

# Quantum Mechanical Model of an Atom

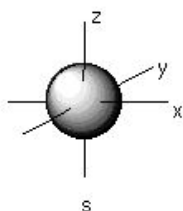
The quantum mechanical model determines the allowed energies an electron can have and how likely it is to find the electron in various locations around the nucleus.

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

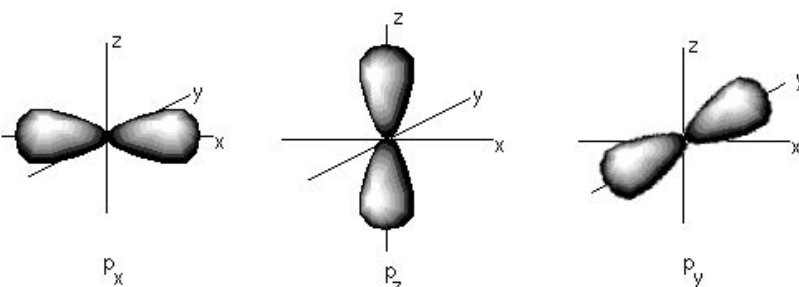
Principal quantum numbers ( $n$ ) represent energy levels of electrons (i.e.,  $n = 1, 2, 3, 4$ , etc.)

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

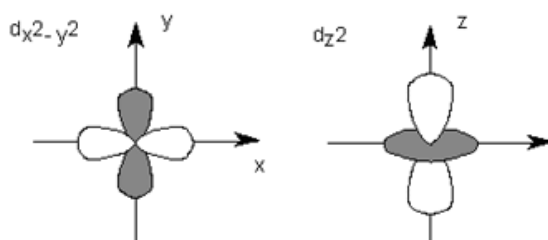
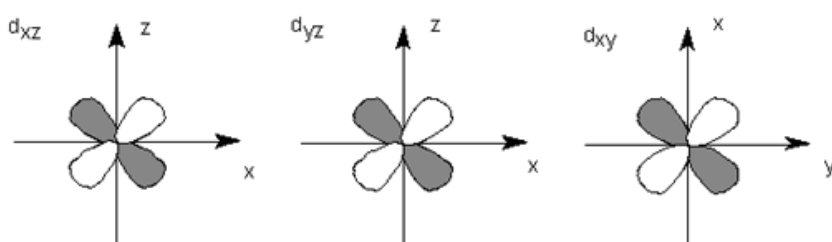
**s orbital**



**p orbitals**



**d orbitals**



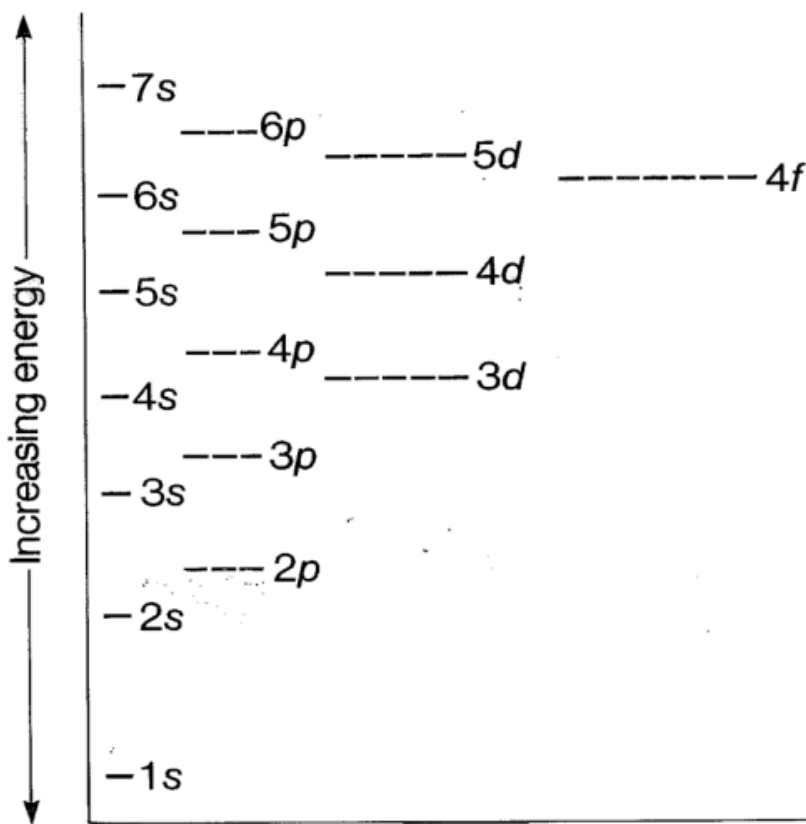


<b>Principal Energy Level</b>	<b>Number of Sublevels</b>	<b>Type of Sublevel</b>	<b>Number of Orbitals (<math>n^2</math>)</b>	<b>Number of Electrons (<math>2n^2</math>)</b>
n = 1	1	1s (1 orbital)		
n = 2	2	2s (1 orbital), 2p (3 orbitals)		
n = 3	3	3s (1 orbital), 3p (3 orbitals), 3d (5 orbitals)		
n = 4	4	4s (1 orbital), 4p (3 orbitals), 4d (5 orbitals), 4f (7 orbitals)		

# 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).

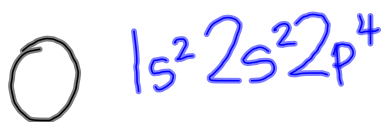
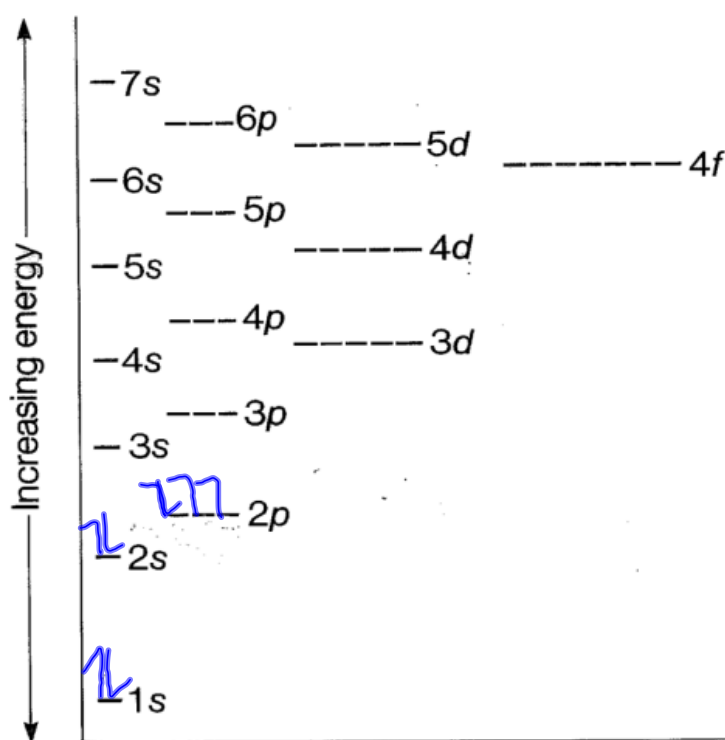
# Aufbau Diagram



**Aufbau principle** - electrons occupy orbitals of lowest energy first

**Pauli exclusion principle** - an atomic orbital can describe at most two electrons

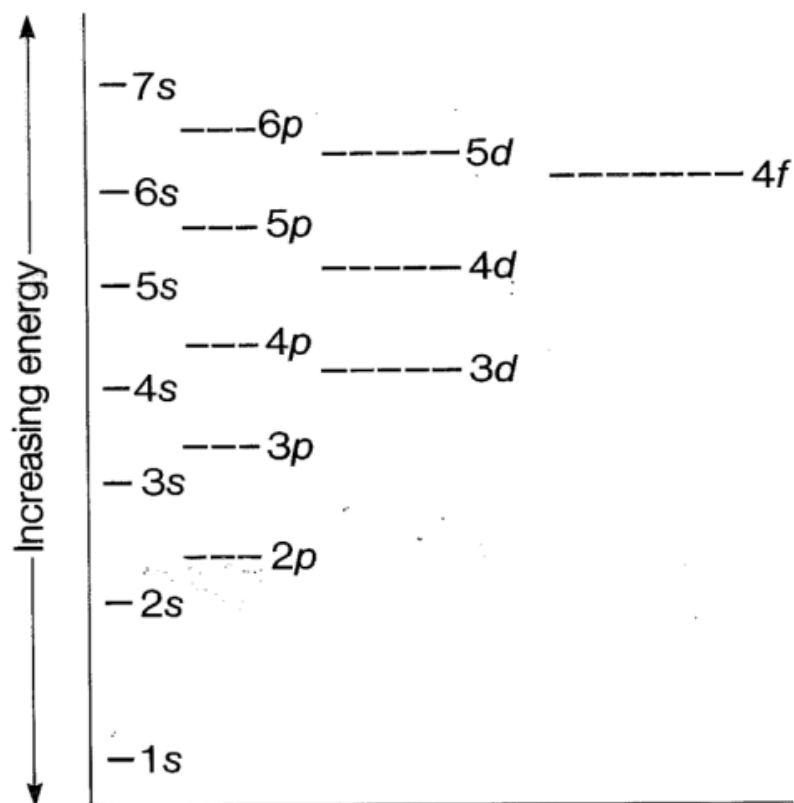
**Hund's rule** - one electron enters each orbital until all orbitals contain one electron with the same spin

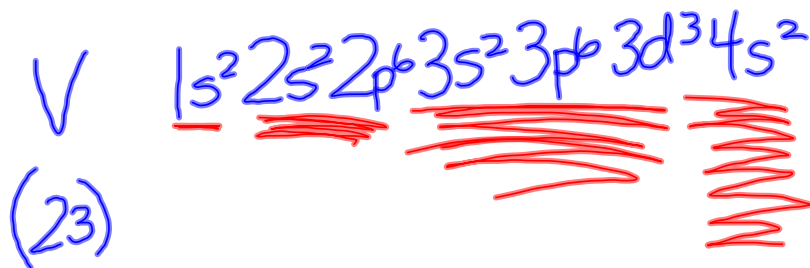
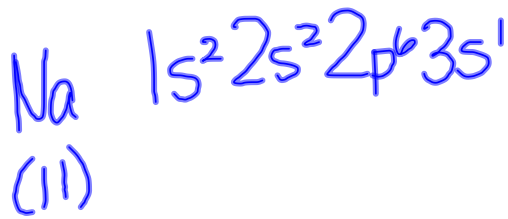
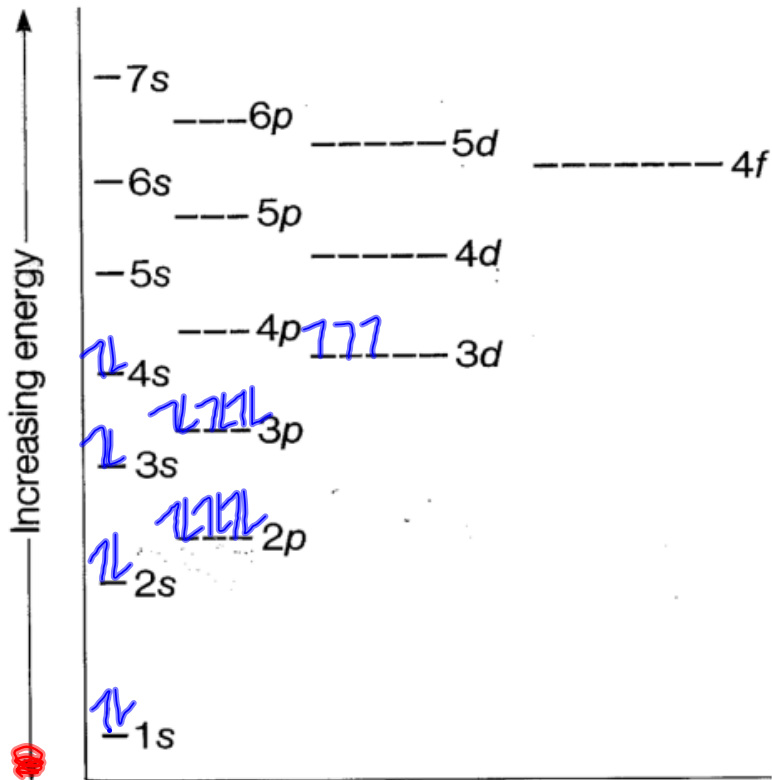


(8)

Na

V



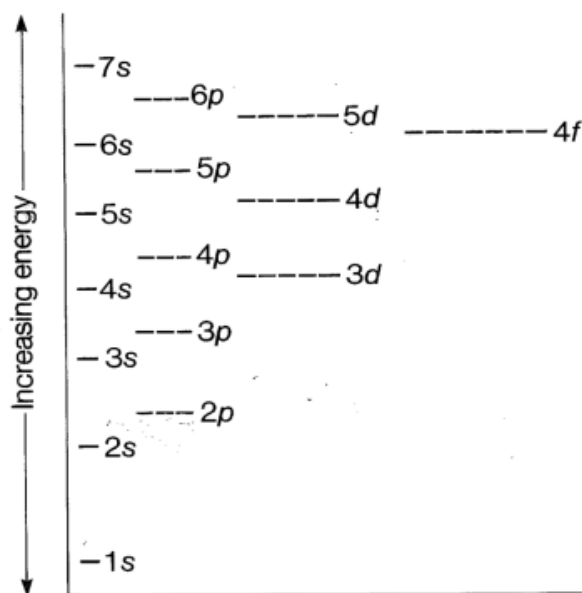




## Exceptional Electron Configurations

Although half-filled sublevels are not as stable as filled sublevels, they are more stable than other configurations.

- more likely to occur at higher principal quantum numbers, because of the small energy differences between sublevels.



# Homework

**Section 5.1 & 5.2      p. 128 - 137**

**p. 132 #1-7**

**p. 135 #8-9**

**p. 136 #10-13**