

Section 3

Electron Configurations



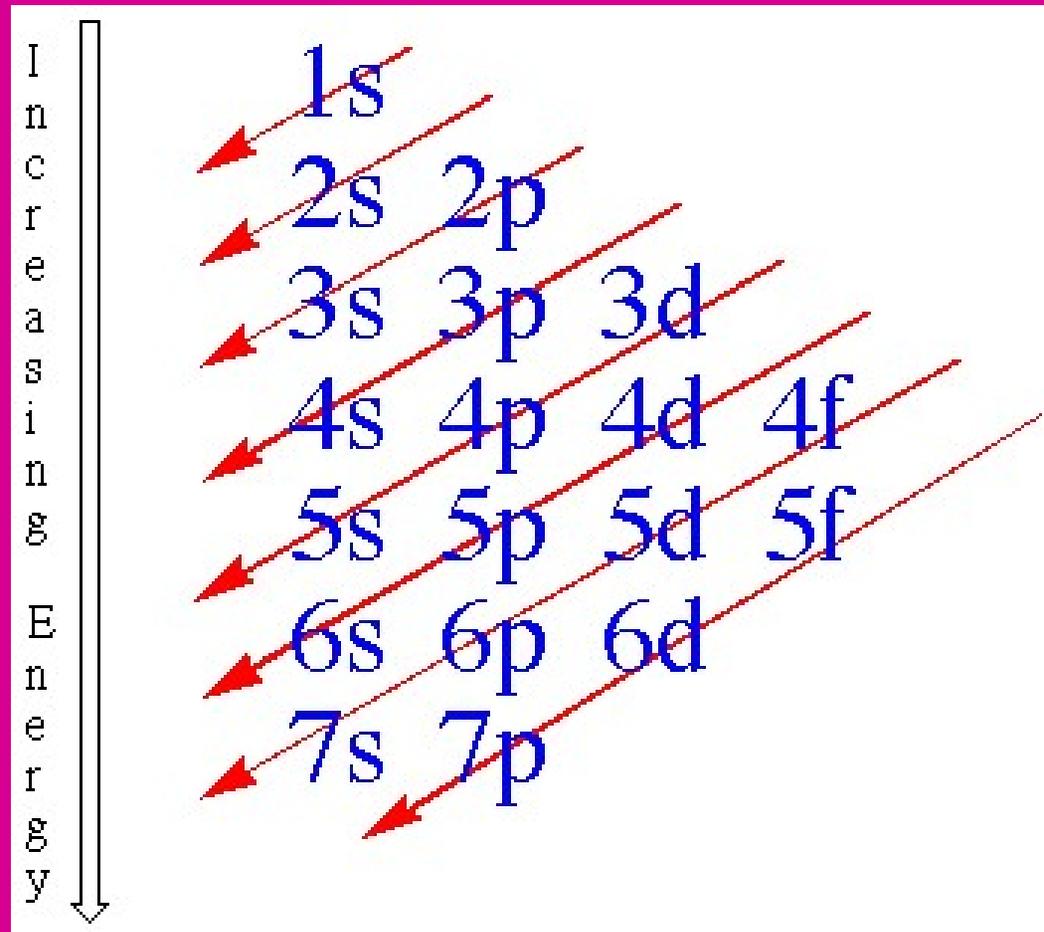
Aufbau Principle

Electrons occupy lowest energy orbital available

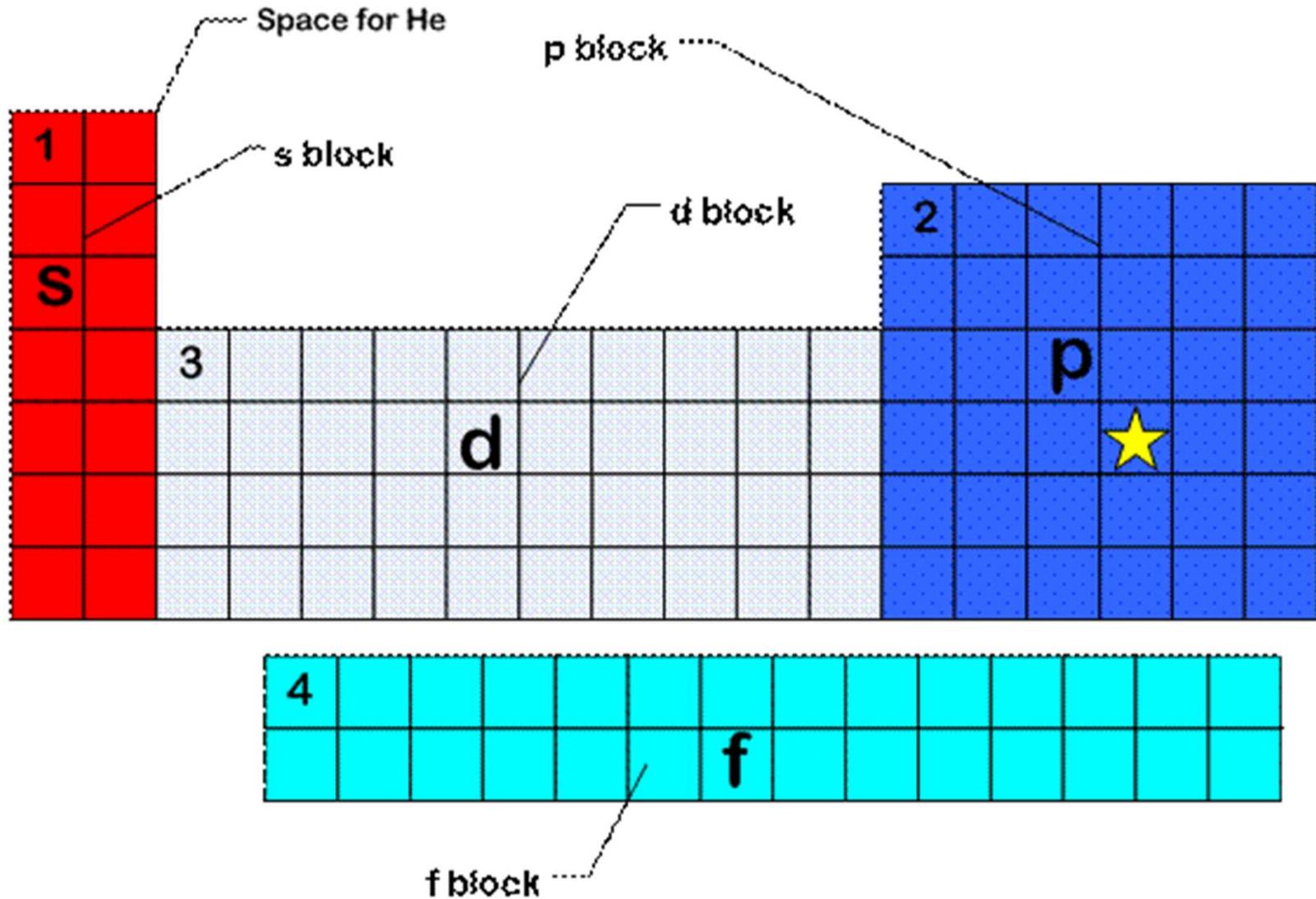
- Within a principal energy level: s, p, d, f**
- Orbitals within one principal energy level can overlap orbitals of another**



Electron Filling Order

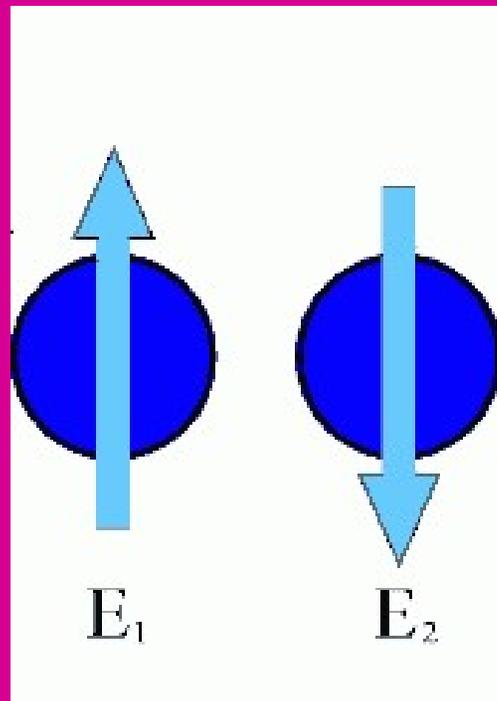


Periodic Table Helps!



Pauli Exclusion Principle

- Maximum of 2 electrons in an orbital, but only if they have opposite spin.



Hund's rule

- Electrons with same spin must occupy each equal energy orbital before additional electrons with opposite spins can occupy the same orbital.



1) Electron Configuration Notation

- Pattern of: number, letter, superscript



subshell designation



of electrons in subshell

Electron Configuration Notation

- **Ex: N**
 - # of electrons?
- **Use the fill order. Start with the lowest energy, fill to capacity, go to next lowest energy, etc. Stop when you run out of electrons.**
 - **Superscripts = total electrons**



Electron Configuration Notation

- You try ... Zinc



Electron Configuration Notation

- Answer:



2) Noble Gas Notation

- Shorthand
 - Find the noble gas closest to the element (without going over).
 - Ex: For Gold (79): Xenon (54)
 - We write [Xe] and start counting from there
 - The first orbital after xenon is 6s



Noble Gas Notation

- $[\text{Xe}]6s^2 4f^{14} 5d^9$
- Check: (Xe's atomic number) $54 + 2 + 14 + 9 = 79$ (gold's Atomic number)!



You Try...

- Silver



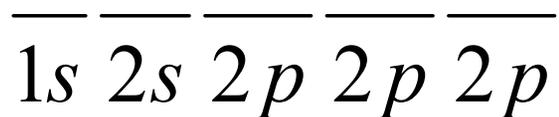
3) Orbital Diagrams

- Show the orbital distributions of electrons related to a sublevel
- Include a line for each orbital
 - $\boxed{\uparrow}$ = orbital with 1 electron
 - $\boxed{\uparrow\downarrow}$ = orbital with 2 electrons

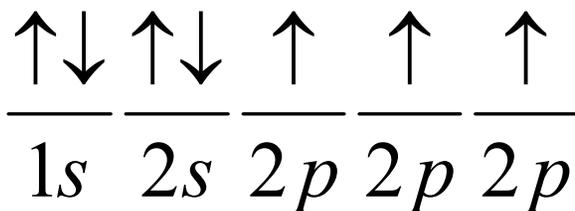


Orbital Diagrams

- Nitrogen: $1s^2 2s^2 2p^3$
 - Write notation of N



- Then we fill them with electrons using the Aufbau principle, Pauli exclusion principle, and Hund's law



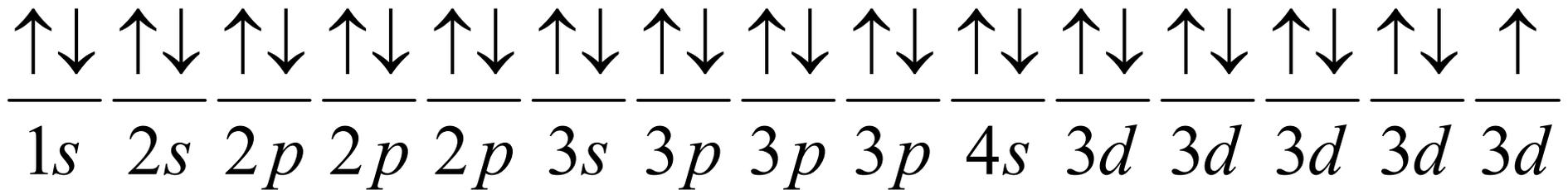
Orbital Diagrams

- You try another example: Cu



Orbital Diagrams

- Answer



4) Electron Dot Structures

- Valence electrons
 - Electrons in outermost energy level.
 - Responsible for chemical properties



Electron Dot Structures

- Valence electrons only
- Place 'dots' around element symbol
- 4 sides of element = orbitals
- Fill these orbitals one at a time (Hund's)



Electron Dot Structures

1	2	13	14	15	16	17	18
H•							He:
Li•	•Be•	•B•	•C•	:N•	:O•	:F•	:Ne:
Na•	•Mg•	•Al•	•Si•	:P•	:S•	:Cl•	:Ar:
K•	•Ca•				:Se•	:Br•	:Kr:
Rb•	•Sr•				:Te•	:I•	:Xe:
Cs•	•Ba•						



Assignment

- P.141 #23(yellow box), 26, 28
- P.147 #81

