Homework - Ions Worksheet

(5) silicon atom	Si	14	14	0	0
(11) calcium ion	Ca^{2+}	20	18	lost 2	2+
(107) unnilseptium atom	Uns	107	107	0	0

1

Uus 111

Quantum Mechanical Model of an Atom

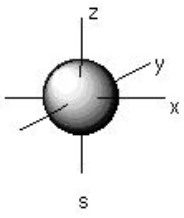
The quantum mechanical model determines the allowed energies an electron can have and how likely it is to find the electron in various locations around the nucleus. "probabilistic model"

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

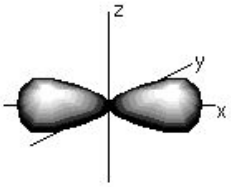
Principal quantum numbers (**n**) represent energy levels of electrons (i.e., n = 1, 2, 3, 4, etc.)

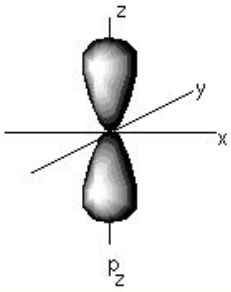
There may be several orbitals with different shapes at different energy levels.

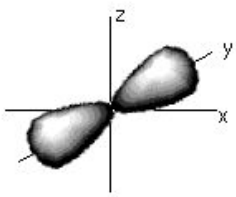
s orbital



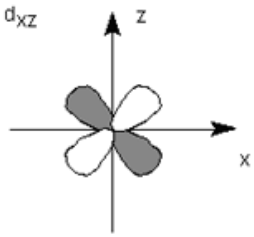
p orbitals

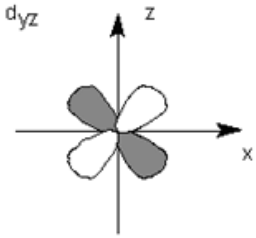


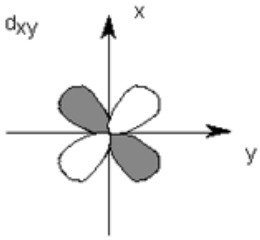


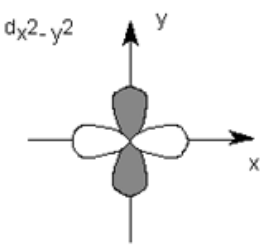


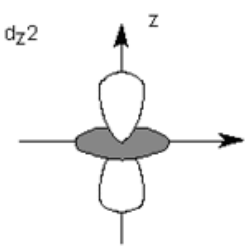
d orbitals











Bohr	Quantum
• orbitting nucleus ↓ exact location • electrons in orbits (shells, rings, etc.)	• outside nucleus ↓ probability • electrons in atomic orbitals

Principal Energy Level	Number of Sublevels	Type of Sublevel	Number of Orbitals (n^2)	Number of Electrons ($2n^2$)
n = 1	1	1s (1 orbital)	1	2
n = 2	2	2s (1 orbital), 2p (3 orbitals)	4	8
n = 3	3	3s (1 orbital), 3p (3 orbitals), 3d (5 orbitals)	9	18
n = 4	4	4s (1 orbital), 4p (3 orbitals), 4d (5 orbitals), 4f (7 orbitals)	16	32

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 $1s^1$

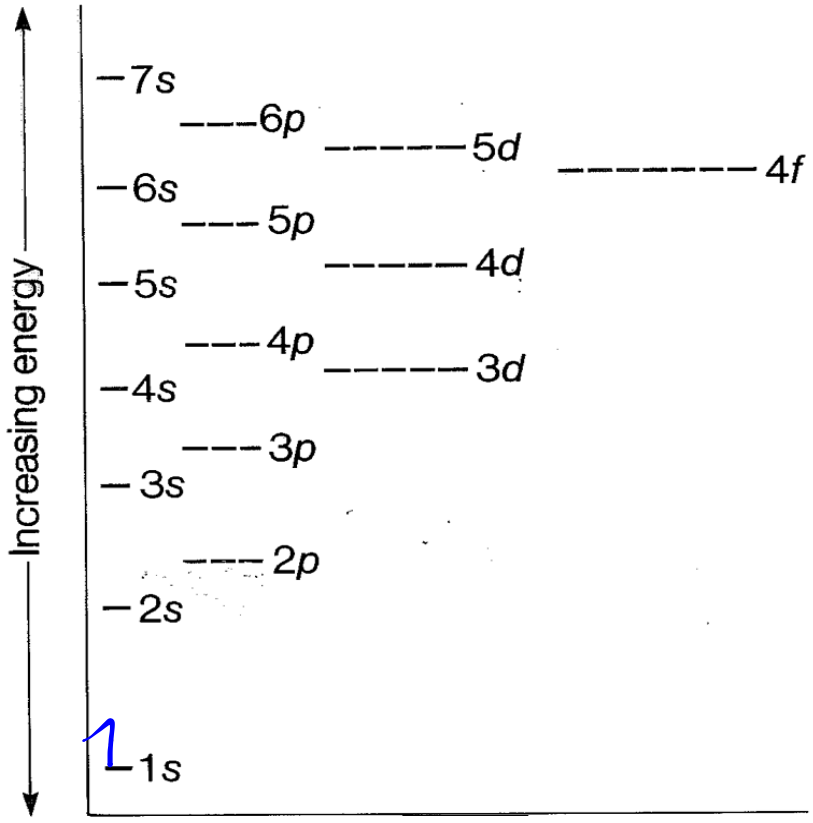
(1)

He

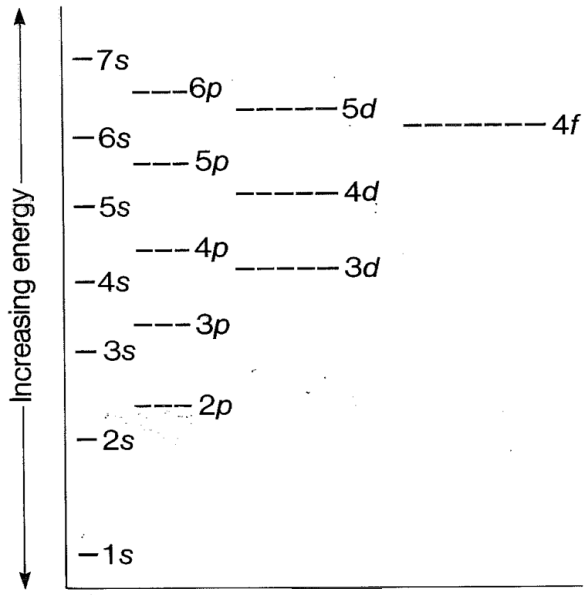
(2)

O

Aufbau Diagram

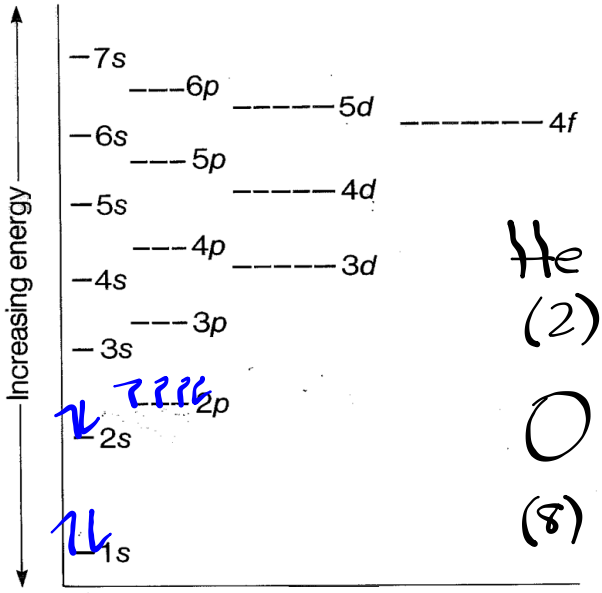


Aufbau principle - electrons occupy orbitals of lowest energy first



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



He $1s^2$

(2)

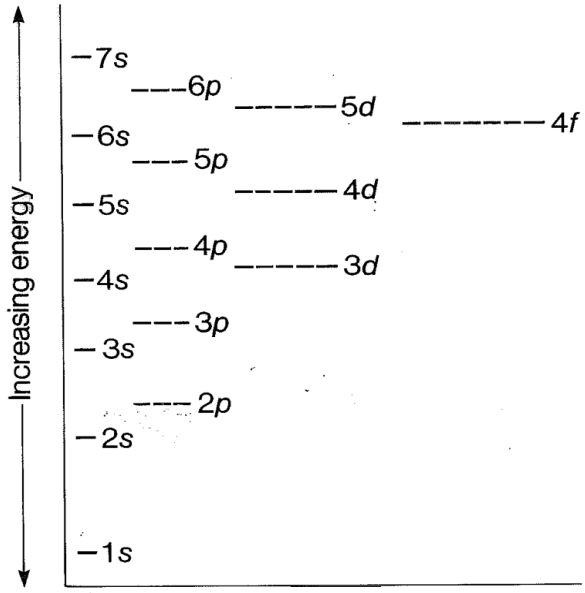
O $1s^2 2s^2 2p^4$

(8)

Ne

Al

Cr


Increasing energy
7s
6p
5d
4f
6s
5p
4d
5s
4p
3d
4s
3p
3s
2p
2s
1s