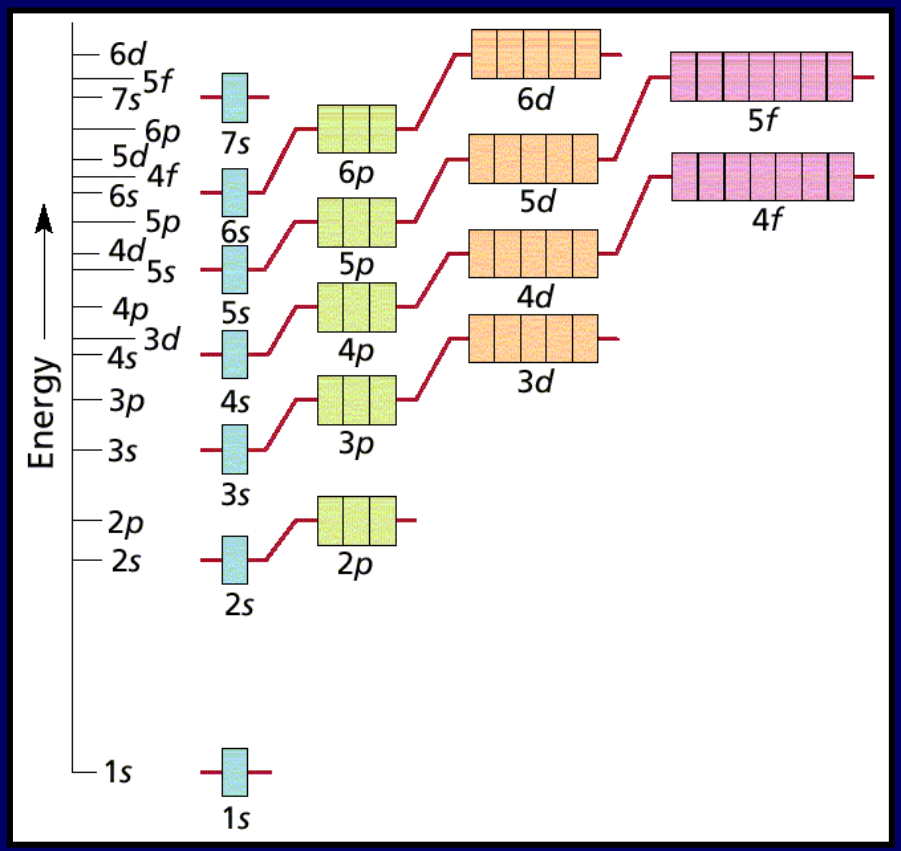
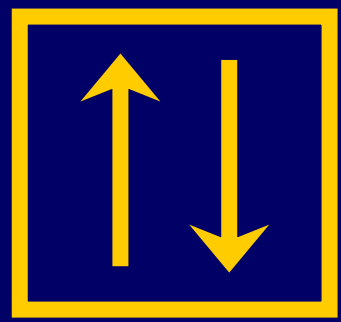
Ch. 4 - Electrons in Atoms



IV. Electron Configuration (p. 105 - 116, 128 - 139)

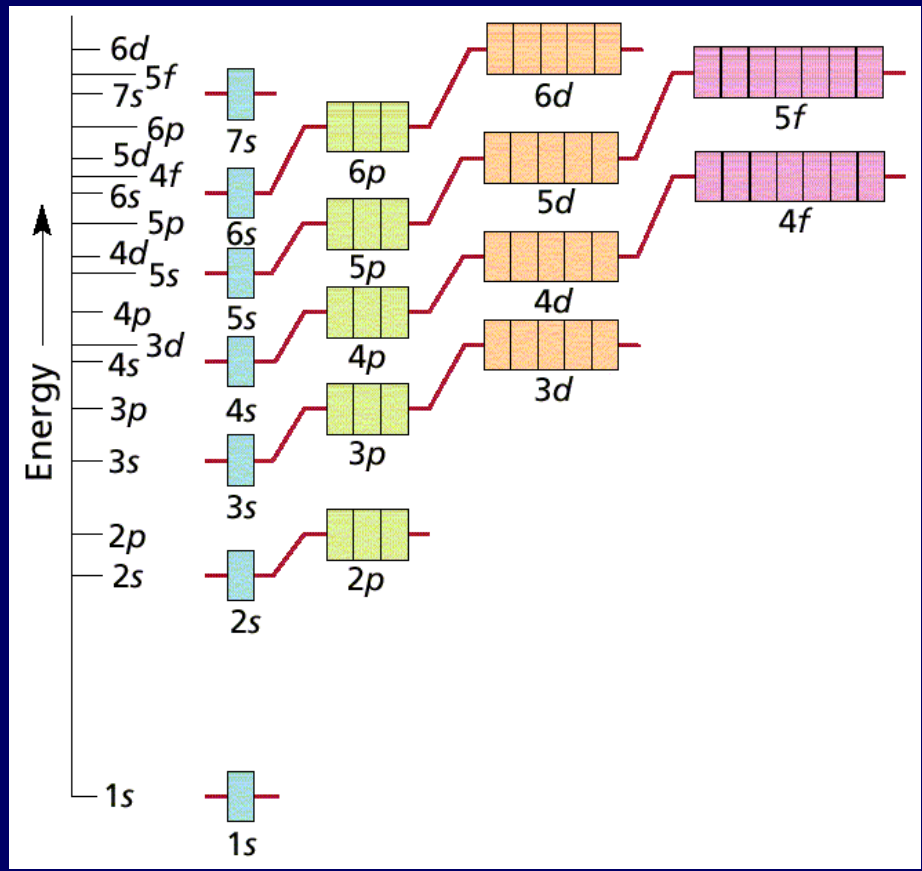
A. General Rules

- **Pauli Exclusion Principle**
  - Each orbital can hold TWO electrons with opposite spins.



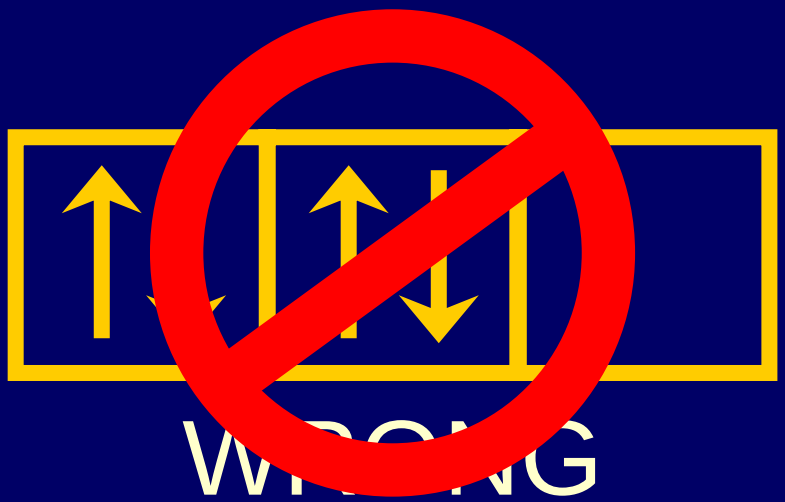
A. General Rules

- **Aufbau Principle**
  - Electrons fill the lowest energy orbitals first.
  - "Lazy Tenant Rule"

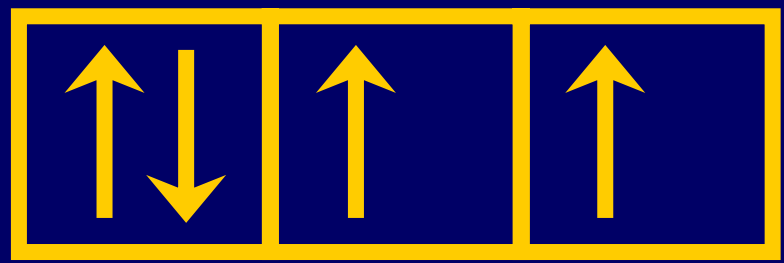


A. General Rules

- **Hund's Rule**
  - Within a sublevel, place one e^- per orbital before pairing them.
  - "Empty Bus Seat Rule"



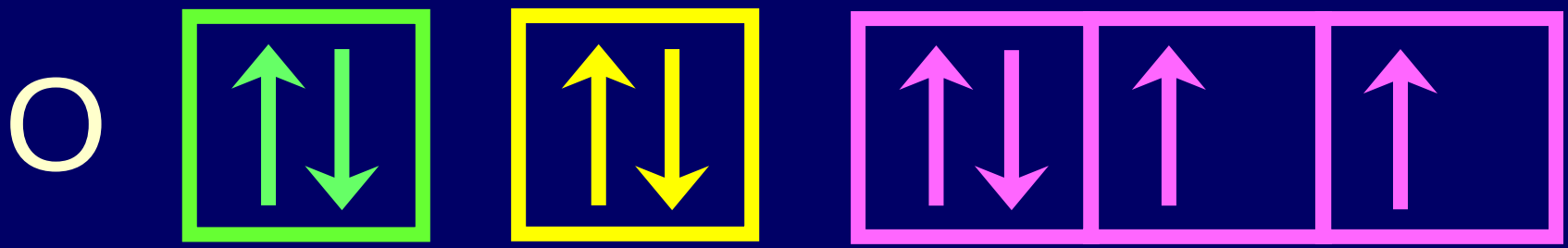
WRONG



RIGHT

B. Notation

- **Orbital Diagram**



- **Electron Configuration**

$$1s^2\ 2s^2\ 2p^4$$

B. Notation

- **Longhand Configuration**

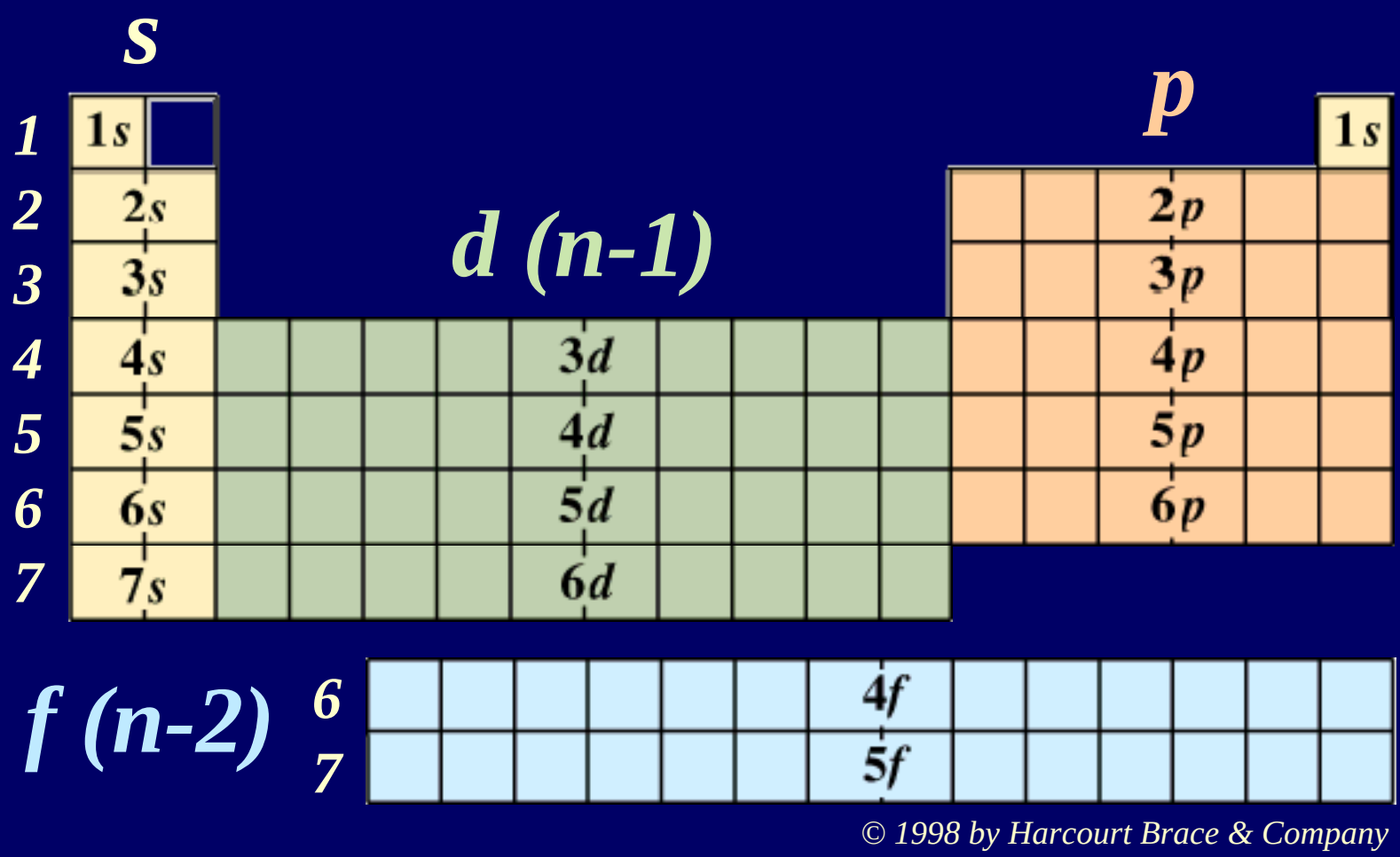
S 16e$^-$ $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$

Core Electrons **Valence Electrons**

- **Shorthand Configuration**

S 16e$^-$ [Ne] $3s^2\ 3p^4$

C. Periodic Patterns



C. Periodic Patterns

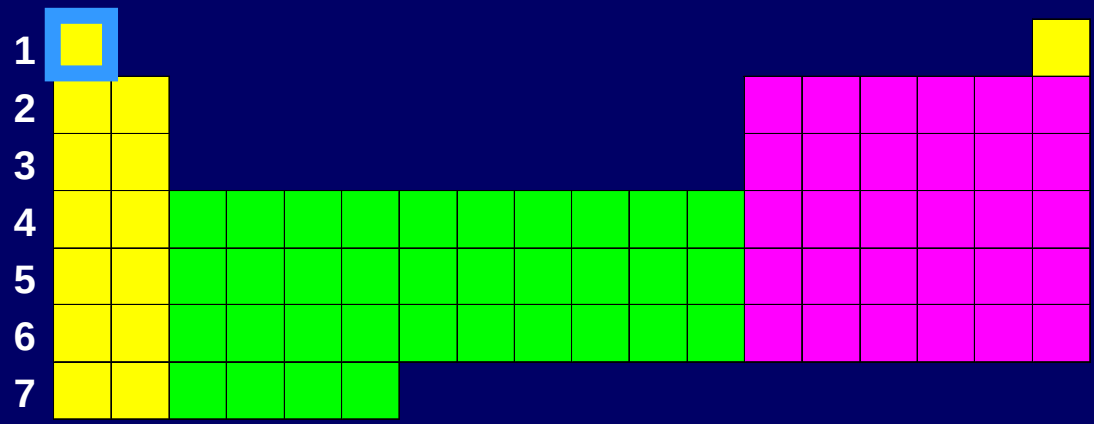
- **Period #**
  - energy level (subtract for d & f)

- **A/B Group #**
  - total # of valence e^-

- **Column within sublevel block**
  - # of e^- in sublevel

C. Periodic Patterns

- **Example -** Hydrogen



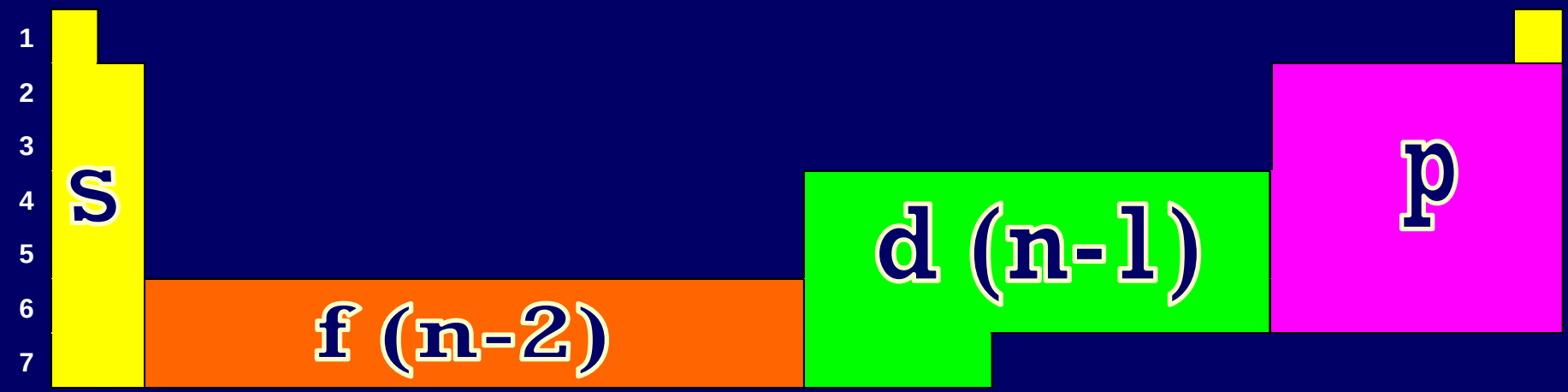
$1s^1$ ← 1st column of s-block

1st Period

s-block

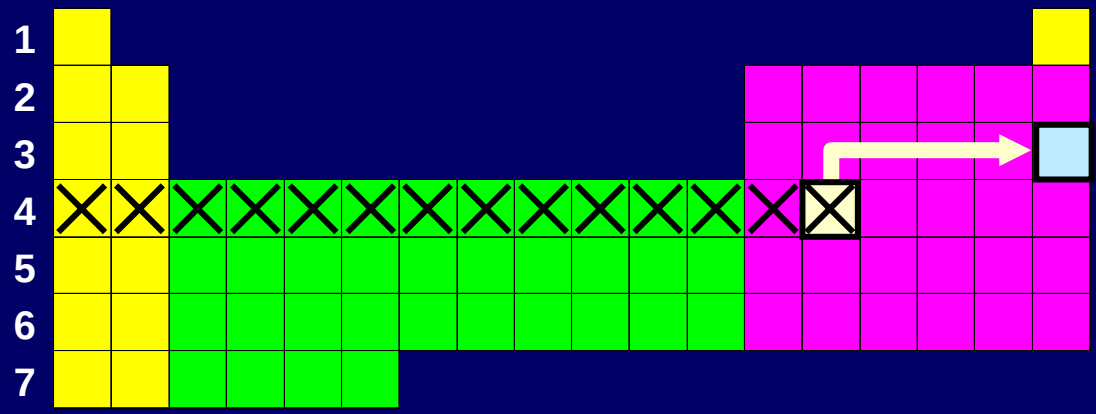
C. Periodic Patterns

- **Shorthand Configuration**
  - **Core e^-:** Go up one row and over to the Noble Gas.
  - **Valence e^-:** On the next row, fill in the # of e^- in each sublevel.



C. Periodic Patterns

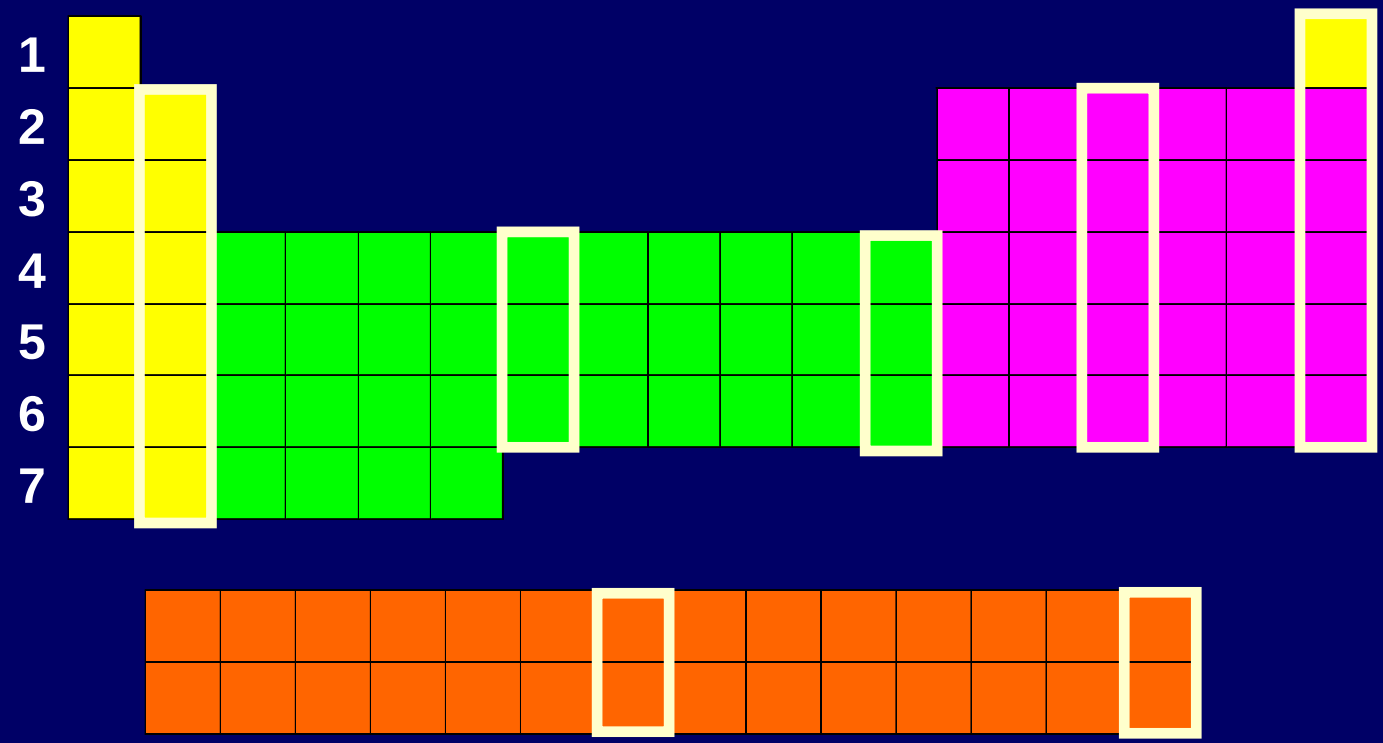
- **Example -** Germanium



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

D. Stability

- Full energy level
- Full sublevel (s, p, d, f)
- Half-full sublevel



D. Stability

- **Electron Configuration Exceptions**
  - Copper

    EXPECT: [Ar] $4s^2$ $3d^9$

    ACTUALLY: [Ar] $4s^1$ $3d^{10}$

  - Copper gains stability with a full d-sublevel.

D. Stability

- **Electron Configuration Exceptions**
  - Chromium

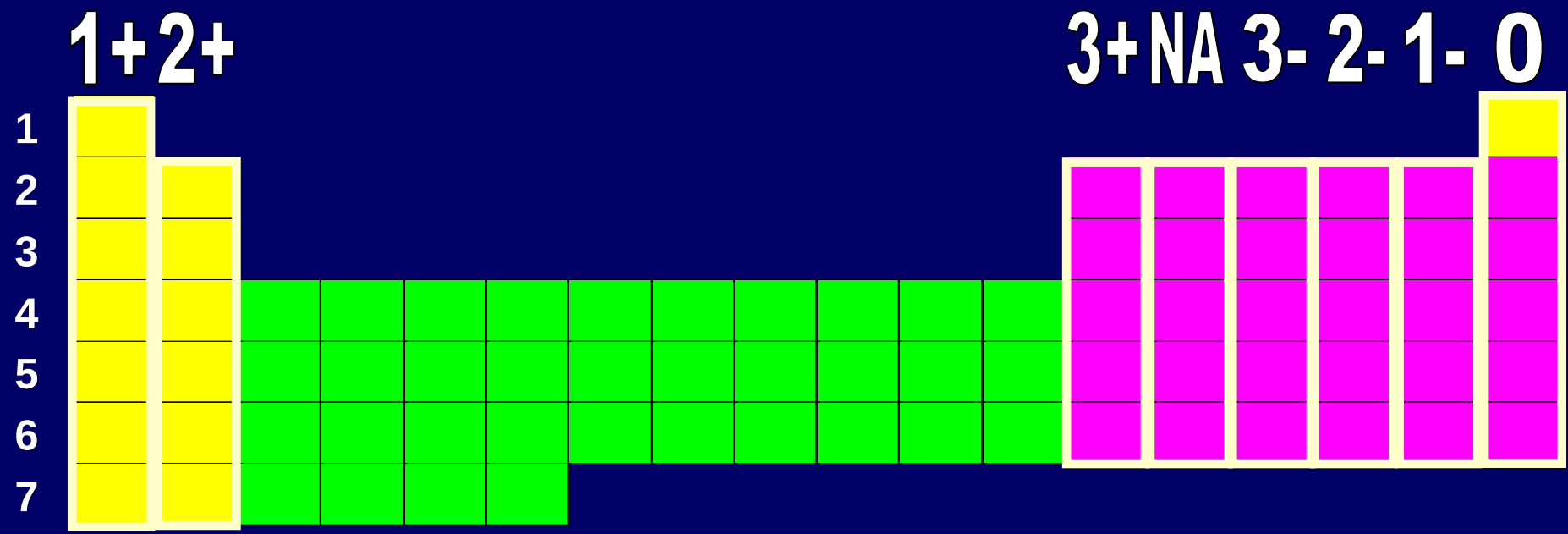
    EXPECT: [Ar] $4s^2$ $3d^4$

    ACTUALLY: [Ar] $4s^1$ $3d^5$

  - Chromium gains stability with a half-full d-sublevel.

D. Stability

- **Ion Formation**
  - Atoms gain or lose electrons to become more stable.
  - Isoelectronic with the Noble Gases.



D. Stability

- **Ion Electron Configuration**
  - Write the e^- config for the closest Noble Gas
  - EX: Oxygen ion $\rightarrow$ $O^{2-} \equiv$ Ne

O^{2-} $10e^-$ $[He]\ 2s^2\ 2p^6$