CONCEPT: THE ELECTRON CONFIGURATION: EXCEPTIONS (SIMPLIFIED)

Electron Orbital Stability

● ***d*** subshell orbitals are most stable when they are half-filled or totally-filled with electrons because of symmetry.

Symmetrical Distribution

Half-Filled	Totally-Filled
d ☐ ☐ ☐ ☐ ☐	d ☐ ☐ ☐ ☐ ☐

Exceptions to Electron Configurations

● Starting from chromium, as the atomic number (Z) _____, **exceptions** to electron configurations can be observed.

MEMORY TOOL Chromium (Z = **24**) and there are **2** and **4**. To get to the other column remember **2** skip next **4**.

	3B	4B	5B	6B	7B	8B			1B	2B
	3	4	5	6	7	8	9	10	11	12
Period 4	21 Sc	22 Ti	23 V	24 **Cr**	25 Mn	26 Fe	27 Co	28 Ni	29 **Cu**	30 Zn
Period 5	39 Y	40 Zr	41 Nb	42 **Mo**	43 Tc	44 Ru	45 Rh	46 Pd	47 **Ag**	48 Cd
Period 6	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 **Au**	80 Hg
Period 7	89 Ac	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 **Rg**	112 Cn

□ An s orbital electron can be promoted to create half-filled orbitals with _____- elements.

Cr (Z = 24) $[Ar]\ 4s^2 3d^4$

[Ar] ↑↓ ↑ ↑ ↑ ↑ ☐
4s 3d

Cr (Z = 24) $[Ar]\ 4s^{\square} 3d^{\square}$

[Ar] ☐ ☐ ☐ ☐ ☐ ☐
4s 3d

□ An s orbital electron can be promoted to create completely-filled orbitals with _____- elements.

Cu (Z = 29) $[Ar]\ 4s^2 3d^9$

[Ar] ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑
4s 3d

Cu (Z = 29) $[Ar]\ 4s^{\square} 3d^{\square}$

[Ar] ☐ ☐ ☐ ☐ ☐ ☐
4s 3d

EXAMPLE: Based on the exceptions, provide the condensed electron configuration for the silver atom.

CONCEPT: THE ELECTRON CONFIGURATION: EXCEPTIONS (SIMPLIFIED)

PRACTICE: Illustrate the exception to the electron configuration of molybdenum.

Mo (Z = 42) [ ] ☐ ☐ ☐ ☐ ☐ ☐

PRACTICE: Which of the following is the correct electron configuration of gold?

a) [Xe] $6s^2 4f^{14} 5d^9$

b) [Ar] $5s^1 4f^{14} 5d^{10}$

c) [Xe] $6s^1 5d^{10}$

d) [Xe] $6s^1 4f^{14} 5d^{10}$

e) [Xe] $6s^1 4f^1 5d^{10}$

PRACTICE: A comparison of the electron configurations of palladium (Pd) and silver (Ag) indicates that:

a) Ag has 2 more *d* electrons and the same number of *s* electrons as Pd.

b) Ag has 1 more *d* electron and the same number of *s* electrons as Pd.

c) Ag has 2 more *d* electrons and 1 less *s* electron than Pd.

d) Ag has 1 more *d* electron and 1 less *s* electron than Pd.

e) Ag has 1 more *d* electron and 1 more *s* electron than Pd.