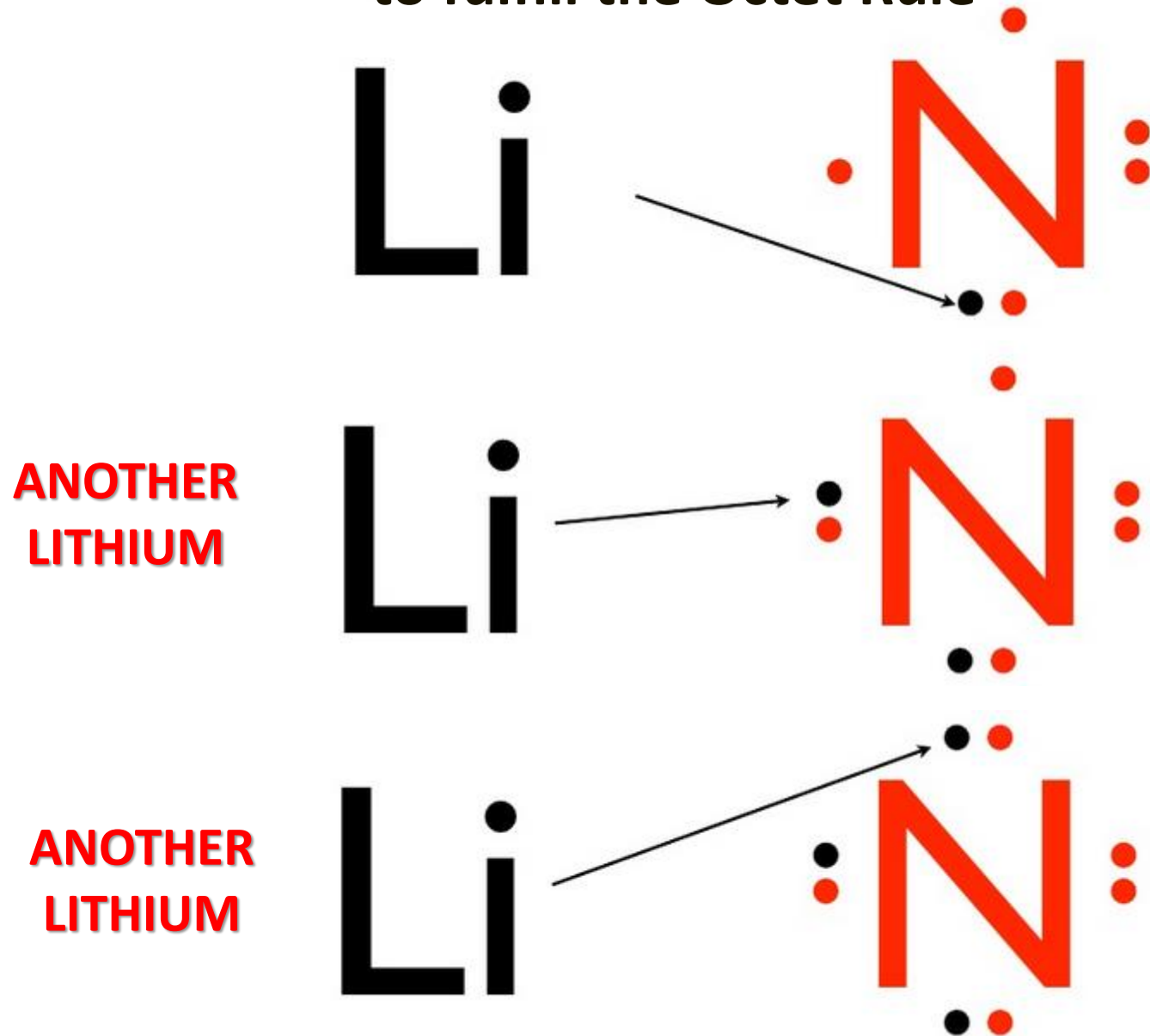


Write the chemical formula for Lithium Nitride

Step 1: Draw the Lewis Dot Structure of each atom



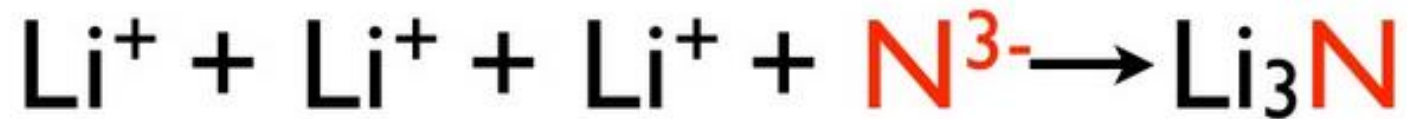
Step 2 : Draw arrows & move electrons to fulfill the Octet Rule

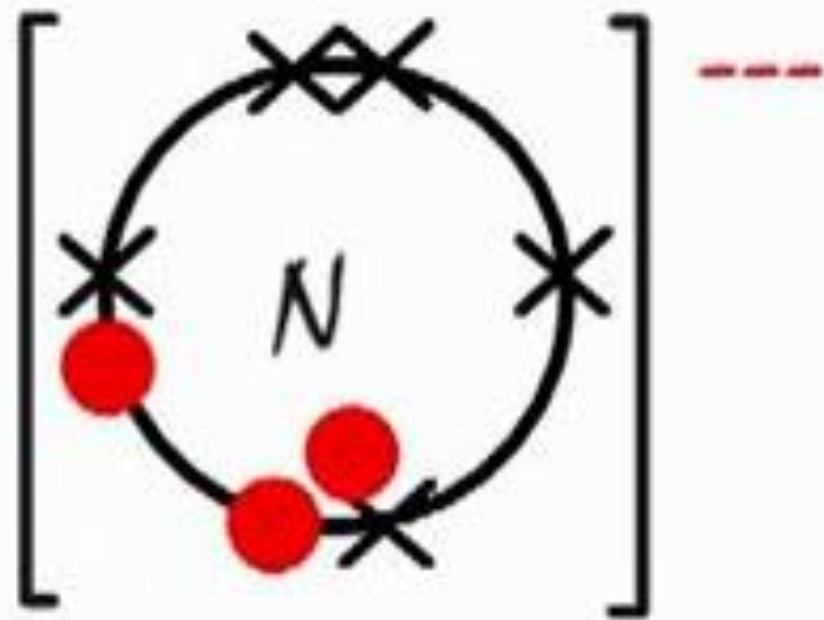
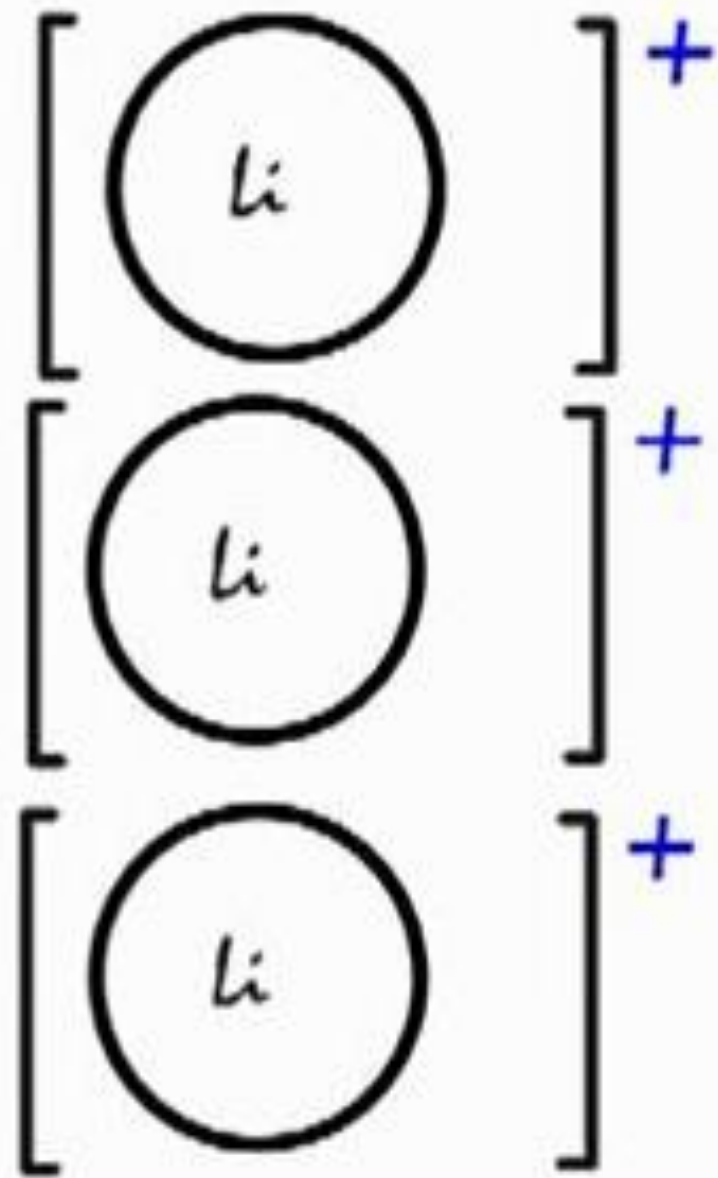


Now, show the charges on the newly formed ions. Lithium lost 1 electron to become +1, and Nitrogen gained 3 electrons to become -3.



Finally, combine the newly formed ions to make the compound.





END OF DAY 1