

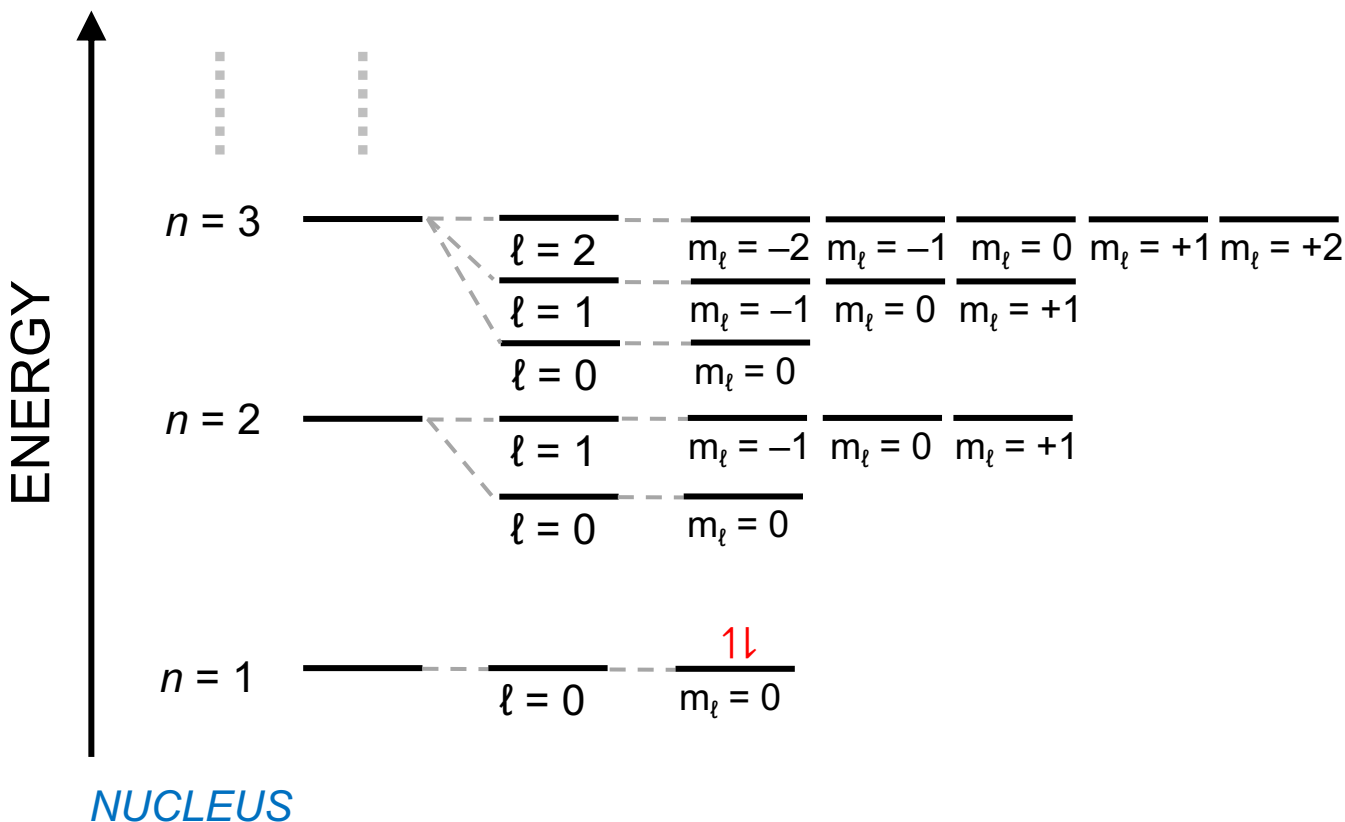
# Electron Configuration

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CHEMISTRY 161  
FALL 2019

[www.mioy.org/chem161](http://www.mioy.org/chem161)

# Quantum Numbers

We can condense this information even more!

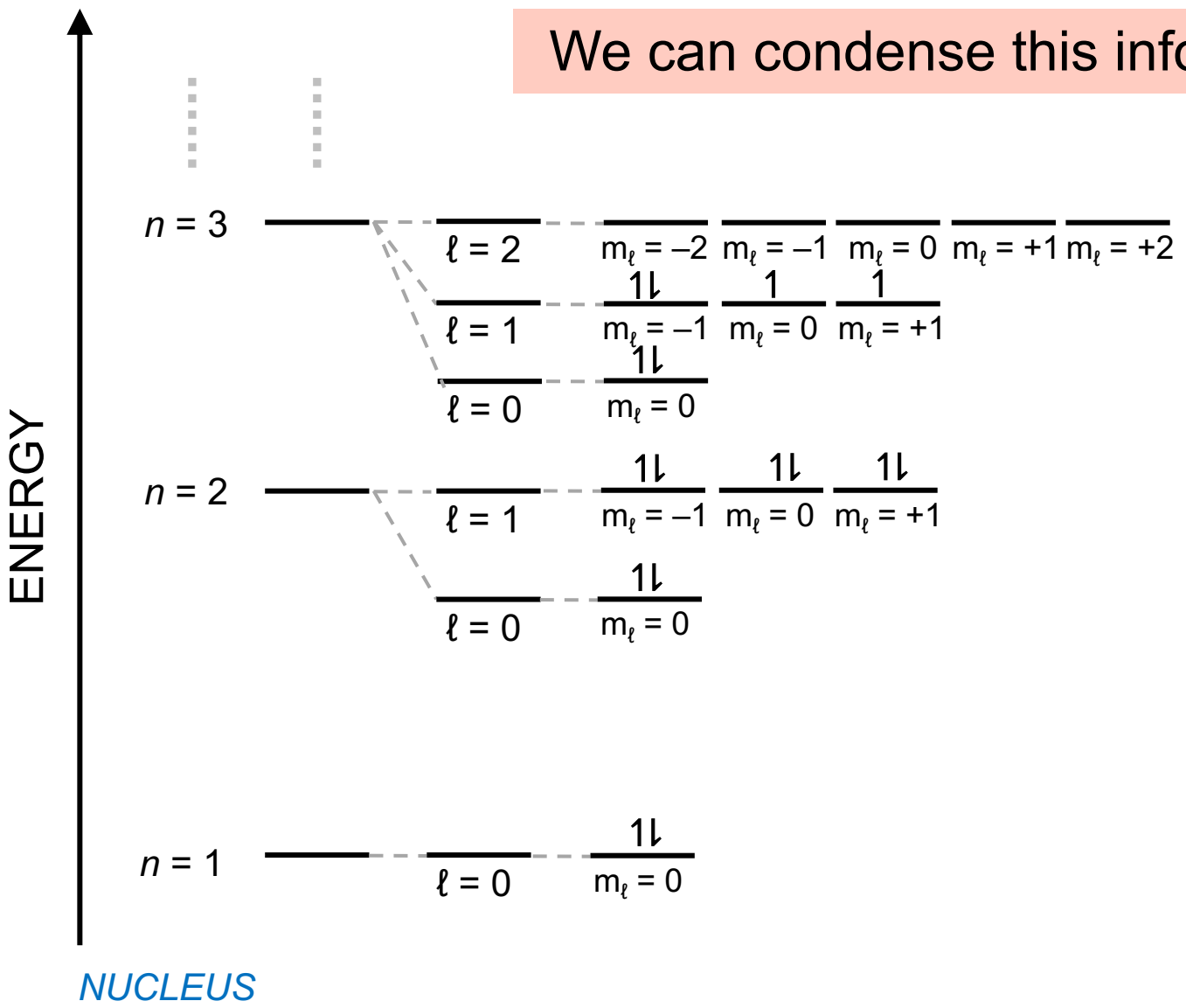


Value of $l$	0	1	2
Orbital Type	s	p	d
Values of $m_l$	0	-1, 0, +1	-2, -1, 0, +1, +2
(# of $m_l$ )	(1)	(3)	(5)
Values of $m_s$	$-\frac{1}{2}, +\frac{1}{2}$	$-\frac{1}{2}, +\frac{1}{2}$	$-\frac{1}{2}, +\frac{1}{2}$
<b>[# of electrons]</b>	<b>[2]</b>	<b>[6]</b>	<b>[10]</b>

\* Spin doesn't mean the electron is physically spinning in space, so "up" and "down" don't have any physical meaning. We just need to designate two different orientations and "up" and "down" are easiest.

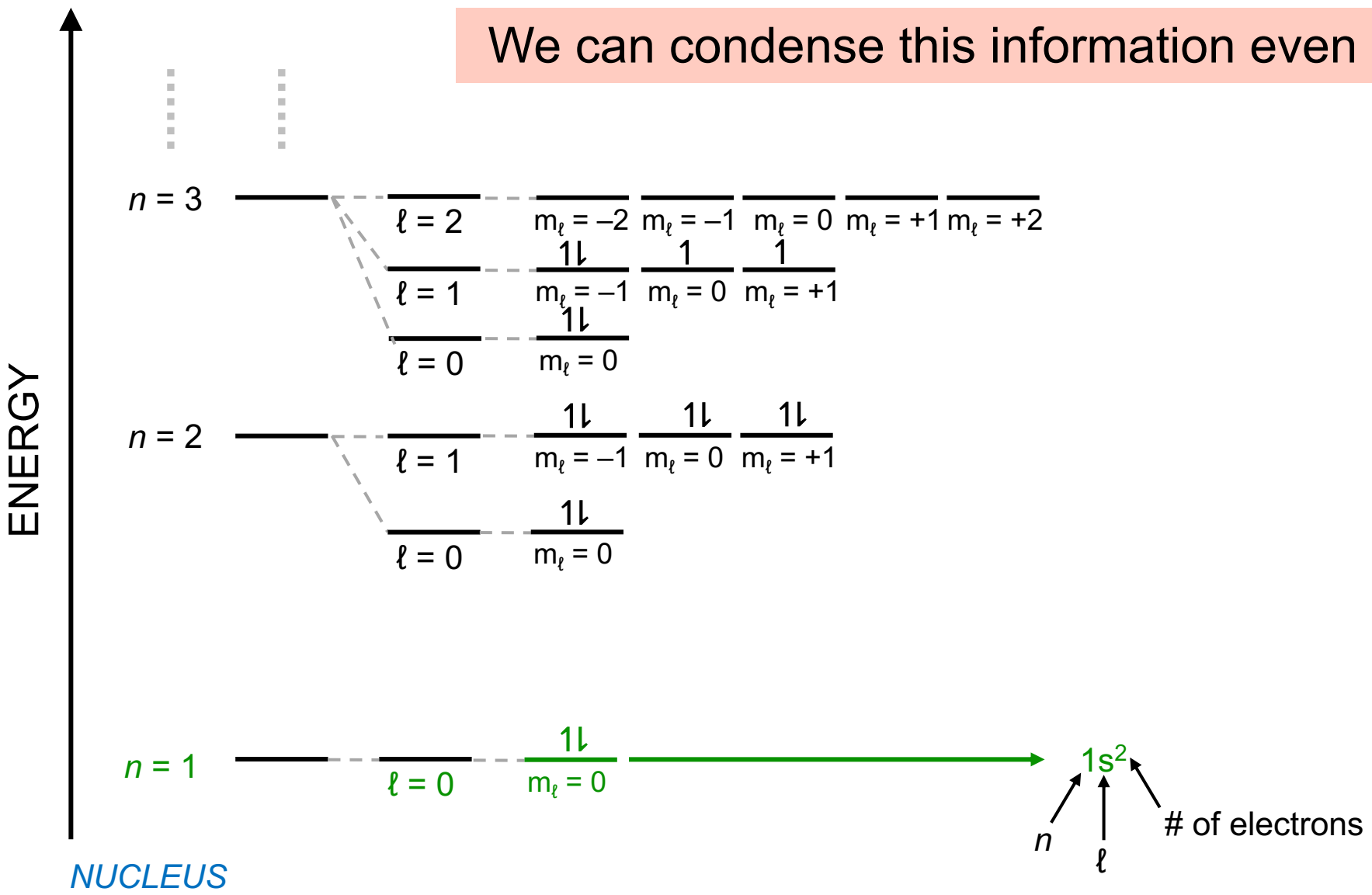
# Electron Configuration

We can condense this information even more!



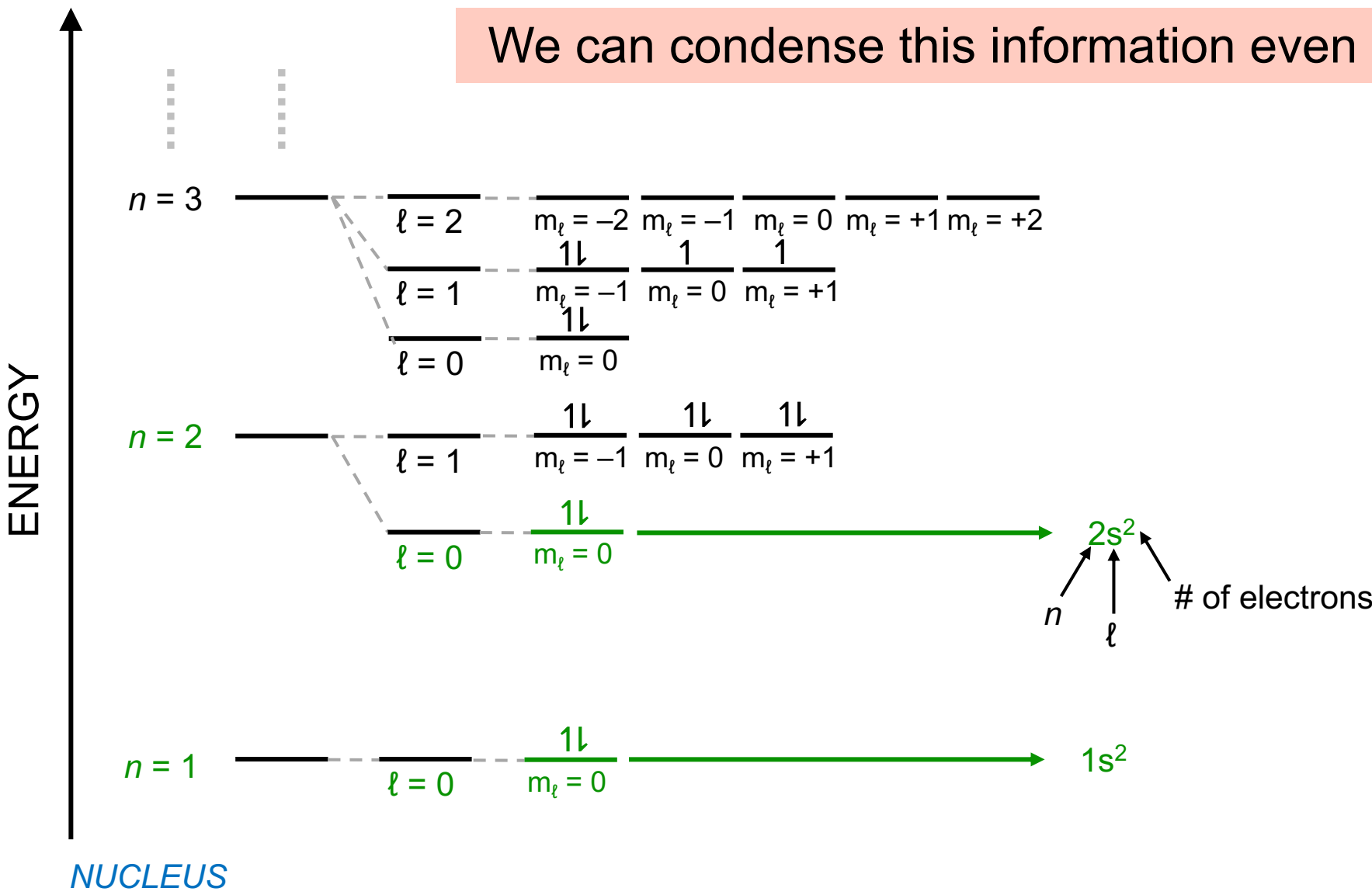
# Electron Configuration

We can condense this information even more!



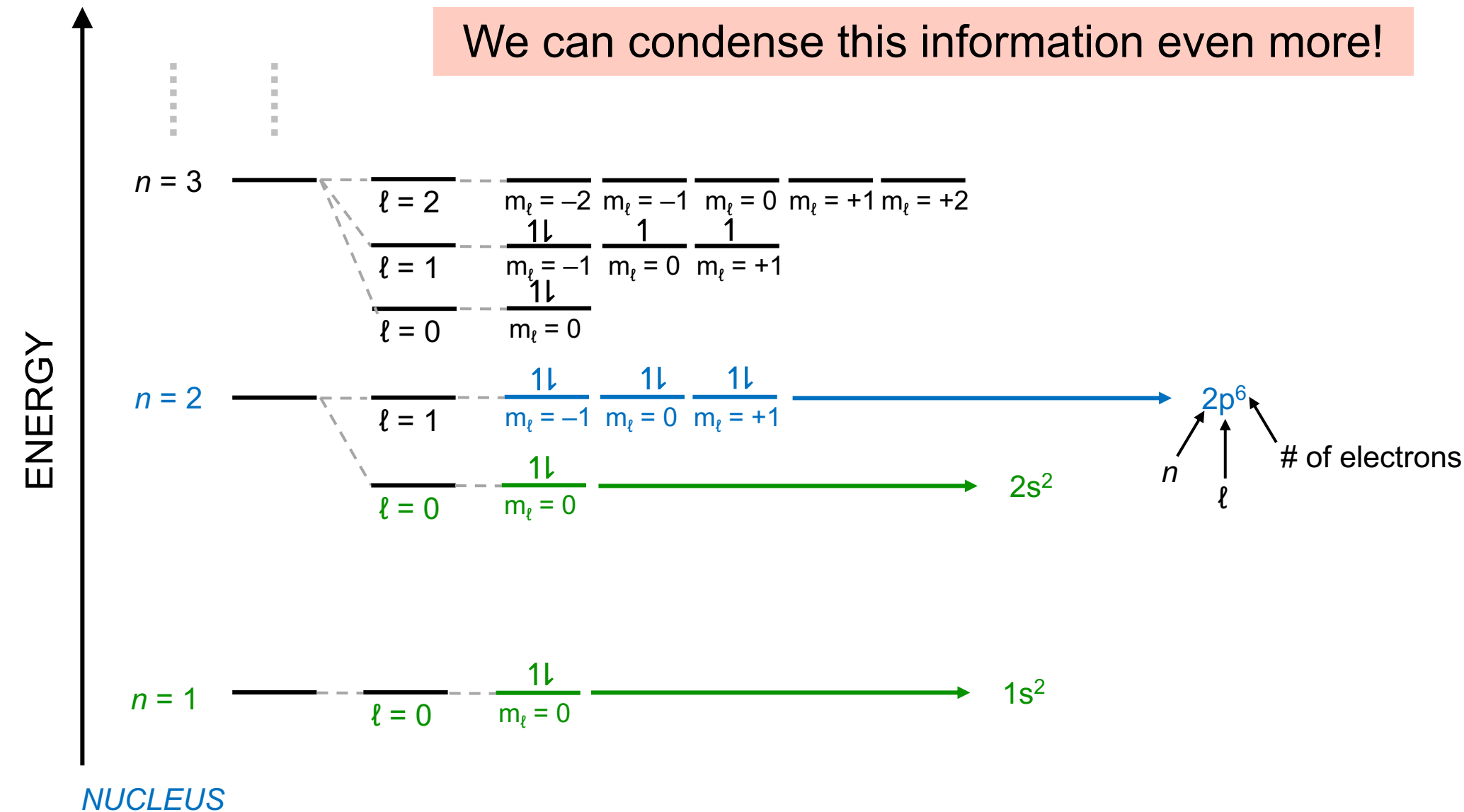
# Electron Configuration

We can condense this information even more!



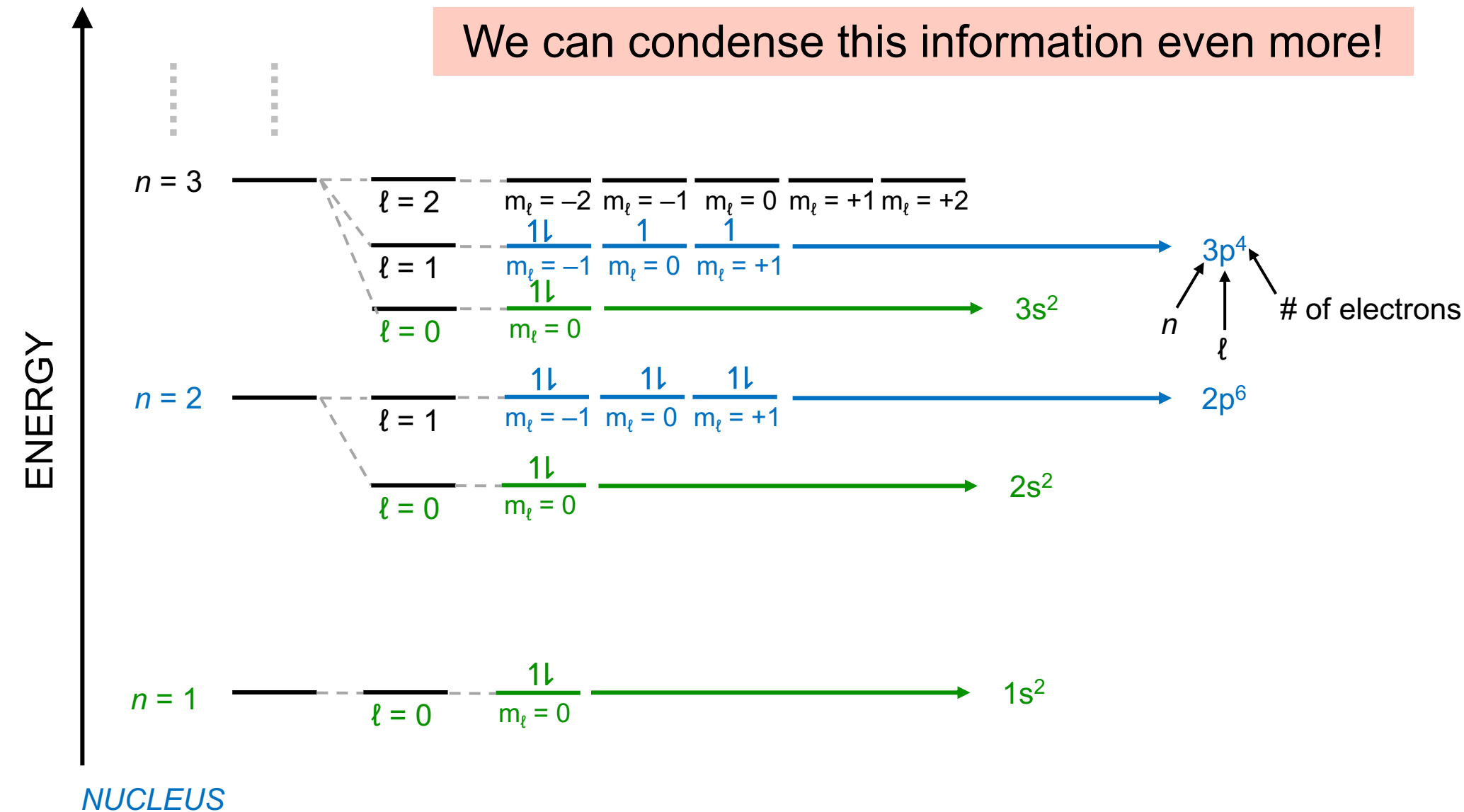
# Electron Configuration

We can condense this information even more!



# Electron Configuration

We can condense this information even more!



# ELECTRON CONFIGURATION

*Fill from left to right!*

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg	d-block										Al	Si	P	S	Cl	Ar
←3s→												←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													



# ELECTRON CONFIGURATION

*Fill from left to right!*

Examples

N:

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg	d-block										Al	Si	P	S	Cl	Ar
←3s→												←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

ELECTRON CONFIGURATION

Fill from left to right!

Examples

N:  $1s^2$

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												2p					
Na	Mg	d-block										Al	Si	P	S	Cl	Ar
←3s→												3p					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		3d										4p					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		4d										5p					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		5d										6p					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		6d										7p					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
4f													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
5f													

# ELECTRON CONFIGURATION

*Fill from left to right!*

Examples

N:  $1s^2 2s^2$

s-block												p-block						8	
1																		He	
H																			
←1s→	2											3	4	5	6	7	←1s→		
Li	Be											B	C	N	O	F	Ne		
←2s→												←2p→							
Na	Mg	d-block										Al	Si	P	S	Cl	Ar		
←3s→												←3p→							
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr		
←4s→		←3d→										←4p→							
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe		
←5s→		←4d→										←5p→							
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn		
←6s→		←5d→										←6p→							
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og		
←7s→		←6d→										←7p→							

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

# ELECTRON CONFIGURATION

*Fill from left to right!*

Examples

N:  $1s^2 2s^2 2p^3$

s-block												p-block						8
1																		He
H																		
←1s→	2											3	4	5	6	7	←1s→	
Li	Be											B	C	N	O	F	Ne	
←2s→												←2p→						
Na	Mg	d-block										Al	Si	P	S	Cl	Ar	
←3s→												←3p→						
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
←4s→		←3d→										←4p→						
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
←5s→		←4d→										←5p→						
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
←6s→		←5d→										←6p→						
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og	
←7s→		←6d→										←7p→						

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

# ELECTRON CONFIGURATION

*Fill from left to right!*

## Examples

N:  $1s^2 2s^2 2p^3$  → 7 electrons

Na:

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg	d-block										Al	Si	P	S	Cl	Ar
←3s→												←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

# ELECTRON CONFIGURATION

*Fill from left to right!*

Examples

N:  $1s^2 2s^2 2p^3$

Na:  $1s^2$

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg	d-block										Al	Si	P	S	Cl	Ar
←3s→												←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

# ELECTRON CONFIGURATION

*Fill from left to right!*

Examples

N:  $1s^2 2s^2 2p^3$

Na:  $1s^2 2s^2$

s-block												p-block						8
1																		He
←1s→	2											3	4	5	6	7	←1s→	
Li	Be											B	C	N	O	F	Ne	
←2s→												←2p→						
Na	Mg											Al	Si	P	S	Cl	Ar	
←3s→		d-block										←3p→						
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
←4s→		←3d→										←4p→						
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
←5s→		←4d→										←5p→						
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
←6s→		←5d→										←6p→						
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og	
←7s→		←6d→										←7p→						

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

ELECTRON CONFIGURATION

*Fill from left to right!*

Examples

N:  $1s^2 2s^2 2p^3$

Na:  $1s^2 2s^2 2p^6$

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg	d-block										Al	Si	P	S	Cl	Ar
←3s→												←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													



# ELECTRON CONFIGURATION

*Fill from left to right!*

Examples

N:  $1s^2 2s^2 2p^3$

Na:  $1s^2 2s^2 2p^6 3s^1$

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg											Al	Si	P	S	Cl	Ar
←3s→		d-block										←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

# ELECTRON CONFIGURATION

*Fill from left to right!*

## Examples

N:  $1s^2 2s^2 2p^3$

Na:  $1s^2 2s^2 2p^6 3s^1$  → 11 electrons

Fe:

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg	d-block										Al	Si	P	S	Cl	Ar
←3s→												←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

# ELECTRON CONFIGURATION

*Fill from left to right!*

## Examples

N:  $1s^2 2s^2 2p^3$

Na:  $1s^2 2s^2 2p^6 3s^1$

Fe:  $1s^2 2s^2 2p^6 3s^2 3p^6$

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg											Al	Si	P	S	Cl	Ar
←3s→		d-block										←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

# ELECTRON CONFIGURATION

*Fill from left to right!*

Examples

N:  $1s^2 2s^2 2p^3$

Na:  $1s^2 2s^2 2p^6 3s^1$

Fe:  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg											Al	Si	P	S	Cl	Ar
←3s→		d-block										←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

# ELECTRON CONFIGURATION

*Fill from left to right!*

## Examples

N:  $1s^2 2s^2 2p^3$

Na:  $1s^2 2s^2 2p^6 3s^1$

Fe:  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg											Al	Si	P	S	Cl	Ar
←3s→		d-block										←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

# ELECTRON CONFIGURATION

*Fill from left to right!*

Examples



s-block		d-block										p-block					
1	2											3	4	5	6	7	8
H	He											B	C	N	O	F	Ne
←1s→	←1s→											←2p→					
Li	Be											Al	Si	P	S	Cl	Ar
←2s→	←2s→											←3p→					
Na	Mg											Ga	Ge	As	Se	Br	Kr
←3s→	←3s→											←4p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	In	Sn	Sb	Te	I	Xe
←4s→	←4s→											←5p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	Tl	Pb	Bi	Po	At	Rn
←5s→	←5s→											←6p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Nh	Fl	Mc	Lv	Ts	Og
←6s→	←6s→											←7p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn						
←7s→	←7s→																

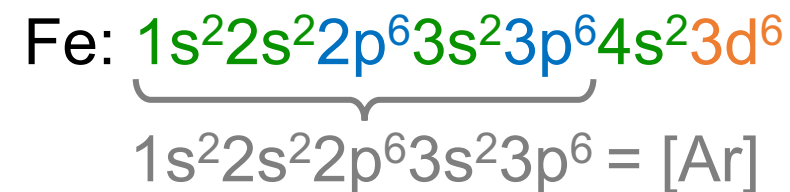
f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg											Al	Si	P	S	Cl	Ar
←3s→		d-block										←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

# ELECTRON CONFIGURATION

Fill from left to right!

## Examples



We can condense this information even more!

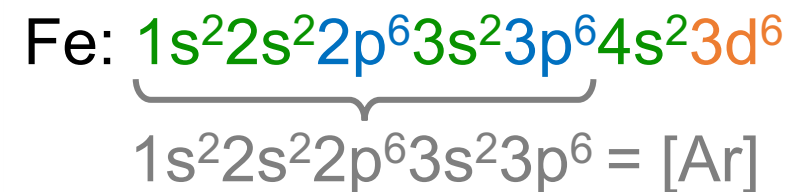
f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg											Al	Si	P	S	Cl	Ar
←3s→		d-block										←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

# ELECTRON CONFIGURATION

Fill from left to right!

## Examples



This is called noble gas configuration.

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

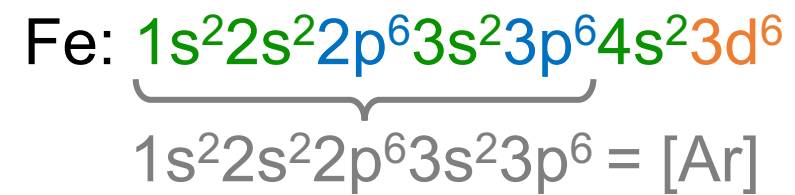


s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg											Al	Si	P	S	Cl	Ar
←3s→		d-block										←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

# ELECTRON CONFIGURATION

Fill from left to right!

## Examples



This is called noble gas configuration.



f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

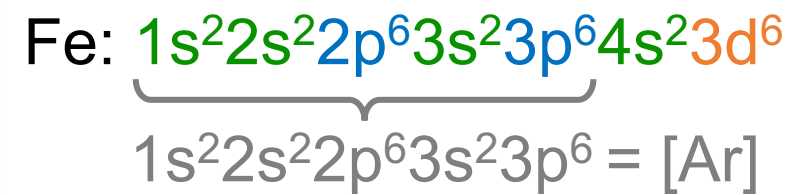
s-block												p-block							
1																	8		
H																	He		
←1s→	2											3	4	5	6	7	←1s→		
Li	Be											B	C	N	O	F	Ne		
←2s→												←2p→							
Na	Mg											Al	Si	P	S	Cl	Ar		
←3s→		d-block										←3p→							
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr		
←4s→		←3d→										←4p→							
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe		
←5s→		←4d→										←5p→							
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn		
←6s→		←5d→										←6p→							
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og		
←7s→		←6d→										←7p→							

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

# ELECTRON CONFIGURATION

Fill from left to right!

## Examples



This is called noble gas configuration.



# ELECTRON CONFIGURATION

*Neutral atoms*

Examples



s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg	d-block										Al	Si	P	S	Cl	Ar
←3s→												←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg	d-block										Al	Si	P	S	Cl	Ar
←3s→												←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

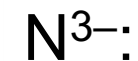
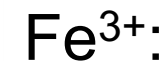
## ELECTRON CONFIGURATION

*Neutral atoms*

Examples



*Ions*



s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg	d-block										Al	Si	P	S	Cl	Ar
←3s→												←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

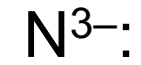
# ELECTRON CONFIGURATION

*Neutral atoms*

Examples



*Ions*



*For transition metal cations, we lose s electrons before d.*

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg	d-block										Al	Si	P	S	Cl	Ar
←3s→												←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

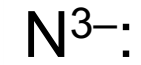
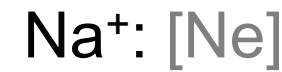
# ELECTRON CONFIGURATION

Neutral atoms

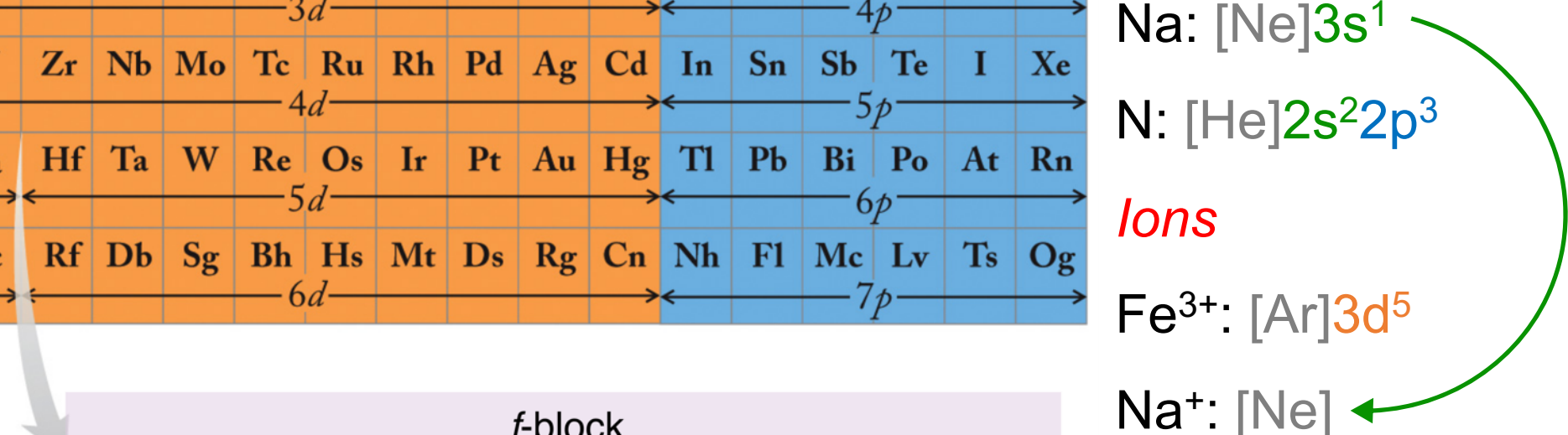
Examples



Ions



Otherwise, lose electrons from outermost orbitals for cations.



s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg	d-block										Al	Si	P	S	Cl	Ar
←3s→												←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					
f-block																	
		Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu		
		←4f→															
		Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr		
		←5f→															

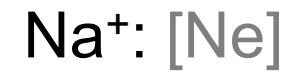
# ELECTRON CONFIGURATION

Neutral atoms

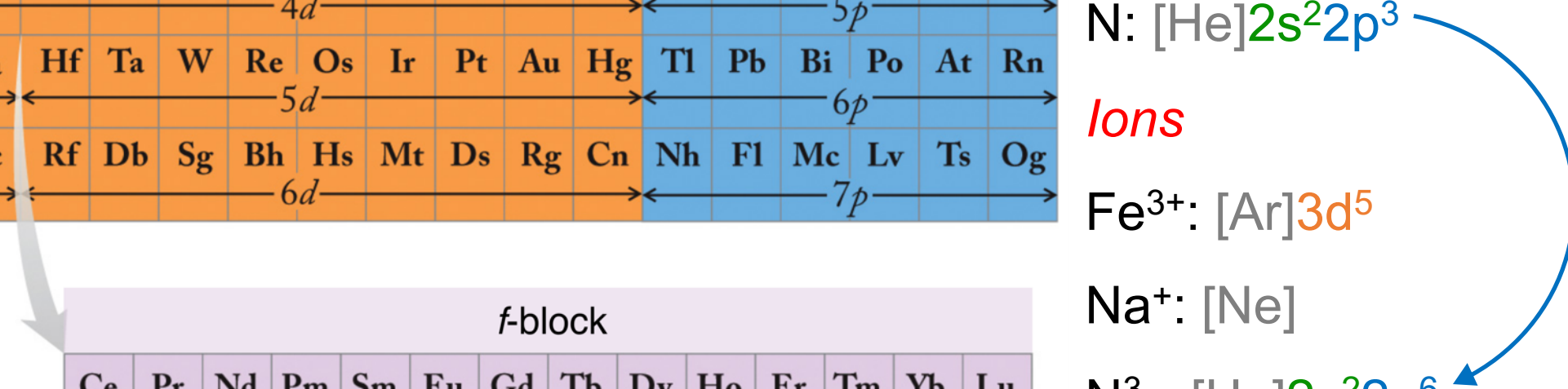
Examples



Ions



Add electrons into outermost orbitals for anions.



# ELECTRON CONFIGURATION

*Two exceptions*



Would expect:  
 $4s^2 3d^4$

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg	d-block										Al	Si	P	S	Cl	Ar
←3s→												←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													



# ELECTRON CONFIGURATION

*Two exceptions*



*Two half-filled orbitals.*

Would expect:  
 ~~$4s^2 3d^4$~~

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg	d-block										Al	Si	P	S	Cl	Ar
←3s→												←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg											Al	Si	P	S	Cl	Ar
←3s→		d-block										←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

## ELECTRON CONFIGURATION

*Two exceptions*



*Two half-filled orbitals.*

Would expect:  
 ~~$4s^2 3d^4$~~



Would expect:  
 $4s^2 3d^9$

s-block												p-block					
1																	8
H																	He
←1s→	2											3	4	5	6	7	←1s→
Li	Be											B	C	N	O	F	Ne
←2s→												←2p→					
Na	Mg											Al	Si	P	S	Cl	Ar
←3s→		d-block										←3p→					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
←4s→		←3d→										←4p→					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
←5s→		←4d→										←5p→					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
←6s→		←5d→										←6p→					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
←7s→		←6d→										←7p→					

f-block													
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
←4f→													
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
←5f→													

## ELECTRON CONFIGURATION

*Two exceptions*



*Two half-filled orbitals.*



*One half-filled orbital.  
One all-filled orbital.*

