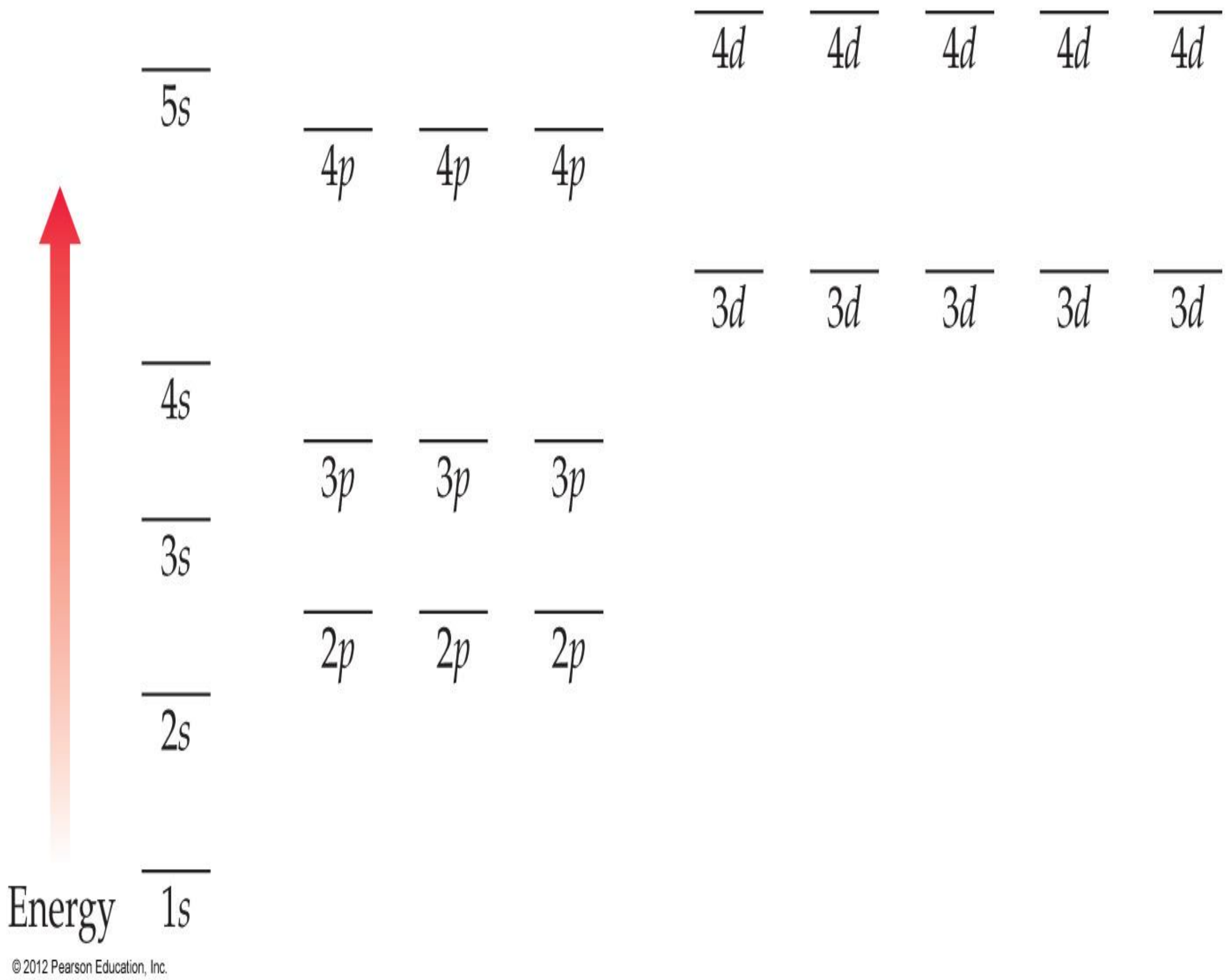
Quantum mechanics:

- **The electron orbit model (Bohr Model) that was proposed for hydrogen, does not work for any other atom. This model does give us the idea of quantization: that thtere are only specific energies avaliable for the electron. (Remember the ladder)**
- **A better model is used to describe where the electrons can be found in an atom. This is Quantum mechanics. It is based on the idea that electrons behave both as waves and as particles, but keeps the quantized idea from before.**
- **The "orbitals" are 3D volumes where you have a 90% chance of finding a particular electron. Each electron in an atom has a set of 4 quantum numbers which are like a serial number. <u>Each electron muse have its own unique set of quantum numbers.</u> The first three designate which orbital you can find the electron, and the last designates the spin on the electron.**
- **These quantum numbers are:**
    - **n This tells you the "shell number" and tells you the SIZE of the orbital. It also is a large factor in the energy of the orbital. Larger n, means larger size and energy.**
        - **n=1,2,3,4,5,6,…**
    - **l This tells you the shape of the orbital, and is often called the "subshell". We use letters to name the shape. There is some energy associated with this number as well. So, in energy terms:**

      s<p<d<f

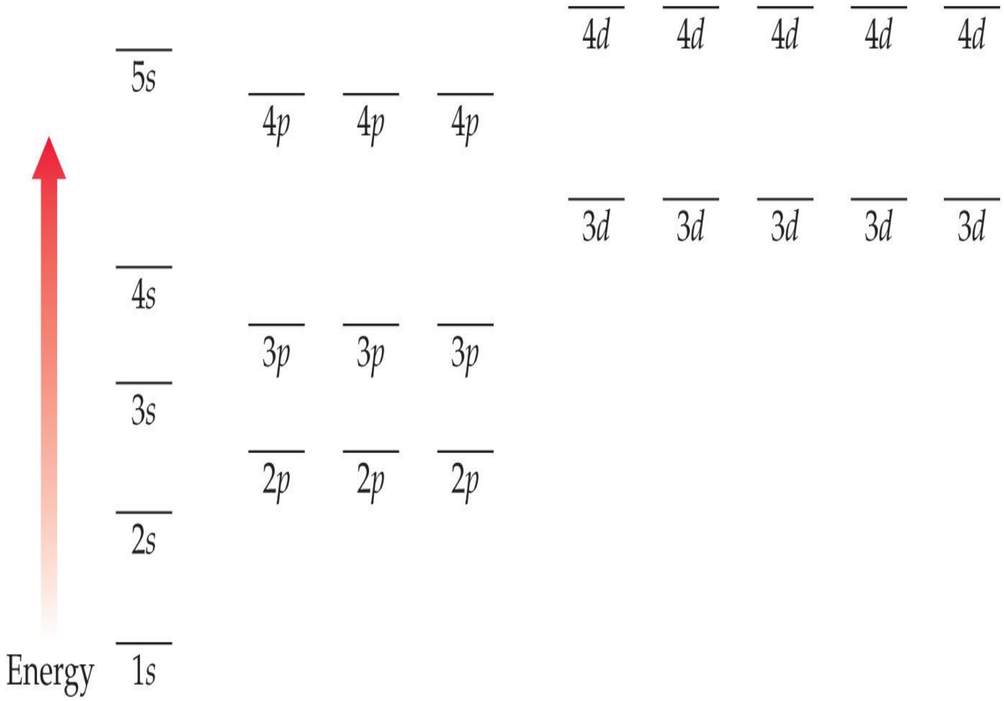
      The shell number (n) dictates how many types of orbitals you can have. For example if n=1, you can only have s-shaped orbitals, but for n=2, you can have s and p-shaped orbitals
    - **The third quantum number tells you how many orbitals of each type there are. This is where we find that the number of each type follows odd numbers:**
        - **there is only one s-shaped orbital per shell**
        - **there are 3 p-shaped orbitals per shell**
        - **there are 5 d-orbitals per shell**
        - **and so on…**
    - **The last quantum number tells you the spin of the electron. Because there are 2 types of spin for an electron (up or down) there can only be two electrons per orbital.**

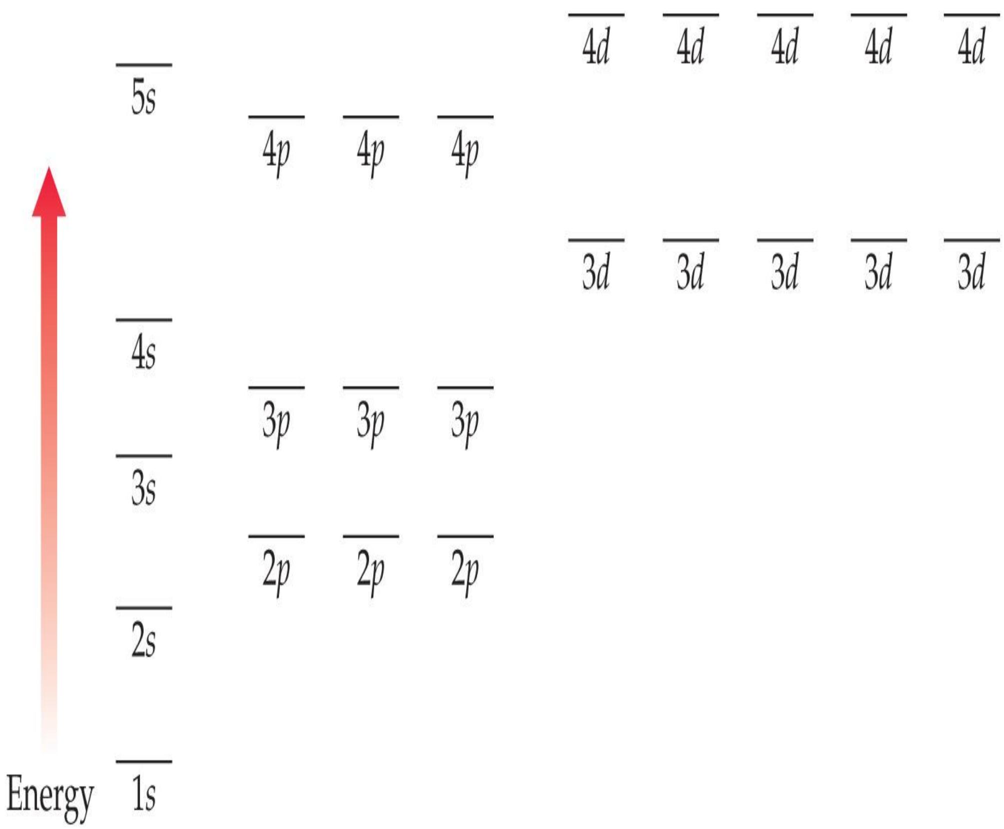
Shell	Number of subshells	Letters specifying subshells			
$n = 4$	4	s	p	d	f
$n = 3$	3	s	p	d	
$n = 2$	2	s	p		
$n = 1$	1	s			



Filling rules:

1. **Fill from low to higher energy.**
2. **Fill orbitals of the same energy halfway before filling any completely**
3. **Only two electrons per orbital, and must have opposite spin.**


4d 4d 4d 4d 4d
5s
4p 4p 4p
3d 3d 3d 3d 3d
4s
3p 3p 3p
3s
2p 2p 2p
2s
Energy
1s


4d 4d 4d 4d 4d
5s
4p 4p 4p
3d 3d 3d 3d 3d
4s
3p 3p 3p
3s
2p 2p 2p
2s
Energy
1s

Write the complete (not abbreviated) electron configurations for the following elements:

1. Be:

2. S:

3. Te:

4. Cr:

Write the Abbreviated electron configurations for the following elements:

5. Cu:

6. Ba:

7. Rb:

8. Mg:

9. P:

10. Zr:

How many valence electrons do atoms of the following elements have?

Element	**# of Valence**	**Element**	**# of Valence**
Be		Ba	
S		Rb	
Te		Mg	
Cr		P	
Cu		Zr	