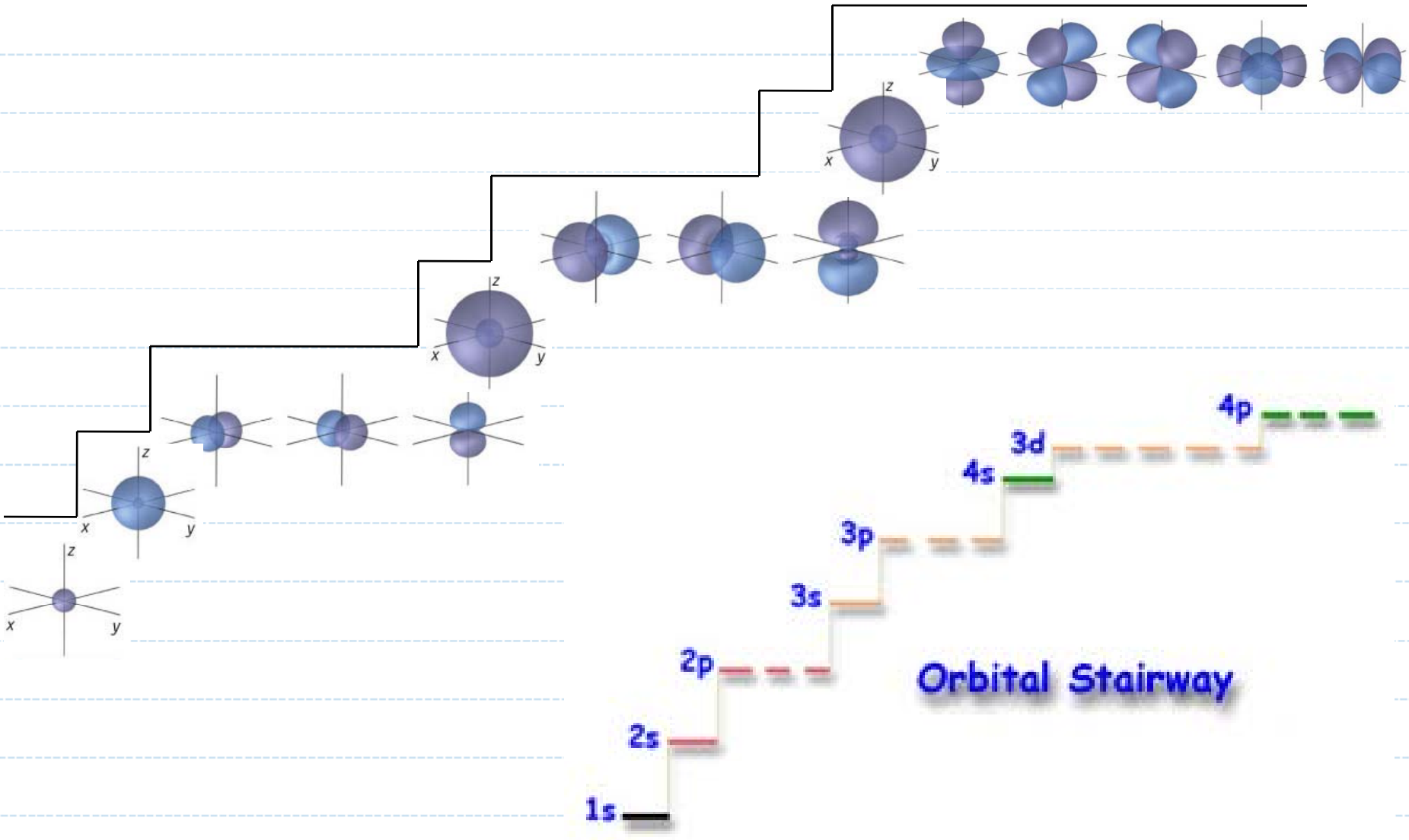
Class Announcements

2.6 How Are the Electrons in an Atom Arranged?

A Orbital Stairway



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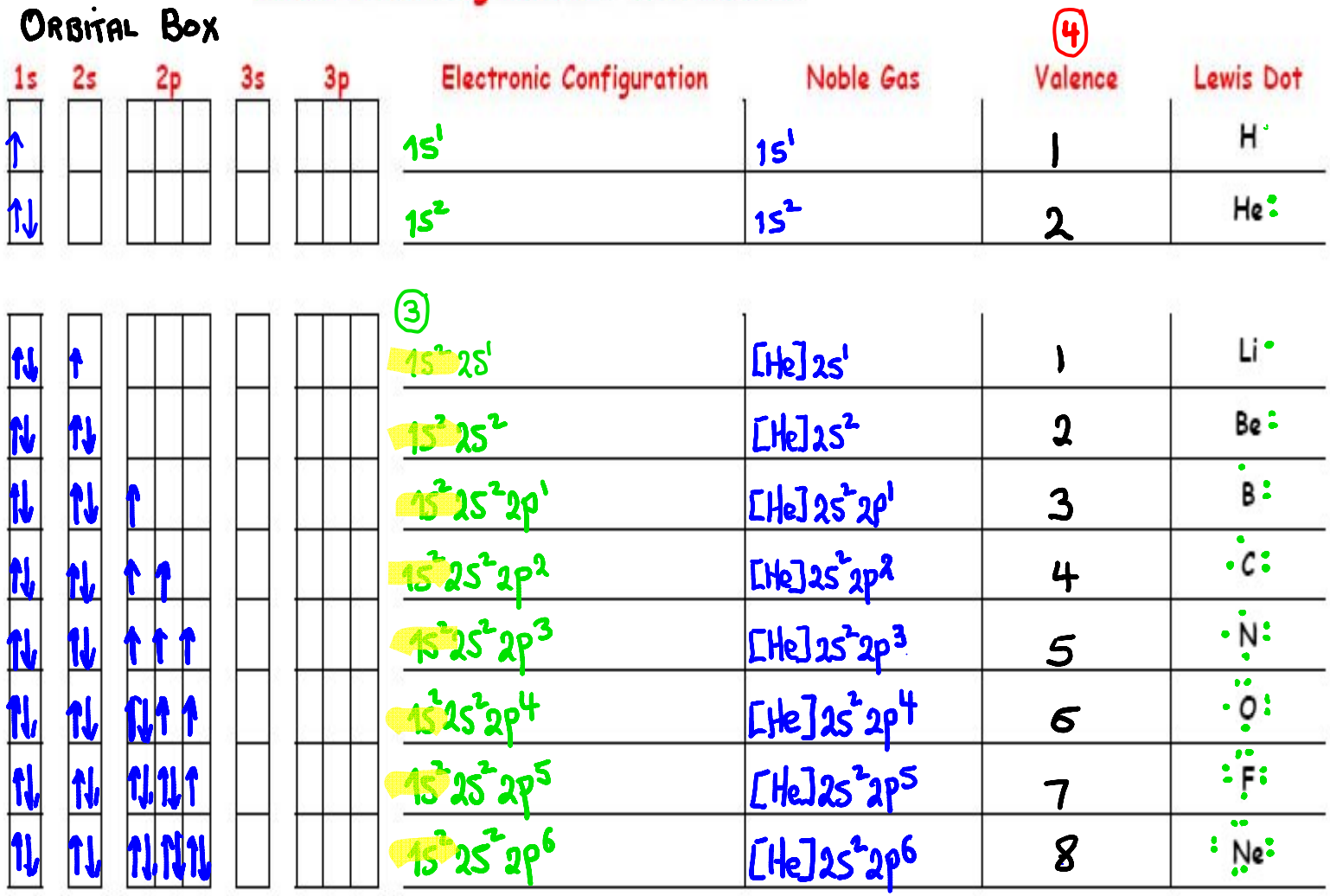
Electron Configurations Worksheet.



Gp		#e	Electronic Configuration	Noble Gas	Valence	Lewis Dot
1A	H	1	$1s^1$	$1s^1$	1	H·
8A	He	2	$1s^2$	$1s^2$	2	He:
1A	Li	3	$1s^2 2s^1$	$[He]2s^1$	1	Li·
2A	Be	4	$1s^2 2s^2$	$[He]2s^2$	2	Be:
3A	B	5	$1s^2 2s^2 2p^1$	$[He]2s^2 2p^1$	3	B:
4A	C	6	$1s^2 2s^2 2p^2$	$[He]2s^2 2p^2$	4	·C:
5A	N	7	$1s^2 2s^2 2p^3$	$[He]2s^2 2p^3$	5	·N:
6A	O	8	$1s^2 2s^2 2p^4$	$[He]2s^2 2p^4$	6	·O:
7A	F	9	$1s^2 2s^2 2p^5$	$[He]2s^2 2p^5$	7	:F:
8A	Ne	10	$1s^2 2s^2 2p^6$	$[He]2s^2 2p^6$	8	:Ne:

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Electron Configurations Worksheet.

Gp		#e	1s	2s	2p	3s	3p	Electronic Configuration	Noble Gas	Valence	Lewis Dot
1A	Na	11	↑↓	↑↓	↑↓ ↑↓ ↑↓	↑		$1s^2 2s^2 2p^6 3s^1$	$[Ne]\,3s^1$	1	Na·
2A	Mg	12	↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓		$1s^2 2s^2 2p^6 3s^2$	$[Ne]\,3s^2$	2	Mg:
3A	Al	13	↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑	$1s^2 2s^2 2p^6 3s^2 3p^1$	$[Ne]\,3s^2 3p^1$	3	·Al:
4A	Si	14	↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑ ↑	$1s^2 2s^2 2p^6 3s^2 3p^2$	$[Ne]\,3s^2 3p^2$	4	·Si:
5A	P	15	↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑ ↑ ↑	$1s^2 2s^2 2p^6 3s^2 3p^3$	$[Ne]\,3s^2 3p^3$	5	·P:
6A	S	16	↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑↓ ↑ ↑	$1s^2 2s^2 2p^6 3s^2 3p^4$	$[Ne]\,3s^2 3p^4$	6	:S:
7A	Cl	17	↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑↓ ↑↓ ↑	$1s^2 2s^2 2p^6 3s^2 3p^5$	$[Ne]\,3s^2 3p^5$	7	:Cl:
8A	Ar	18	↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑↓ ↑↓ ↑↓	$1s^2 2s^2 2p^6 3s^2 3p^6$	$[Ne]\,3s^2 3p^6$	8	:Ar:

2.6 How Are the Electrons in an Atom Arranged?

1 **Pauli:** Maximum of 2 electrons per orbital

2. **Hund:** Orbitals on the same level are filled singly first, then they are paired up.

3. **Noble Gas Electrons:** Their stability precludes them from any desire to get involved in any chemistry!

4. **Valence electrons:** For Main Group elements ... the total number of electrons occupying the highest n valued orbitals

↑ Watch out for this.

I: $[Kr]5s^2 4d^{10} 5p^5$; 7 Valence electrons

✓ ✗ ✓

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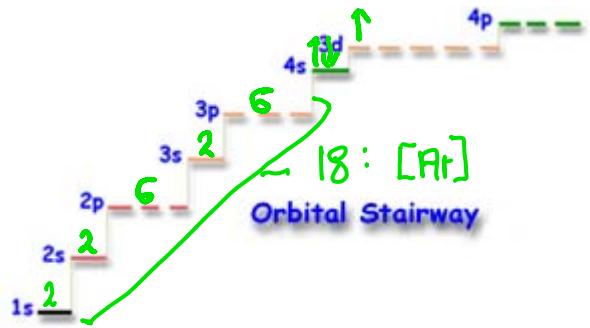
Transition Metals



He : 2

Ne : 10

Ar : 18

Kr : 36

21	22	23	24	25	26	27	28	29	30
Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn
Scandium	Titanium	Vanadium	Chromium	Manganese	Iron	Cobalt	Nickel	Copper	Zinc
44.9559	47.88	50.9415	51.9961	54.9380	55.847	58.9332	58.693	63.546	65.39

See class web site to check these predictions

Predictions

21	Sc :	$[Ar]\,4s^2 3d^1$	✓
22	Ti :	$[Ar]\,4s^2 3d^2$	✓
23	V :	$[Ar]\,4s^2 3d^3$	✓
24	Cr :	$[Ar]\,4s^2 3d^4$	x Actually $[Ar]\,4s^1 3d^5$
25	Mn :	$[Ar]\,4s^2 3d^5$	✓
26	Fe :	$[Ar]\,4s^2 3d^6$	✓
27	Co :	$[Ar]\,4s^2 3d^7$	✓
28	Ni :	$[Ar]\,4s^2 3d^8$	✓
29	Cu :	$[Ar]\,4s^2 3d^9$	x Actually $[Ar]\,4s^1 3d^{10}$
30	Zn :	$[Ar]\,4s^2 3d^{10}$	✓

2.7 Electronic Configuration and Position in the Periodic Table

			Electron Configuration	Noble Gas	Valence
1A	Li	3	$1s^2 2s^1$	$[He]2s^1$	1
2A	Be	4	$1s^2 2s^2$	$[He]2s^2$	2
3A	B	5	$1s^2 2s^2 2p^1$	$[He]2s^2 2p^1$	3
4A	C	6	$1s^2 2s^2 2p^2$	$[He]2s^2 2p^2$	4
5A	N	7	$1s^2 2s^2 2p^3$	$[He]2s^2 2p^3$	5
6A	O	8	$1s^2 2s^2 2p^4$	$[He]2s^2 2p^4$	6
7A	F	9	$1s^2 2s^2 2p^5$	$[He]2s^2 2p^5$	7
8A	Ne	10	$1s^2 2s^2 2p^6$	$[He]2s^2 2p^6$	8
1A	Na	11	$1s^2 2s^2 2p^6 3s^1$	$[Ne]\ 3s^1$	1
2A	Mg	12	$1s^2 2s^2 2p^6 3s^2$	$[Ne]\ 3s^2$	2
3A	Al	13	$1s^2 2s^2 2p^6 3s^2 3p^1$	$[Ne]\ 3s^2 3p^1$	3
4A	Si	14	$1s^2 2s^2 2p^6 3s^2 3p^2$	$[Ne]\ 3s^2 3p^2$	4
5A	P	15	$1s^2 2s^2 2p^6 3s^2 3p^3$	$[Ne]\ 3s^2 3p^3$	5
6A	S	16	$1s^2 2s^2 2p^6 3s^2 3p^4$	$[Ne]\ 3s^2 3p^4$	6
7A	Cl	17	$1s^2 2s^2 2p^6 3s^2 3p^5$	$[Ne]\ 3s^2 3p^5$	7
8A	Ar	18	$1s^2 2s^2 2p^6 3s^2 3p^6$	$[Ne]\ 3s^2 3p^6$	8