

## Announcements

Monday, March 30, 2009

### MasteringChemistry assignments:

- Ch 8 due today
- Ch 9 due this Wed, Apr 1

Exam 2 covering the end of Ch 5 through Ch 9 is this Wed, April 1. The study guide is on the webpage

QA sessions in lab this week - Tues 1pm, Wed 8am

Mon 3pm lab today: Exp 9 (make-up from Feb 23)

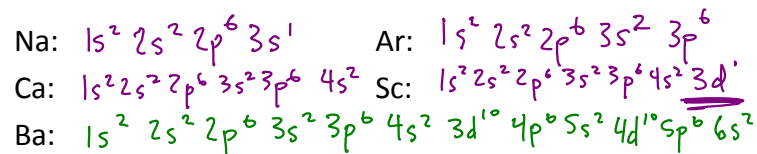
## Electron configurations and the rest of the periodic table

### Available subshells to fill:

$n=1$	1s		
$n=2$	2s 2p		
$n=3$	3s 3p 3d	1st available d subshell	
$n=4$	4s 4p 4d 4f		
$n=5$	5s 5p 5d 5f		
$n=6$	6s 6p 6d		
$n=7$	7s 7p		

Subshell	Max # e <sup>-</sup>
s	2
p	6
d	10
f	14



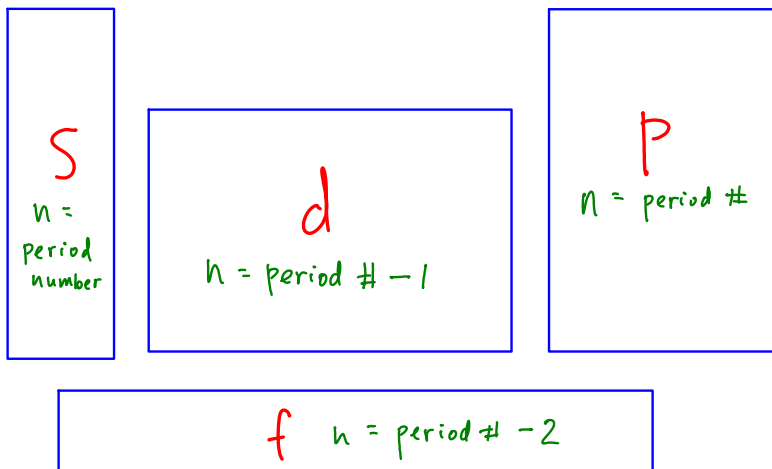
3 4 5 6 7 8 v.e.

**Periodic Table of the Elements**

Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	IA	IIA	IIIB	IVB	VB	VIB	VIB	VIB	VIB	VIB	IB	IB	IIIA	IVA	VA	VIA	VIA	VIIIA
1	H 1.008	He 4.003																
2	Li 6.939	Be 9.012											B 10.81	C 12.01	N 14.01	O 16.00	F 19.00	Ne 20.18
3	Na 22.99	Mg 24.31											Al 26.98	Si 28.09	P 30.97	S 32.07	Cl 35.45	Ar 39.95
4	K 39.10	Ca 40.08	Sc 44.96	Ti 47.88	V 50.94	Cr 52.00	Mn 54.94	Fe 55.85	Co 58.93	Ni 58.69	Cu 63.55	Zn 65.38	Ga 69.72	Ge 72.61	As 74.92	Se 78.96	Br 79.90	Kr 83.80
5	Rb 85.47	Sr 87.62	Y 88.91	Zr 91.22	Nb 92.91	Mo 95.96	Tc (98)	Ru 101.07	Rh 102.91	Pd 106.4	Ag 107.87	Cd 112.41	In 114.82	Sn 118.71	Sb 121.75	Te 127.60	I 126.90	Xe 131.29
6	Cs 132.91	Ba 137.33	La 138.91	Ce 140.12	Pr 140.91	Nd 144.24	Pm (147)	Sm 150.36	Eu 151.96	Gd 157.25	Tb 158.93	Dy 162.50	Ho 164.93	Er 167.26	Tm 168.93	Po 173.04	At (210)	Rn (222)
7	Fr (223)	Ra (226)	Lr (257)	Lr (257)	Rf (261)	Db (262)	Sg (262)	Bh (271)	Hs (272)	Mt (270)	Ds (276)	Rg (281)	Uub (284)	Uut (284)	Uuq (288)	Uuq (288)	Uuh (289)	Uuo (294)
			57	58	59	60	61	62	63	64	65	66	67	68	69	70		
			La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb		
			138.91	140.12	140.91	144.24	(147)	150.36	151.96	157.25	158.93	162.50	164.93	167.26	168.93	173.04		
			89	90	91	92	93	94	95	96	97	98	99	100	101	102		
			Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No		
			(227)	232.04	231.04	238.03	(237)	(244)	(243)	(247)	(247)	(251)	(252)	(257)	(258)	(259)		

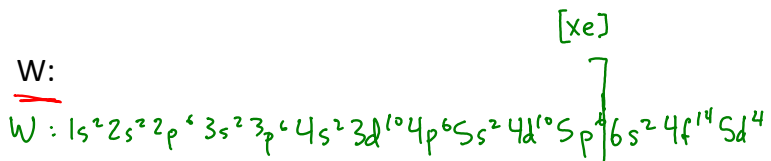
Reference: <http://www.webelements.com>

Sections of the periodic table



Filling order (to check work only!)

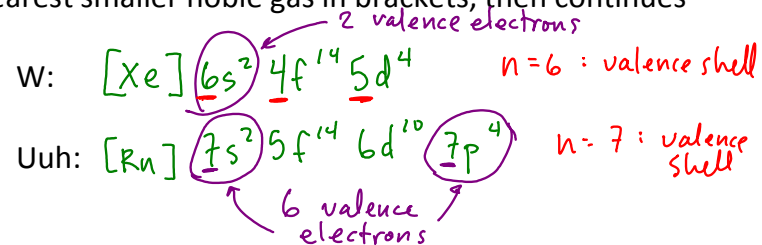
- ~~1s~~
- ~~2s 2p~~
- ~~3s 3p 3d~~
- ~~4s 4p 4d 4f~~
- ~~5s 5p 5d 5f~~
- ~~6s 6p 6d~~
- ~~7s 7p~~



Abbreviated electron configurations, valence electrons

Noble gases all have **full subshells**

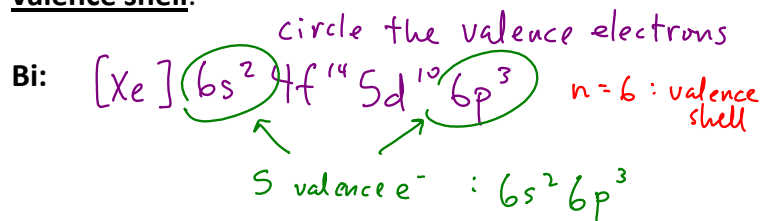
**Abbreviated electron configuration** starts with the nearest smaller noble gas in brackets, then continues



**Valence electrons:** electrons in the outermost **shell** (not subshell) highest "n"

- $4s$  subshell is in the  $n=4$  shell
- $5p$  subshell is in the  $n=5$  shell

The largest  $n$  number in an electron configuration is the **valence shell**.



Br:

## Orbital diagrams

Subshell	Max # e <sup>-</sup>	# Orbitals
s	2	1
p	6	3
d	10	5
f	14	7

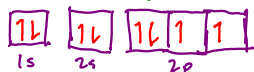
Recall, an orbital is a ... volume inside of which an electron is likely to be found

If an s subshell contains a single orbital, how many orbitals are in a p subshell?

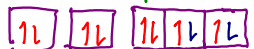
Every orbital holds a maximum of 2 electrons.

**Orbital diagrams:** box : an orbital

O:  $1s^2 2s^2 2p^4$

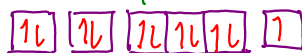


O<sup>2-</sup>:  $1s^2 2s^2 2p^6$       2 - means 2 more electrons



← subshells full  
Stable, just like Ne

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

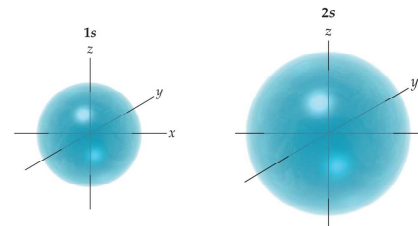


Na<sup>+</sup>:  $1s^2 2s^2 2p^6$       ← stable, like Ne

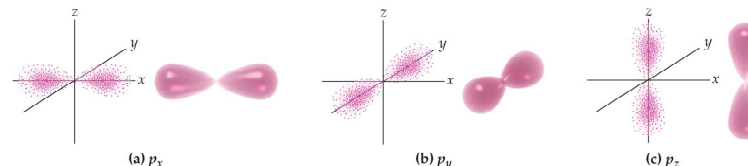
What do these orbitals look like?

These orbitals are actual 3-dimensional shapes which can hold up to 2 electrons.

All s orbitals are spherical:



p orbitals are dumbbell-shaped:



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