Chapter 8
Electronic Configurations – 2
Exceptions, Properties, Ionic Configruations, etc.

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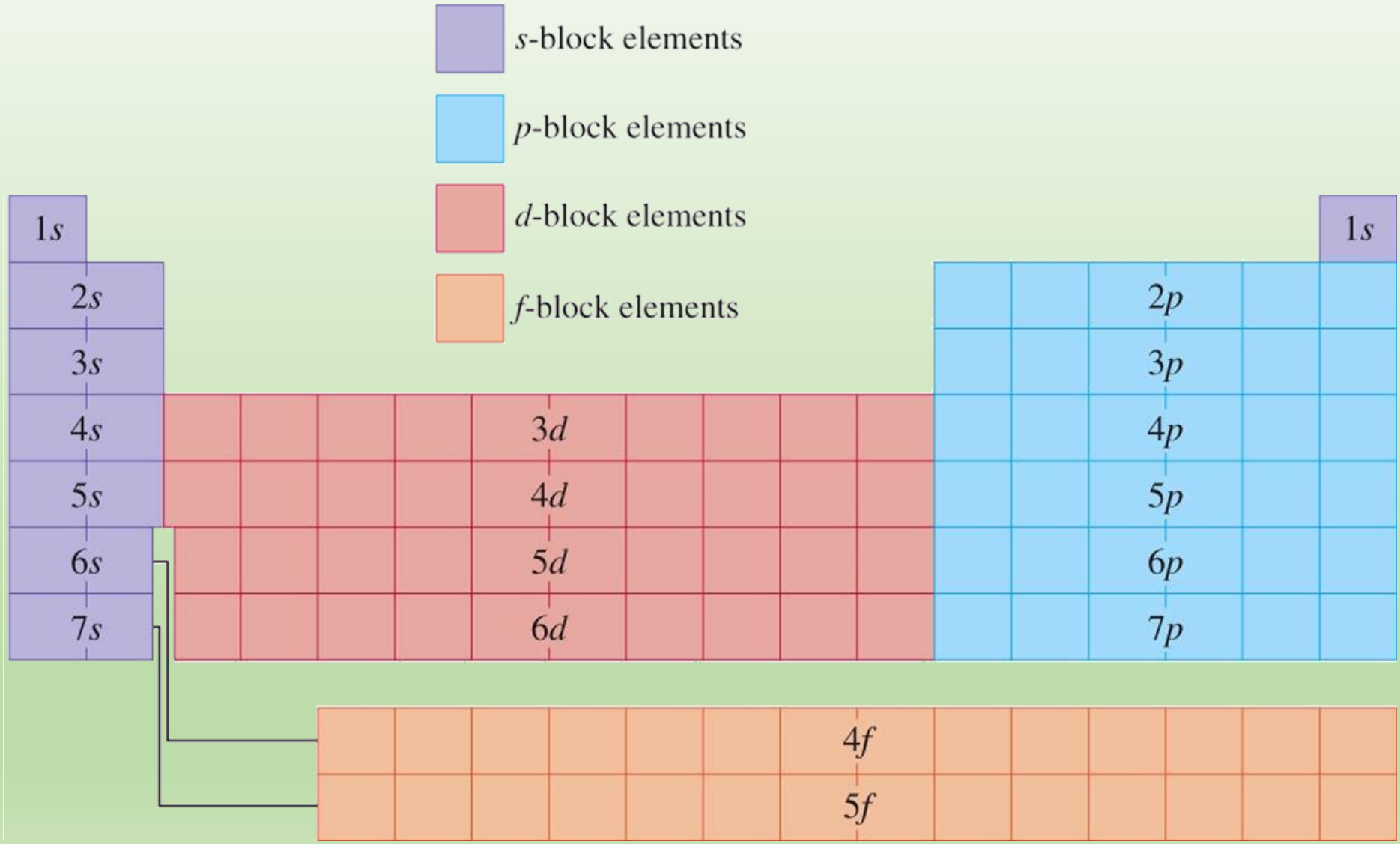
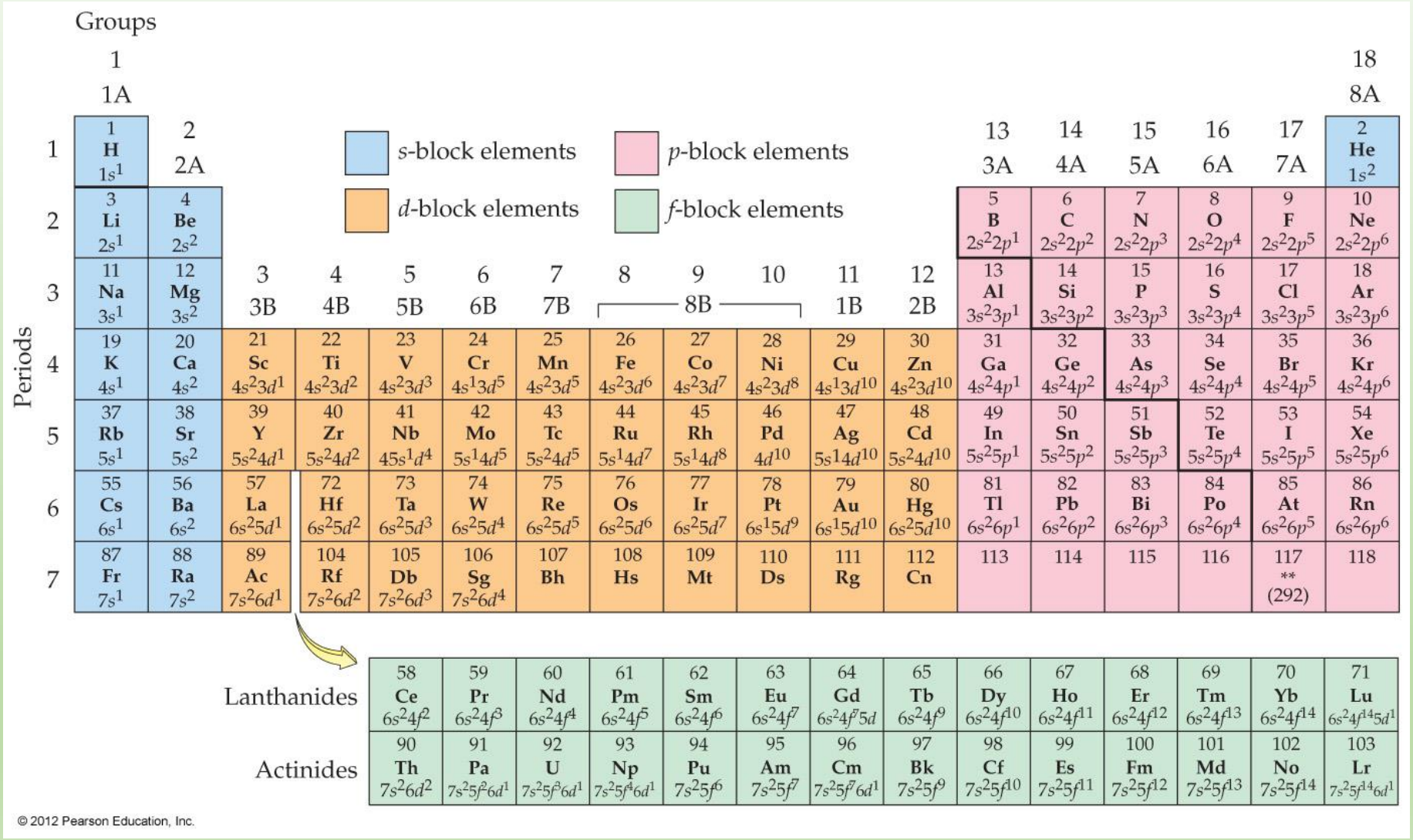
Exceptions

- There are a things to watch out for when filling out shells.
  - Fill s in the higher n number before starting d:
    - Fill the 4s before 3d because of energy consideration. Same goes for 5s before 4d.
  - Fill s completely before d for two columns
    - Chromium (4^{th} column in transition metals) and elements below: Should be $4s^2, 3d^4$; But is **$4s^1, 3d^5$** (for Mo: $5s^1, 4d^5$) This is to make the d configuration more stable.
    - Copper and the elements below it are filled as: Should be $4s^2\ 3d^9$; But is **$4s^1, 3d^{10}$** (for Ag: $5s^2, 4d^{10}$)

The Periodic Table Divided in Blocks

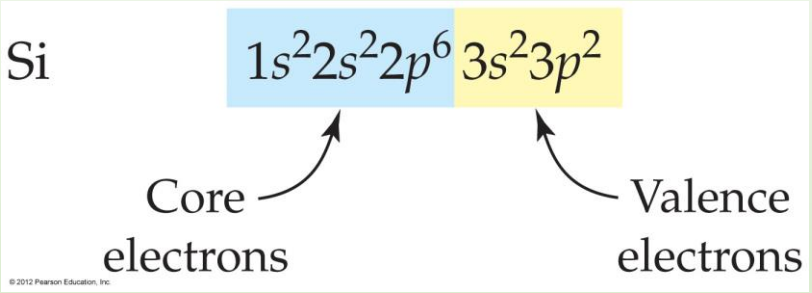


Electronic Configuration of Periodic Table

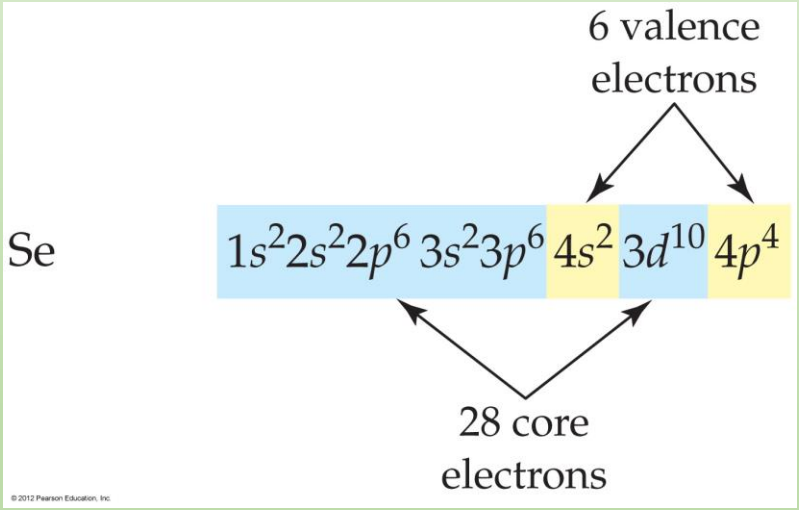


Valence and Core Electrons

- Silicon has 4 valence electrons (those in the $n = 3$ principal shell) and 10 core electrons.



- Selenium has 6 valence electrons (those in the $n = 4$ principal shell). All other electrons, including those in the 3*d* orbitals, are core electrons.



Noble Gas Configurations

- This helps to shorten the electronic configurations so we don't have to write long notations.
- Take the noble gas of the previous period and continue on filling with the rest of the electrons.
- E.g. Bromine configuration is:

$$1s^2 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10} 4s^2 4p^5$$

- But the noble gas configuration is:

$$[\mathrm{Ar}] 3d^{10} 4s^2 4p^5$$

(*It is important to remember that the "d" electrons are core so the only the s and p electrons are valence electrons*)

Configurations for Ions

- Cations: remove the valence shell electrons of the higher energy first.

  Al: $1s^2 2s^2\ 2p^6\ 3s^2\ 3p^1$

  Al^{3+}: $1s^2 2s^2\ 2p^6$

- Anions: add the electrons to the lower subshell of valence shell.

  S: $1s^2 2s^2\ 2p^6\ 3s^2\ 3p^4$

  S^{2-}: $1s^2 2s^2\ 2p^6\ 3s^2\ 3p^6$

Paramagnetism and Diamagnetism

A **paramagnetic substance** is one that is weakly attracted by a magnetic field, usually as the result of *unpaired electrons*.

A **diamagnetic substance** is not attracted by a magnetic field generally because it has *only paired electrons*.

Visit UC Davis ChemWiki for more information.

Key Words

- Noble gas configuration
- Valence and core electrons
- Electronic configuration of ions
- Paramagnetism
- Diamagnetism