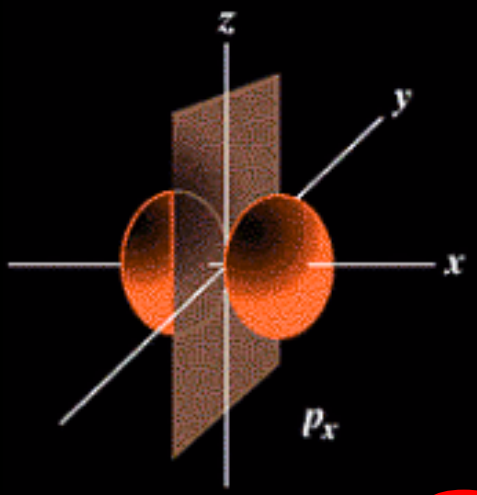
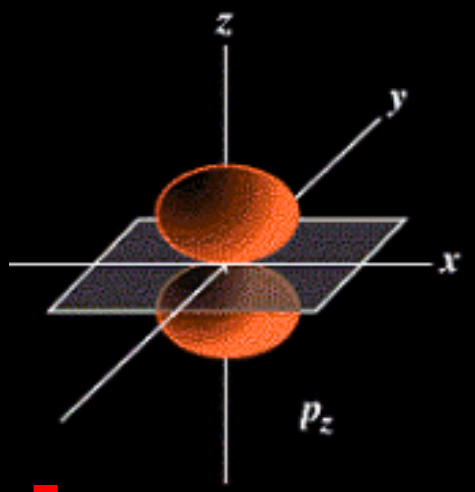
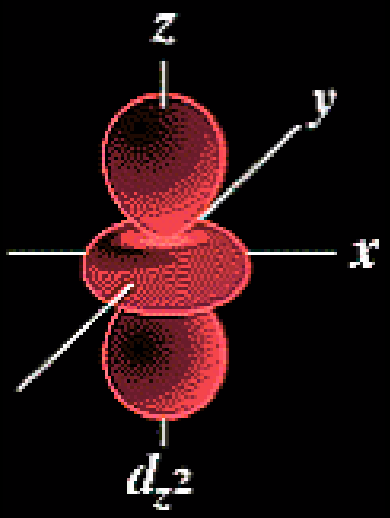
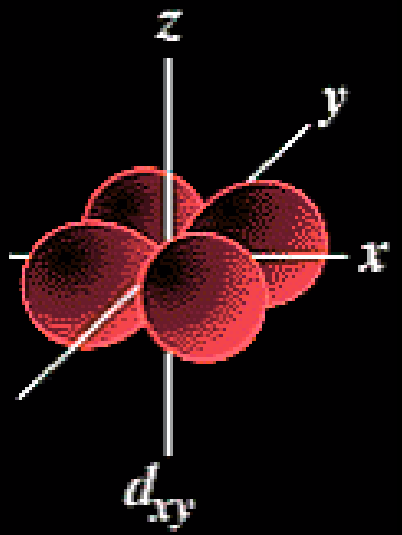


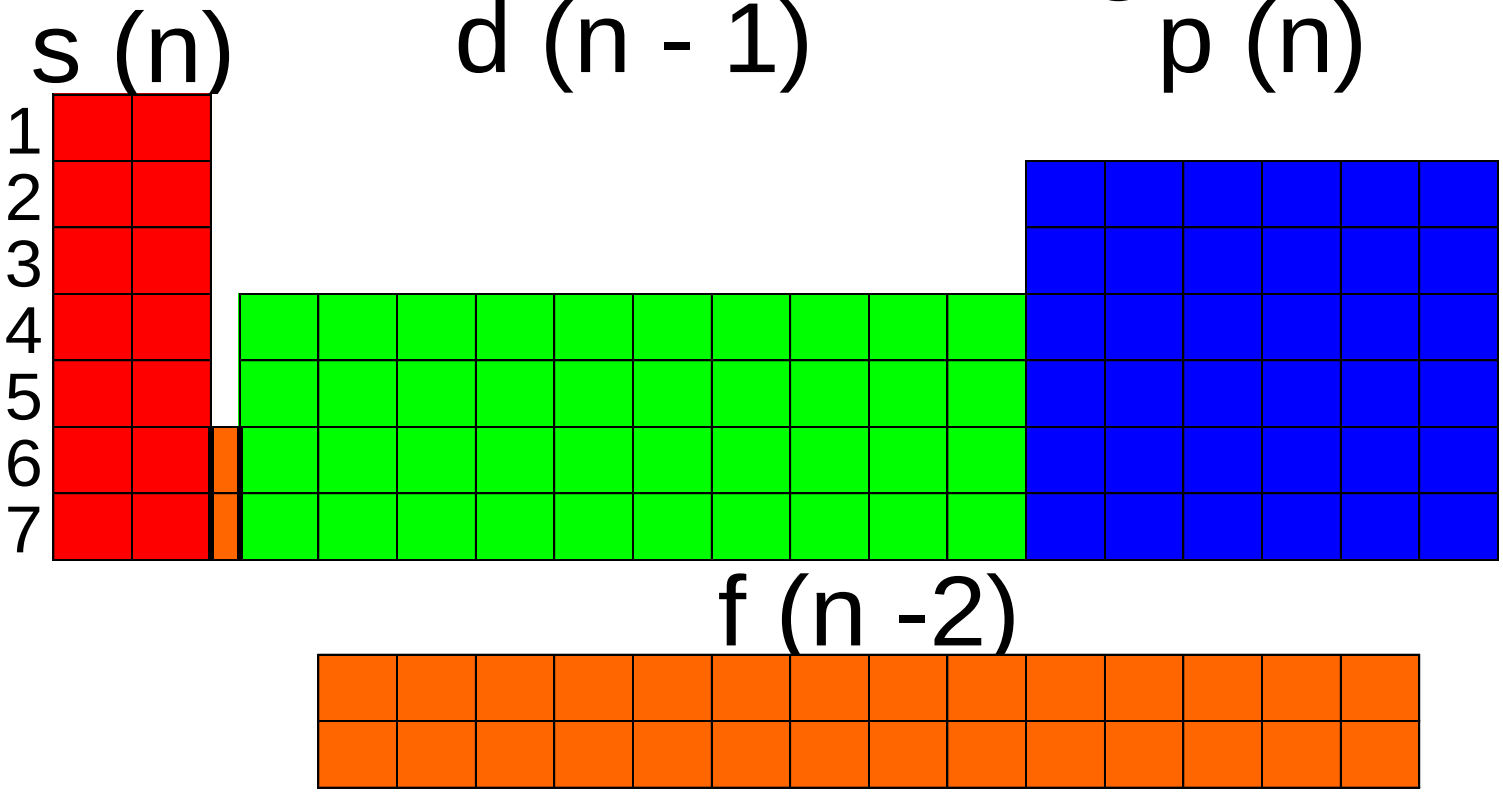


Shapes and Orientations of Orbitals





Periodic table arrangement



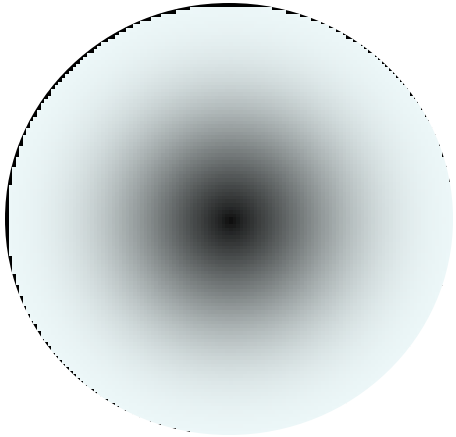
- the quantum theory helps to explain the structure of the periodic table.
- n - 1 indicates that the d subshell in period 4 actually starts at 3 (4 - 1 = 3).

- The location of electrons is described by:
  n, l, m_l

  n = size, *l* = shape, m_l = orientation

Electron clouds

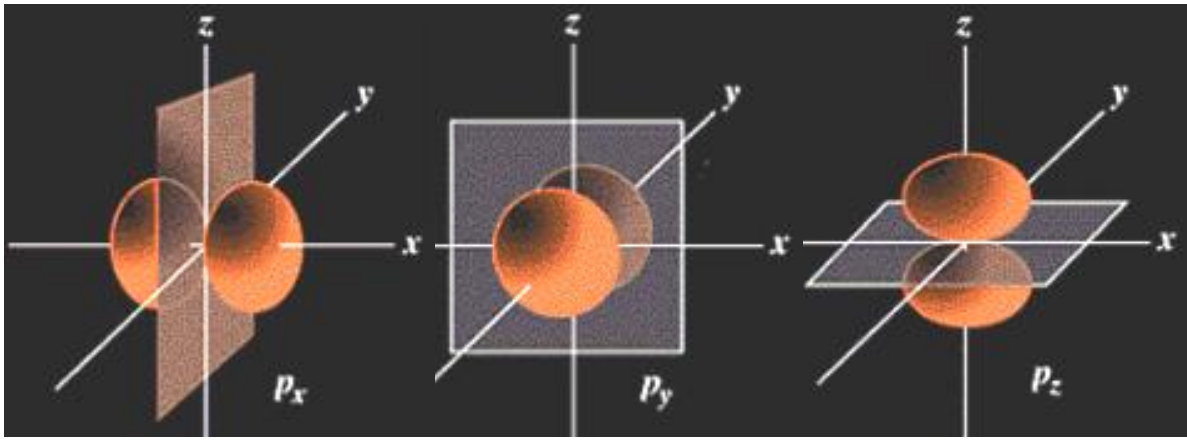
- The “probability” of finding an electron around a nucleus can be calculated.
- Relative probability is indicated by a series of dots, indicating the “electron cloud”.



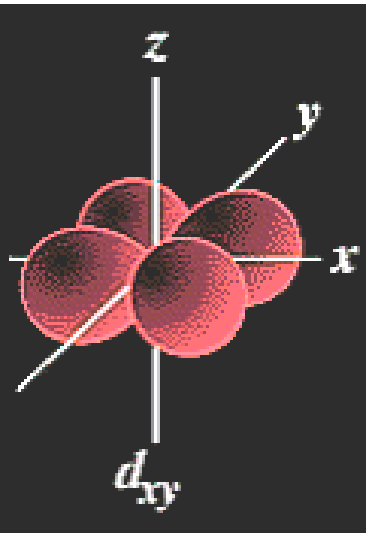
- 90% electron probability/cloud for 1s orbital (notice higher probability toward the centre)

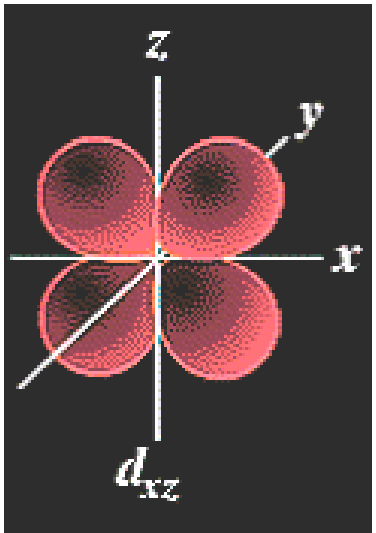
p orbitals and d orbitals

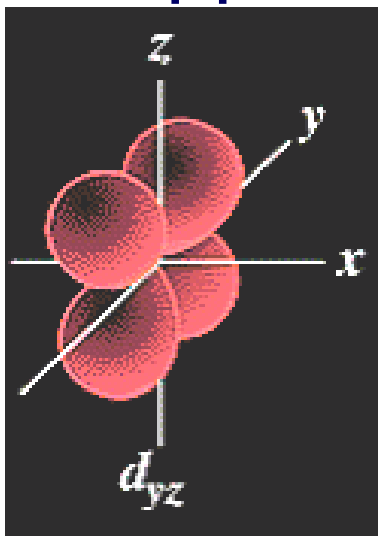
p orbitals look like a dumbell with 3 orientations: p_x, p_y, p_z ("p sub z").

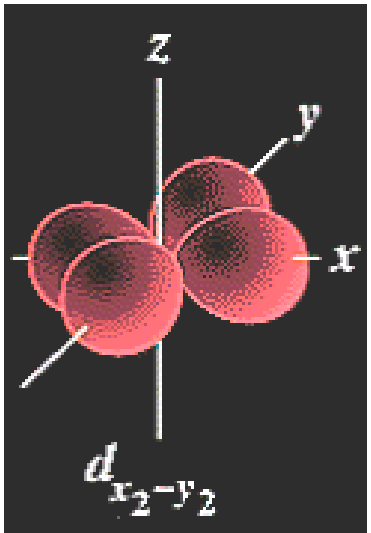


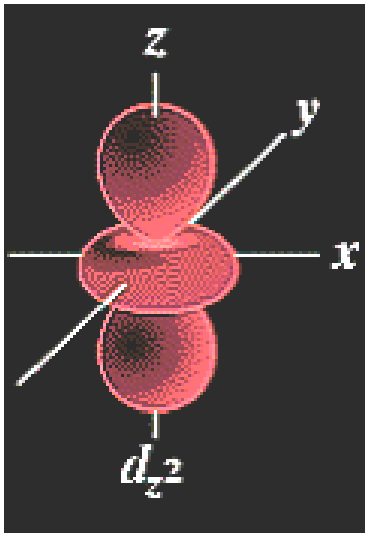
Four of the d orbitals resemble two dumbells in a clover shape. The last d orbital resembles a p orbital with a donut wrapped around the middle.



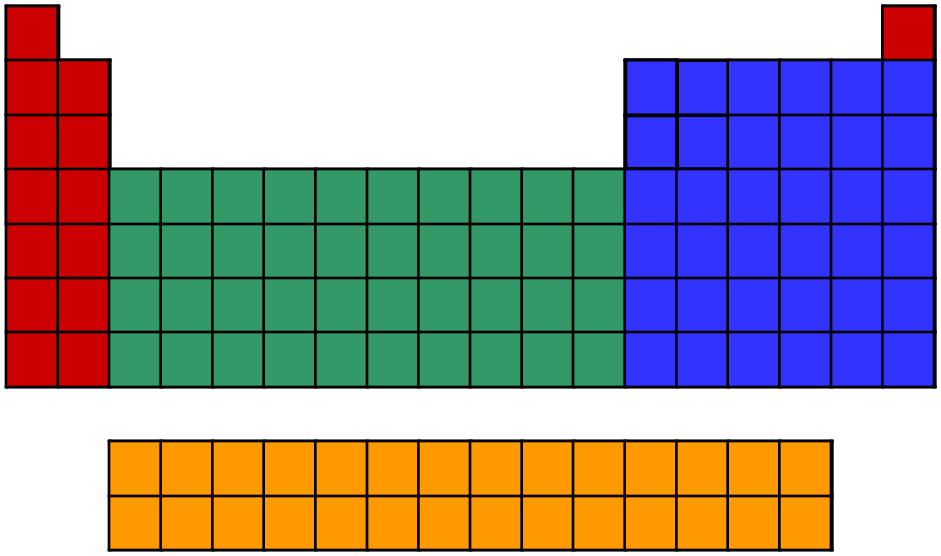


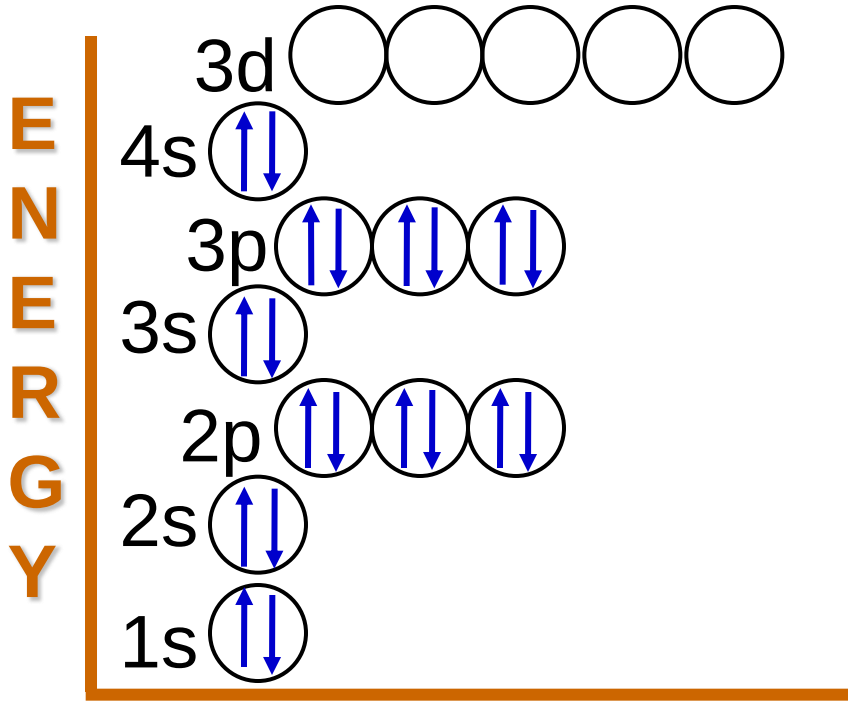


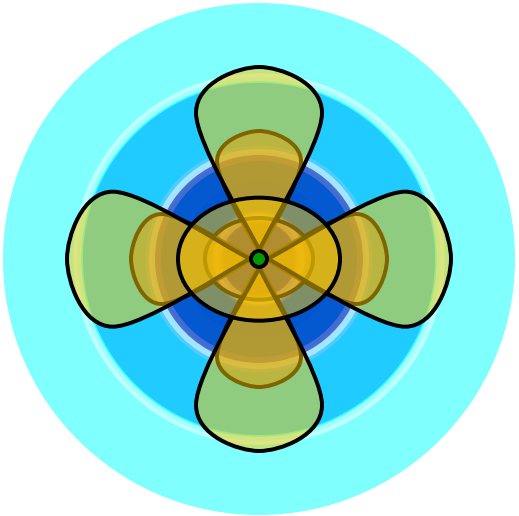




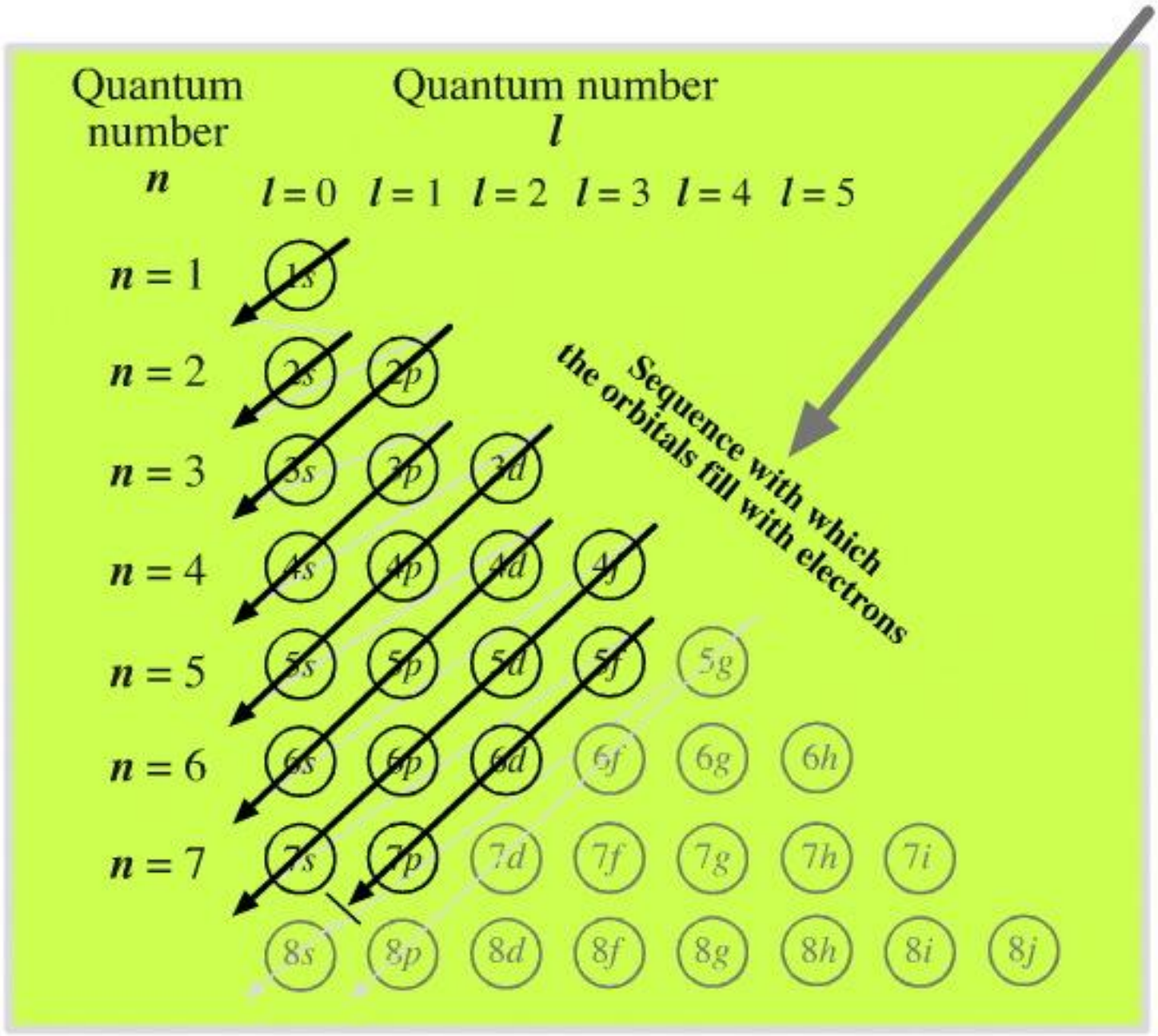
n	l	m_l	m_s
1	0(s)	0	
2	0(s)	0	
	1(p)	-1, 0, 1	
3	0(s)	0	
	1(p)	-1, 0, 1	
	2(d)	-2, -1, 0, 1, 2	
4	0(s)	0	

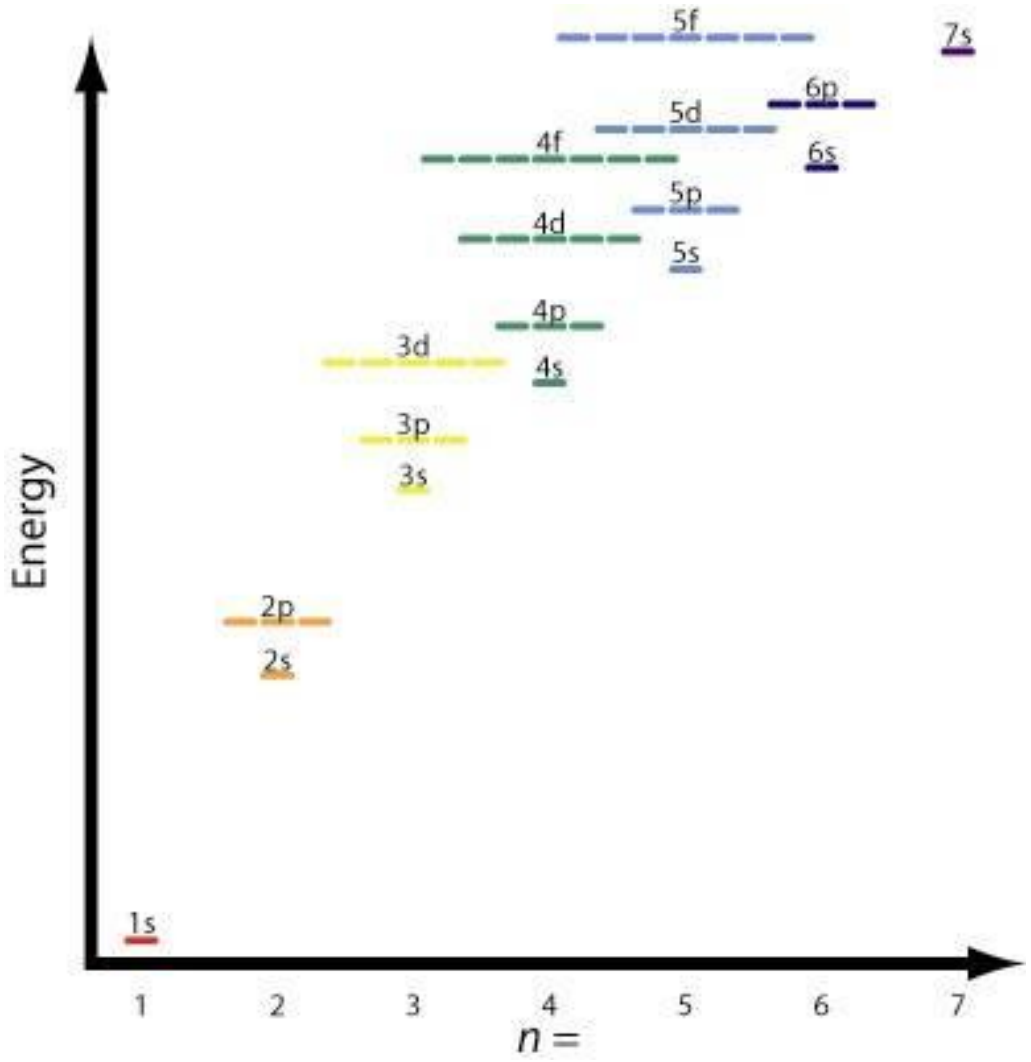






Movie: periodic table of the elements: t10-20


Quantum number
n
Quantum number
l
l = 0
l = 1
l = 2
l = 3
l = 4
l = 5
n = 1
n = 2
n = 3
n = 4
n = 5
n = 6
n = 7
1s
2s
2p
3s
3p
3d
4s
4p
4d
4f
5s
5p
5d
5f
5g
6s
6p
6d
6f
6g
6h
7s
7p
7d
7f
7g
7h
7i
8s
8p
8d
8f
8g
8h
8i
8j
Sequence with which the orbitals fill with electrons


5f
7s
6p
5d
4f
6s
5p
4d
5s
4p
3d
4s
3p
3s
2p
2s
1s
Energy
1
2
3
4
5
6
7
n =

lobes point to the corners of a cube, with four lo
and four lobes below the *xy* plane. The *x* and *y*
through the centers of four of the cube's faces (
lobes). The three nodal planes are defined by t
axes.

The $4f_{5yz^2 - yr^2}$ orbital corresponds to n=4, [illegible]=3, a
lobes point to the corners of a regular hexagon
plane, with one pair of lobes along the *x*-axis. T
planes pass between the lobes and intersect at

The $4f_{zx^2 - zy^2}$ orbital corresponds
has the same shape as the $4f_{xyz}$
cube are in the planes defined b
three nodal planes cut between
the z axis.

23