

Aufbau principle $\longleftrightarrow$ filling up principle $\longrightarrow$ just use the periodic table, go from left to right and you only have three exceptions to worry about.

1. Cr, Mo, W, according to aufbau, would have d^4s^2 but it's more stable to have 5 half-filled orbitals so it changes to d^5s^1 .
2. Cu, Ag, Au, according to aufbau, it would have d^9s^2 but again, the s electron jumps to the d-orbital to gain more stability and thus these guys have an outer electron configuration of $d^{10}s^1$.
3. When you begin and end the inner transition metals. Starting at the sixth-period Element 56, Barium has an electronic configuration $[Xe]6s^2$, then comes lanthanum with the first d-electron $[Xe]6s^25d^1$. Now the inner-transition metals have to fit in and the electrons for them go into f-orbitals. That lone d-electron is unstable when filling up the f-sublevel and jumps into an f-orbital until the sublevel is full. So Cerium has an electronic configuration $[Xe]6s^25d^14f^1$. When you get to the end, filling up the f-sublevel, the electron pops back into the d-sublevel. So, Lutetium has an electronic configuration $[Xe]6s^25d^14f^{14}$.

1s ¹																	1s ²
2s ¹	2s ²											2p ¹	2p ²	2p ³	2p ⁴	2p ⁵	2p ⁶
3s ¹	3s ²											3p ¹	3p ²	3p ³	3p ⁴	3p ⁵	3p ⁶
4s ¹	4s ²	3d ¹	3d ²	3d ³	4s ¹ 3d ⁵	3d ⁵	3d ⁶	3d ⁷	3d ⁸	4s ¹ 3d ¹⁰	3d ¹⁰	4p ¹	4p ²	4p ³	4p ⁴	4p ⁵	4p ⁶
5s ¹	5s ²	4d ¹	4d ²	4d ³	5s ¹ 4d ⁵	4d ⁵	4d ⁶	4d ⁷	4d ⁸	5s ¹ 4d ¹⁰	4d ¹⁰	5p ¹	5p ²	5p ³	5p ⁴	5p ⁵	5p ⁶
6s ¹	6s ²	5d ¹	5d ²	5d ³	6s ¹ 5d ⁵	5d ⁵	5d ⁶	5d ⁷	5d ⁸	6s ¹ 5d ¹⁰	5d ¹⁰	6p ¹	6p ²	6p ³	6p ⁴	6p ⁵	6p ⁶
7s ¹	7s ²	6d ¹	6d ²	6d ³	7s ¹ 6d ⁵	6d ⁵		6d ⁷									

5d ⁰ 4f ²	5d ⁰ 4f ³	5d ⁰ 4f ⁴	5d ⁰ 4f ⁵	5d ⁰ 4f ⁶	5d ⁰ 4f ⁷	6s ² 4f ⁷	5d ⁰ 4f ⁹	5d ⁰ 4f ¹⁰	5d ⁰ 4f ¹¹	5d ⁰ 4f ¹²	5d ⁰ 4f ¹³	5d ⁰ 4f ¹⁴	6s ² 4f ¹⁴
6d ⁰ 5f ²	6d ⁰ 5f ³	6d ⁰ 5f ⁴	6d ⁰ 5f ⁵	6d ⁰ 5f ⁶	6d ⁰ 5f ⁷	7s ² 5f ⁷	6d ⁰ 5f ⁹	6d ⁰ 5f ¹⁰	6d ⁰ 5f ¹¹	6d ⁰ 5f ¹²	6d ⁰ 5f ¹³	6d ⁰ 5f ¹⁴	7s ² 5f ¹⁴

Student Packet: 1.3: Electronic Structure: AssessMe questions

- 1) Which of the following electron configurations is not possible?
- A) $1s^2 2s^2 2p^6$
B) $1s^2 2s^2 2p^3$
C) $1s^2 2s^2 2p^6 3s^1$
D) $1s^2 2s^2 2p^6 2d^2$
E) I'm clueless
- 2) Which of the following refers to the ground-state electron configuration of an atom?
- A) $1s^1 2s^1$ B) $[Kr]5p^1$ C) $[Ne]3s^1 3p^2$ D) $[Ar]4s^2 3d^6$ E) I'm clueless
- 3) A neutral atom which has 42 electrons and a mass number of 93 has
- A) an atomic number of 51.
B) a nucleus containing 51 neutrons.
C) a nucleus containing 40 neutrons.
D) a nucleus containing 51 protons.
E) I'm clueless
- 4) The sublevel that can be occupied by a maximum of 10 electrons is identified by the letter
- A) d B) f C) p D) s E) I'm clueless
- 5) An orbital can never be occupied by
- A) 1 electron B) 2 electrons C) 3 electrons D) 0 electrons E) I'm clueless
- 6) The number of orbitals in the 2nd shell of an atom is
- A) 1 B) 9 C) 16 D) 4 E) I'm clueless

Student Packet: 1.3: Electronic Structure: ShowMe questions

1) Give the electronic structure of the following atoms:

- a) Ne
- b) Cl
- c) Ca

2) Give the electronic structure for the following transitional metals:

- a) Fe
- b) Cr
- c) Ag

3) Identify the element that corresponds to the following configurations:

- a) $[\text{Kr}]5s^24d^2$
- b) $[\text{Kr}]5s^24d^{10}5p^5$
- c) $[\text{Xe}]6s^24f^{10}$

4) How many unpaired electrons are in the following atoms?

- a) N
- b) Se
- c) Cr

5) Give the ground-state electronic configuration of the following ions:

- a) Co^{2+}
- b) F^-
- c) Mn^{3+}

Student Packet: 1.3: Electronic Structure: TestMe questions

- 1) The electronic configuration $[\text{Xe}]6s^14f^{14}5d^9$ corresponds to which of the following elements?
- A) Ir
 - B) Pt
 - C) Au
 - D) Pd
 - E) None of the above
- 2) How many unpaired electrons does Te have?
- A) 0
 - B) 1
 - C) 2
 - D) 3
 - E) 4
- 3) Which of the following sets are all isoelectronic species (atoms and ions have the same number of electrons)?
- A) Mn^+ , Fe, Co^{2+}
 - B) S^{2-} , Cl, Ar
 - C) Tc^+ , Mo, Ru^{3+}
 - D) Na^+ , Ne, F^-
 - E) H^+ , He, Na^+
- 4) Identify the set of elements that corresponds to the electron configuration:
 $[\text{noble gas}] ns^2(n-1)d^{10}np^3$
- A) P, As
 - B) Ge, Sn
 - C) Ga, In
 - D) As, Sb
 - E) As, Se
- 5) Which of the following electronic configurations corresponds to Fe^{3+} ?
- A) $[\text{Ar}] 4s^23d^3$
 - B) $[\text{Ar}] 3d^4$
 - C) $[\text{Ar}] 3d^5$
 - D) $[\text{Ar}] 4s^13d^4$
 - E) $[\text{Ar}] 4s^23d^4$