

Announcements

- Homework 8 is due on March 29 (Wednesday).
- Homework 9 is due on April 3, Monday.
- Exam 2 is on April 5, next Wednesday. DRC test accommodation request.
- We will offer a practice exam 2, due on April 3.
- Review session on April 3, Monday.

Last time

- Spin

Today's class

- How to fill the periodic table

in-class quiz (3 min)

Including the electron spin, what is the degeneracy of the $n=6$ energy level of hydrogen?

A. 6

B. 12

C. 36

D. 72

E. Not sufficient to determine.

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$$(n, l, m_l) \rightarrow n^2$$

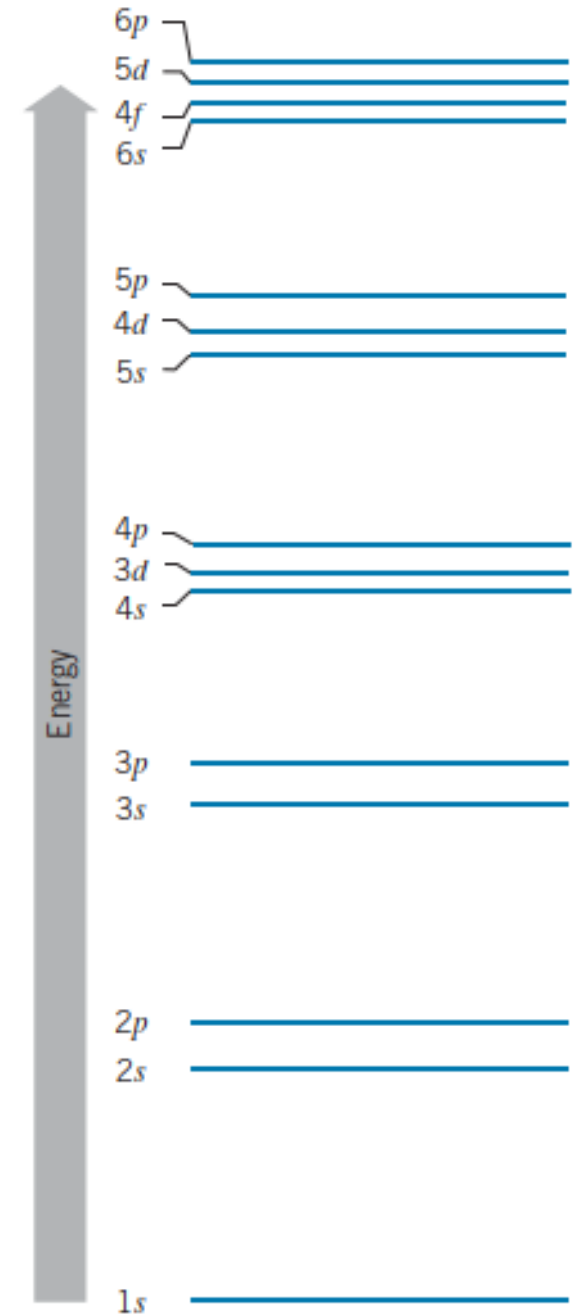
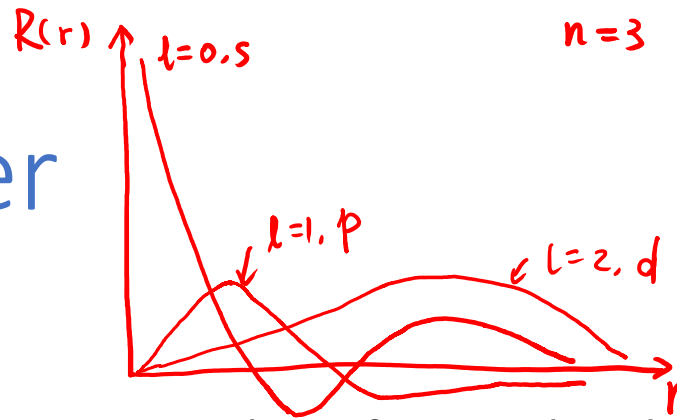
$$(n, l, m_l, m_s) \rightarrow 2n^2 = 72$$

Pauli exclusion principle

No two electrons in a single atom can have the same set of quantum numbers (n, l, m_l, m_s) .

Electron filling order

For many-electron atoms, we first use up all of the possible quantum numbers for one level, and then place electrons in the next level.



Notation of electron configuration of each element:

$nl^{\#}$ H: $1s^1$

[inert gas element] $nl^{\#}$

The level with a certain n and l is a subshell.

How many electrons are allowed in a subshell?

l		how many e^- s	$2(2l+1)$	all possible m_s	\times	all possible m_l
0	s	2		\downarrow		\downarrow
1	p	6		2		$(2l+1)$
2	d	10				
3	f	14				

n given, l is constrained.

1s \checkmark 1p \times
2s, 2p \checkmark 2d \times



Alkalis		Transition metals										Inert gases						
1s	1 H											2 He						
	Alkaline earths											Halogens						
2s	3 Li	4 Be											10 Ne					
	$1s^2 2s^1$	$1s^2 2s^2$											$1s^2 2s^2 2p^6$					
3s	11 Na	12 Mg											18 Ar					
	$[Ne] 3s^1$	$[Ne] 3s^2$											$[Ne] 3s^2 3p^6$					
4s	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
	$[Ar] 4s^1$	$[Ar] 4s^2$	$[Ar] 4s^2 3d^1$									$[Ar] 4s^1 3d^{10}$ ✓	$[Ar] 4s^2 3d^{10}$					
5s	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
			4d									$[Ar] 4s^2 3d^9$ X	$[Ar] 4s^2 3d^{10}$					
6s	55 Cs	56 Ba	57 Lu	58 Hf	59 Ta	60 W	61 Re	62 Os	63 Ir	64 Pt	65 Au	66 Hg	67 Tl	68 Pb	69 Bi	70 Po	71 At	72 Rn
			5d									$[Ar] 4s^2 3d^9$ X	$[Ar] 4s^2 3d^{10}$					
7s	87 Fr	88 Ra	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Mv	102 No		
			6d									$[Ar] 4s^2 3d^9$ X	$[Ar] 4s^2 3d^{10}$					

Lanthanides (rare earths) 14 columns

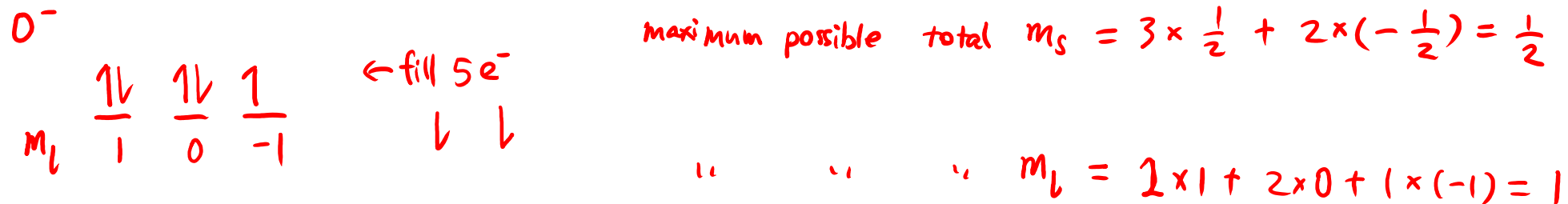
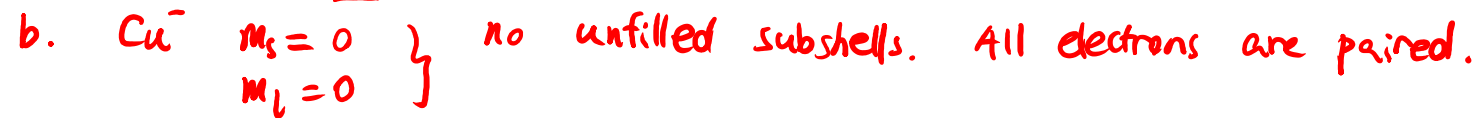
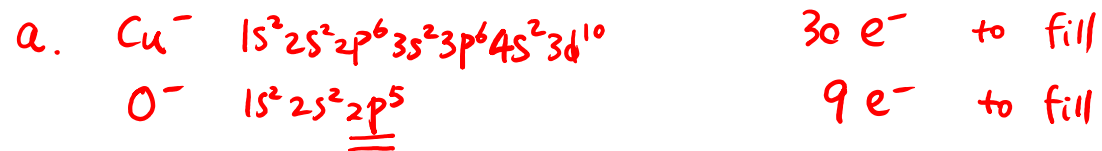
4f	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb
5f	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Mv	102 No

Actinides


in-class exercise (8 min)

Negative ions can be produced by adding an electron to a neutral atom.

- What is the electron configuration of Cu^- and O^- ? Hint: $Z=29$ for Cu. $Z=8$ for O.
For practice, write out the full configuration instead of the inert-gas abbreviated configuration.
- What is the maximum possible total m_s for Cu^- and O^- ?
- When the electrons have their maximum possible total m_s , what is the maximum total m_l ?



<https://www.youtube.com/watch?v=fPnwBITSmgU>



and anim

Clark's Nutcracker
Nucifraga columbiana

rs

Translator: tom carter
Reviewer: Bedirhan Cinar

10 YEARS OF TED-ED

0:02 / 4:24

YouTube video player controls: play, next, volume, pause, closed captions, settings, full screen, and expand.

The genius of Mendeleev's periodic table - Lou Serico