

# Electron Configurations And Orbital Notations

Name \_\_\_\_\_

Date \_\_\_\_\_ Per \_\_\_\_\_

**Orbital Notation**—While electron configurations provide some information about the location of electrons in an atom, orbital notations provide all four quantum numbers and thus, the “complete address” of electrons. Energy levels, sublevels, # of orbitals, and spin of electrons are all provided and shown with orbital notations.

## PART A – ELECTRON CONFIGURATIONS AND ORBITAL NOTATIONS

Use the patterns within the periodic table to write the orbital notation for the following atoms.

	Symbol	# e <sup>-</sup>	Electron configuration Orbital Notation
1.	Mg	12	$1s^2 2s^2 2p^6 3s^2$ $\uparrow\downarrow \uparrow\downarrow \uparrow\downarrow \uparrow\downarrow \uparrow\downarrow \uparrow\downarrow$ 1s    2s        2p        3s
2.	Ar	18	$1s^2 2s^2 2p^6 3s^2 3p^6$ $\frac{\uparrow\downarrow}{1s} \quad \frac{\uparrow\downarrow}{2s} \quad \frac{\uparrow\downarrow \uparrow\downarrow \uparrow\downarrow}{2p} \quad \frac{\uparrow\downarrow}{3s} \quad \frac{\uparrow\downarrow \uparrow\downarrow \uparrow\downarrow}{3p}$
3.	V	23	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^3$ $\frac{\uparrow\downarrow}{1s} \quad \frac{\uparrow\downarrow}{2s} \quad \frac{\uparrow\downarrow \uparrow\downarrow \uparrow\downarrow}{2p} \quad \frac{\uparrow\downarrow}{3s} \quad \frac{\uparrow\downarrow \uparrow\downarrow \uparrow\downarrow}{3p} \quad \frac{\uparrow\downarrow}{4s} \quad \frac{\uparrow \uparrow \uparrow}{3d}$
4.	Ge	32	$[\text{Ar}] 4s^2 3d^{10} 4p^2$ $[\text{Ar}] \quad \frac{\uparrow\downarrow}{4s} \quad \frac{\uparrow\downarrow \uparrow\downarrow \uparrow\downarrow \uparrow\downarrow \uparrow\downarrow}{3d} \quad \frac{\uparrow \uparrow}{4p}$
5.	He	2	$1s^2$ $\frac{\uparrow\downarrow}{1s}$
6.	N	7	$1s^2 2s^2 2p^3$ $\frac{\uparrow\downarrow}{1s} \quad \frac{\uparrow\downarrow}{2s} \quad \frac{\uparrow \uparrow \uparrow}{2p}$

### Part B – Shorthand Electron Configuration and Orbital Notations

Use noble gas shorthand configurations to determine orbital notations. You only need to write out orbital notations for the energy levels and sublevels after the noble gas.

	Symbol	# e <sup>-</sup>	Electron configuration (noble gas shortcut) Orbital Notation
7.	Sr	38	[Kr] 5s <sup>2</sup> [Kr] ↑↓ 5s
8.	Pb	82	[Pb] 6s <sup>2</sup> 4f <sup>14</sup> 5d <sup>10</sup> 6p <sup>2</sup> [ ] [ ] [ ] 6p
9.	Al	13	[Ne] 3s <sup>2</sup> 3p <sup>1</sup> [ ] [ ] [ ] 3p
10.	Pu	94	[Rn] 7s <sup>2</sup> 6d <sup>1</sup> 5f <sup>5</sup> [ ] [ ] [ ] [ ] [ ] [ ] 5f
11.	Au	79	[Xe] 6s <sup>2</sup> 4f <sup>14</sup> 5d <sup>9</sup> [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] 5d

### PART C – RULES OF ELECTRON CONFIGURATIONS AND ORBITAL NOTATIONS

Which of the following "rules" is being violated in each electron configuration below? Explain your answer for each. Choices: *Hund's Rule*, *Pauli Exclusion Principle*, *Aufbau Principle*

12	↑↓ ↑↓ <del>↑↓</del> ↑ _ 1s 2s 2p	Rule and explanation: Hund's Rule
13	↑↓ ↑↓ ↑↓↑↓↑↓ _ ↑↓↑↑ 1s 2s 2p 3s 3p	Rule and explanation: Aufbau Principle
14	↑↓ ↑↓ ↑↓↑↓↑↓ (↑↑) ↑↓↑↓↑ 1s 2s 2p 3s 3p	Rule and explanation: Pauli Exclusion Principle
15	↑↓ ↑↓ ↑↓↑↓↑↓ ↑↓ ↑↓↑↓↑↓ ↑↓↑↓↑↓↑↓↑↓↑↓ 1s 2s 2p 3s 3p 4s 3d	Rule and explanation: Aufbau Principle