Quantum Mechanical Model

https://www.youtube.com/watch?v=accyCUzasa0

Sep 20-7:39 AM

Quantum Mechanical Model of an Atom

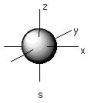
The quantum mechanical model determines the allowed energies an electron can have and how likely it is to find the electron in various locations around the nucleus.

atomic orbital - region of space in which there is a high probability to find an electron

Principal quantum numbers (**n**) represent energy levels of electrons (i.e., n = 1, 2, 3, 4, etc.)

There may be several orbitals with different shapes at different energy levels.

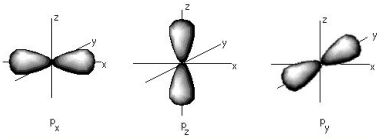
s orbital
1



spherical

p 131

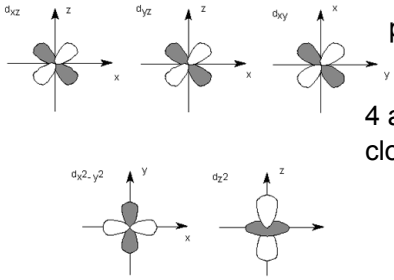
p orbitals
3



dumbell

p 132

d orbitals
5



4 are cloverleaf

Sep 17-3:47 PM

Principal Energy Level	Number of Sublevels	Type of Sublevel	Number of Orbitals (n2)	Number of Electrons (2n2)
n = 1	1	1s (1 orbital)		
n = 2	2	2s (1 orbital), 2p (3 orbitals)		
n = 3	3	3s (1 orbital), 3p (3 orbitals), 3d (5 orbitals)		
n = 4	4	4s (1 orbital), 4p (3 orbitals), 4d (5 orbitals), 4f (7 orbitals)		

Sep 17-4:06 PM

In the space below, write the unabbreviated electron configurations of the following elements:

1) sodium _____
2) iron _____
3) bromine _____
4) cesium _____
5) tin _____

1) $1s^2 2s^2 2p^6 3s^1$

2) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$

3) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$

4) $1s^2 2s 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^1$

5) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^2$

11) $16e^-$ S

12. $37e^-$ Rb

$[Kr] 5s^2 4d^{10} 5p^3$

$51e^-$ Sb

$[Xe] 6s^2 4f^{14} 5d^6$

$54 + 22 = 76$ Os

$[Rn] 7s^2 5f^{11}$

$86 + 13 = 99e^-$ Es

Mar 15-9:50 AM

p. 132 #1-7

Oct 3-10:12 AM

Complete the guided reading sheet for 5.1
Page 132 Q 1-7
1. Couldn't explain with metals or compounds give off characteristic colors when heated nor the chemical properties of the elements.

2. An electron is found only in specific circular paths or orbits around the nucleus.

3. It determines the allowed energy levels an electron can have and the likelihood of finding an electron in various locations around the nucleus

4. The sublevels have different shapes.

5.They can move by losing or gaining just the right amount of energy- a quantum.

6. In an atom, the electrons can have certain fixed energy levels. To move from one level to another requires the emission or absorption of an exact of amount of energy or quantum, thus the energy of the electrons is said to be quantized.

7. a) 3 b)1 c) 3 d) 5 e)7

Oct 3-10:04 AM

Electron Configuration

https://www.youtube.com/watch?v=2AFPfg0Como

Oct 3-10:13 AM

Atomic Orbitals

Principal energy level

Superscript

$1s^2$

Number of Electrons

Atomic Orbital

Orbital Name	# of Orbitals	Max # of Electrons
s	1	2
p	3	6
d	5	10
f	7	14

Oct 3-10:16 AM

Electron Configurations

Electron configurations are the ways in which electrons are arranged in different orbitals around the nuclei of atoms, according to the quantum mechanical model (equivalent to the Bohr model of the Bohr Theory).

H $1s^1$

He $1s^2$

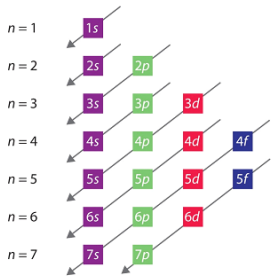
Be $1s^2 2s^2$

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

C $1s^2 2s^2 2p^2$

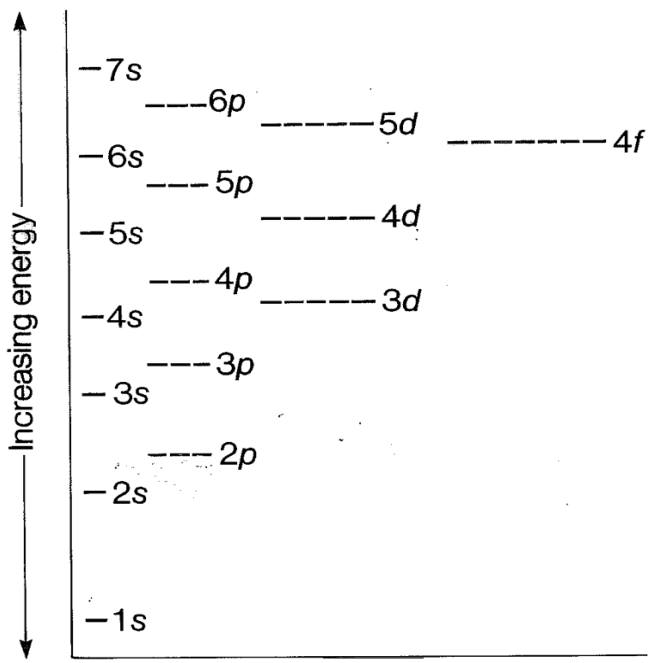
18 Ar $1s^2 2s^2 2p^6 3s^2 3p^6$

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



Sep 17-4:22 PM

Aufbau Diagram



Sep 17-3:44 PM

Three Rules-

Aufbau principle - electrons occupy orbitals of lowest energy first

Pauli exclusion principle- an atomic orbital can describe at mostwo electrons

Hund's rule - one electron enters each orbital until all orbitalscontain one electron with the same spin

Sep 17-4:17 PM

In the space below, write the unabbreviated electron configurations of the following elements:

1) sodium $1s^2\ 2s^2\ 2p^6\ 3s^1$
2) iron $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^6$
3) bromine $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^5$
4) cesium $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^{10}\ 5p^2\ 6s^1$
5) tin $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^{10}\ 5p^2$

Mar 15-10:51 AM

Determine what elements are represented by the following electron configurations:

11) $1s^2 2s^2 2p^6 3s^2 3p^4$ 16 e⁻ S

12) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1$ 37 e⁻ Rb

13) [Kr] $5s^2 4d^{10} 5p^3$ 51 e⁻ Sb

14) [Xe] $6s^2 4f^{14} 5d^6$ 76 e⁻ Os

15) [Rn] $7s^2 5f^{11}$ 99 e⁻ Es

Mar 15-10:53 AM

In the space below, write the abbreviated electron configurations of the following elements:

6) cobalt [Ar] $4s^2 3d^7$

7) silver [Kr] $5s^2 4d^9$

8) tellurium [Kr] $5s^2 4d^{10} 5p^4$

9) iodine [Kr] $5s^2 4d^{10} 5p^5$

10) radon [Xe] $6s^2 4f^{14} 5d^{10} 6p^6$

Mar 15-10:53 AM

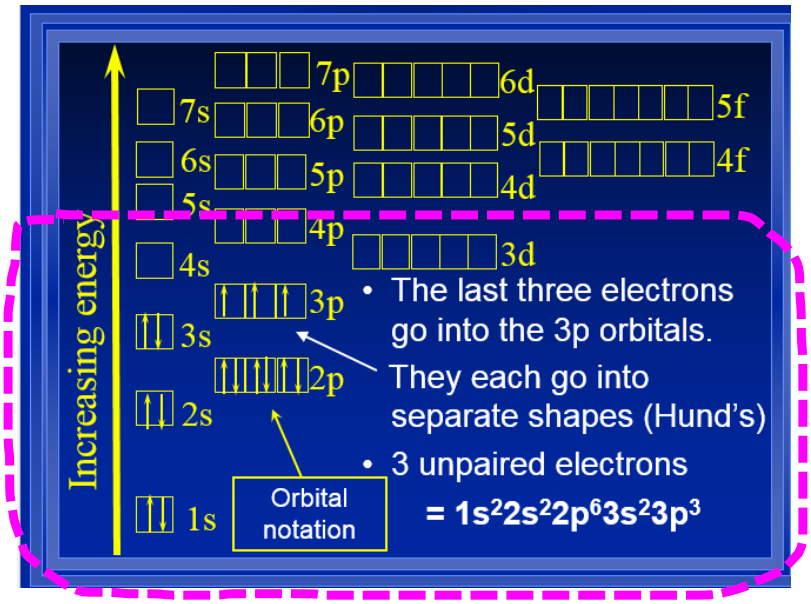
Orbitals fill in an order

- Lowest energy to higher energy.
- Adding electrons can change the energy of the orbital. Full orbitals are the absolute best situation.
- However, **half filled** orbitals have a lower energy, and are next best
  - Makes them more stable.
  - Changes the filling order

Oct 3-10:21 AM

Exceptional Electron Configurations

Although half-filled sublevels are not as stable as filled sublevels, they are more stable than other configurations and more likely to occur at higher principal quantum numbers, because of the small energy differences between sublevels.



Sep 17-9:01 PM

Example of exceptions pg 45 PPT

NOTE-Some Principal Energy Levels start to fill before previous ones finish.

ex 3d fills before 4s, because 4s has less energy than 3d. It must fill first.

Copper & Chromium

Cr $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^4\,4s^2$
Cu $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^9\,4s^2$

The correct electron configurations are as follows:

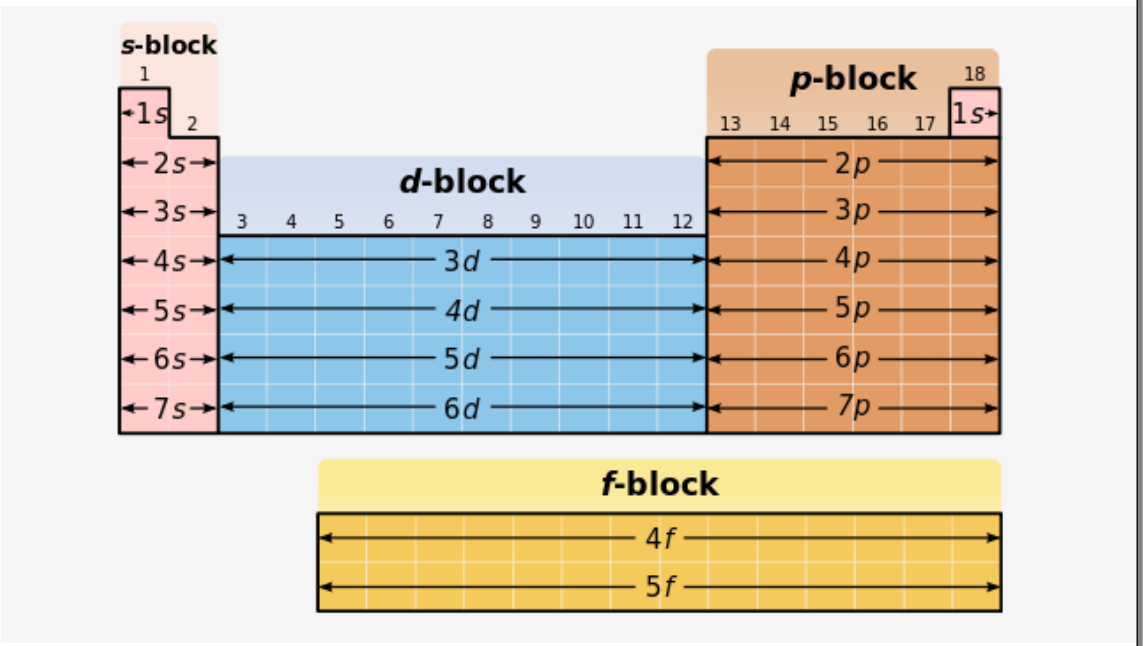
Cr $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^5\,4s^1$
Cu $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^{10}\,4s^1$

p 136

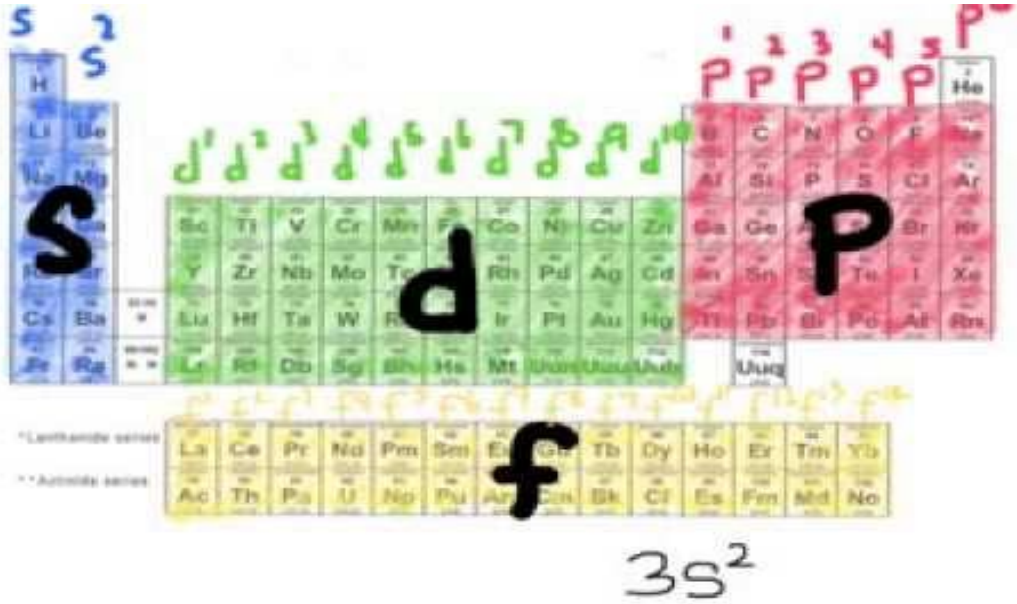
Oct 3-10:23 AM

http://www.chalkbored.com/lessons/chemistry-12/periodic-configurations.pdf

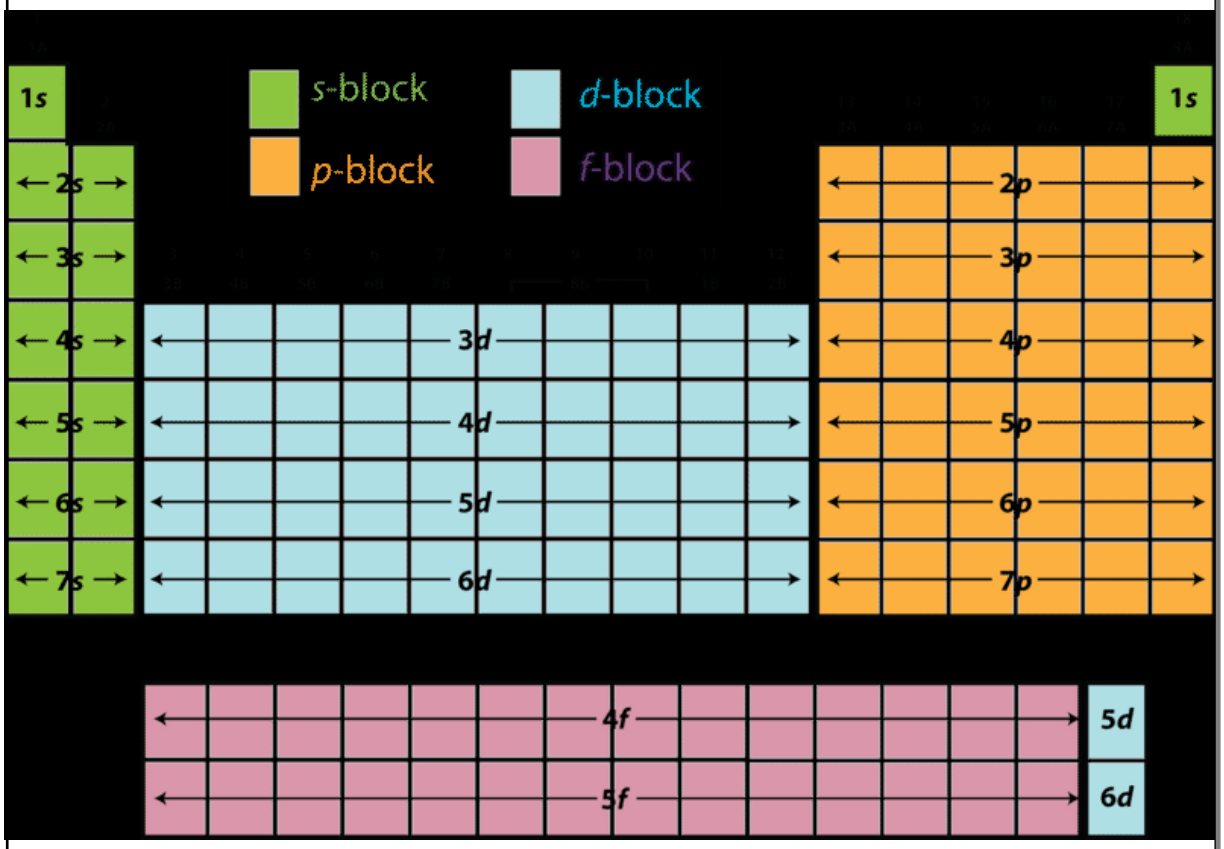
Sep 17-3:51 PM



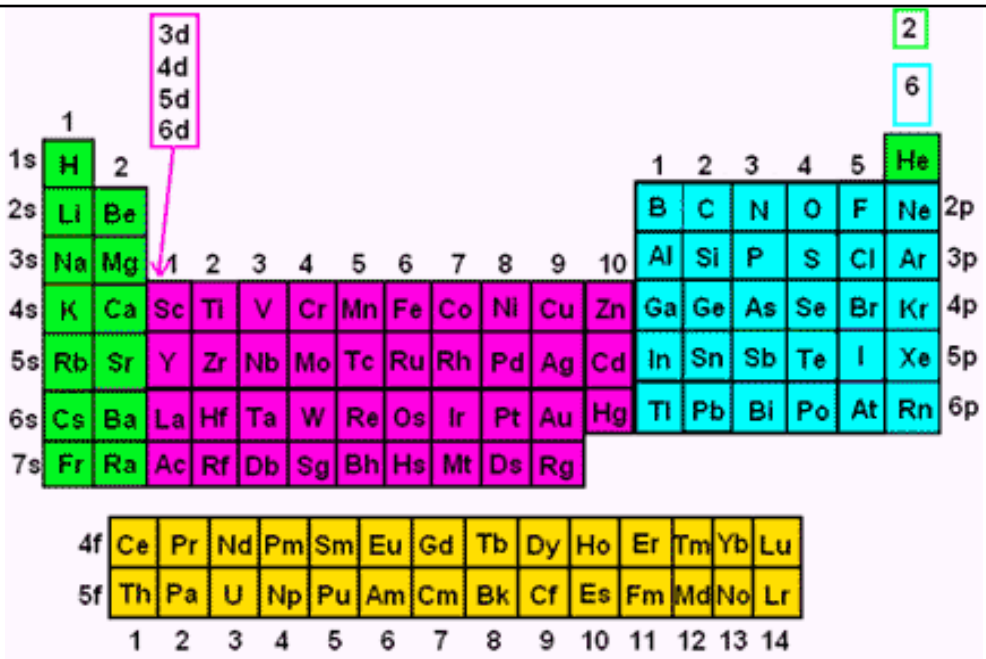
Oct 3-11:59 AM



Oct 4-11:19 AM



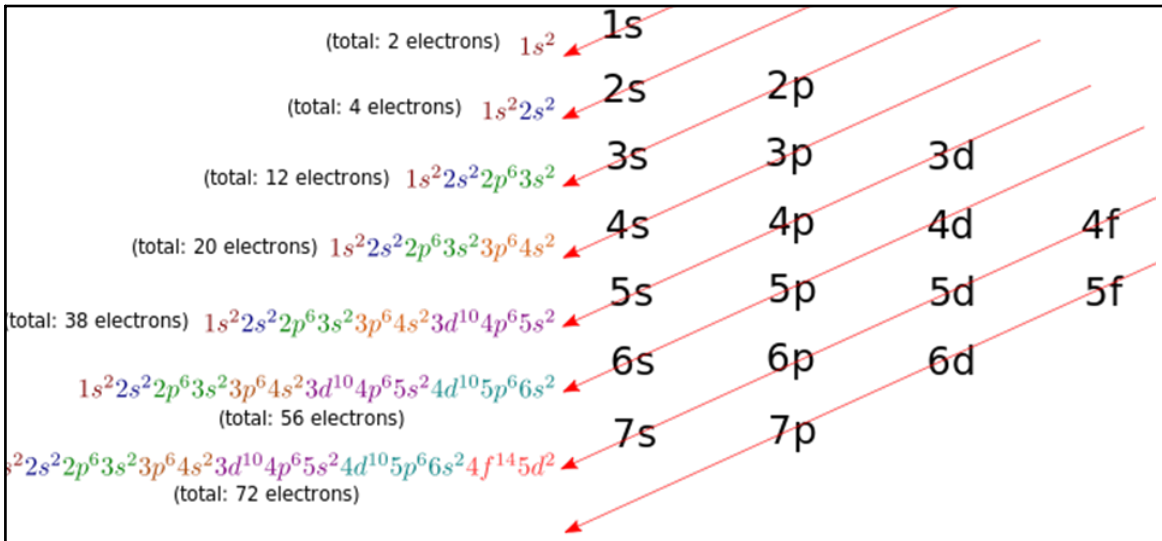
Oct 4-11:22 AM



Oct 4-11:20 AM

http://www.mpcfaculty.net/mark_bishop/abbreviated_electron_configuration_help.htm

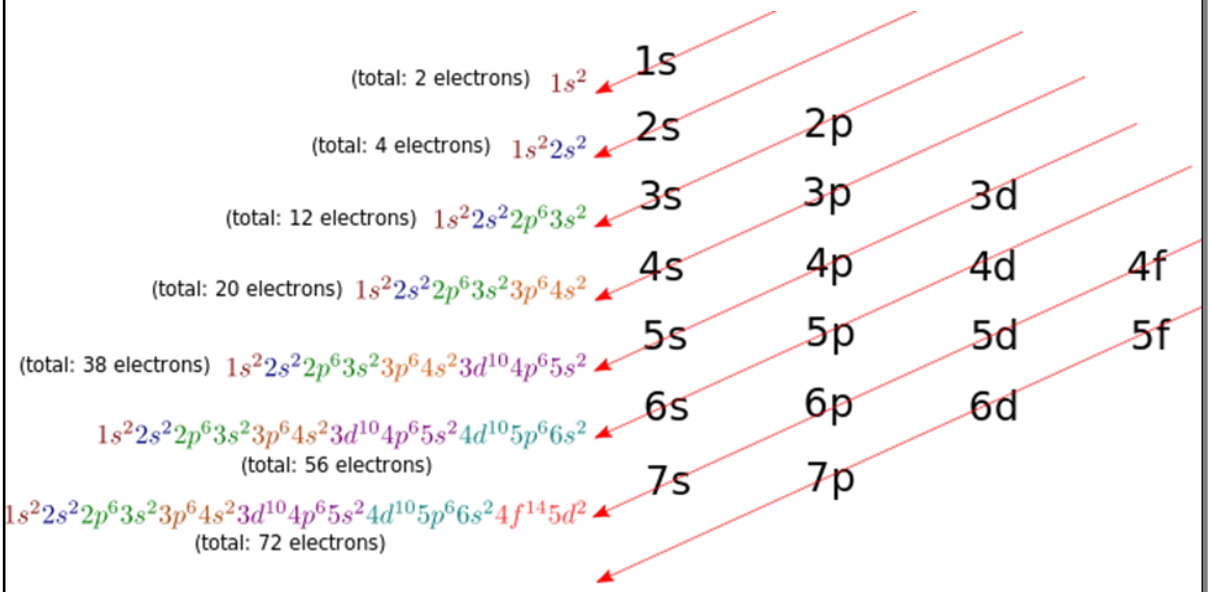
Oct 4-3:32 PM



unabbreviated electron configuration for S

Abbreviated electron configuration for S

Oct 5-10:30 AM



Oct 5-10:30 AM

The Principal Energy Level (the #) only holds that # of sublevels.

Principal Energy Level	# of Sublevels	sublevels
1	1	1s
2	2	2s 2p
3	3	3s 3p 3d
4	4	4s 4p 4d 4f
5	5	5s 5p 5d 5f 5g

The number of electrons in each sublevel

sublevel	# of electrons in each sublevel
s	2
p	6
d	10
f	14
g	*18*

Oct 3-10:35 AM

Homework

p. 132 #1-7

p. 135 #8-9

p. 136 #10-13

Sep 17-8:53 PM

Electron Configuration Practice.doc

Oct 4-10:59 AM

P 135 8 & 9

8 a) Carbon $1s^2 2s^2 2p^2$

b) argon $1s^2 2s^2 2p^6 3s^2 3p^6$

c)nickel $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$

9. boron $1s^2 2s^2 2p^1$ 1 unpaired electron

b) silicon $1s^2 2s^2 2p^6 3s^2 3p^2$ - two unpaired electrons

Oct 3-10:25 AM

Thursday, Oct 5

- Complete the worksheet assigned yesterday Chemistry 112 Electron Configuration- have Ms. Casey check your work
- Assessment sheet to be done on your own with the use of the Elec. config.chart and periodic table- hand in for marks
- Complete the guided reading for sections 5.2-5.3 (you will receive the second sheet for this today)
- Unit Test next week

Sections 1.1, all of chapter 2, 6.1, 6.2, all of Chap 4, 5.1,5.2,5.3, 6.3, 7.1

Sep 25-7:24 PM

Feb 28-2:26 PM

Attachments

Chapter 11 - Electron Configuration Worksheet III 2014-2015.doc

SKMBT_50117100410120.pdf

Electron Configuration Practice.doc