**Orbital WS Two (13.6)** Name: KEY

1) Draw out **orbital notation** for the following elements, being sure to follow Hund's rule:

Si ↑↓ (1s) ↑↓ (2s) ↑↓ ↑ ↑ (2p) ↑↓ (3s) ↑ _ _ (3p)

P ↑↓ (1s) ↑↓ (2s) ↑↓ ↑ ↑ (2p) ↑↓ (3s) ↑ ↑ ↑ (3p)

S ↑↓ (1s) ↑↓ (2s) ↑↓ ↑ ↑ (2p) ↑↓ (3s) ↑ ↑ (3p)

2) Define the **Aufbau Principle** and state an example of when it is no longer true.

- electrons fill lowest energy orbitals first
- may not be true if electron elevated to d orbital to achieve a half filled sublevel or a full sublevel

3) Write **noble gas configurations** for the following elements. When done, look at your new PT to see which ones are exceptions to the filling order and put the correct configuration to the right.

| Expected configuration | Correct configuration |
|---|---|
| Co: $[Ar]\,4s^2 3d^7$ | Co: $[Ar]\,4s^2 3d^7$ |
| Cr: $[Ar]\,4s^2 3d^4$ | Cr: $[Ar]\,4s^1 3d^5$ * |
| Se: $[Ar]\,4s^2 3d^{10} 4p^4$ | Se: $[Ar]\,4s^2 3d^{10} 4p^4$ |
| Cu: $[Ar]\,4s^2 3d^9$ | Cu: $[Ar]\,4s^1 3d^{10}$ * |
| Pd: $[Kr]\,5s^2 3d^8$ | Pd: $[Kr]\,4d^{10}$ * |
| Ag: $[Kr]\,5s^2 4d^9$ | Ag: $[Kr]\,5s^1 4d^{10}$ * |

4) Why do electron configurations sometimes break Aufbau's rule?

- lower energies can be achieved by creating a half filled sublevel or a full d sublevel

5) Write out noble gas configurations for these larger elements. When done check for exceptions!

| | |
|---|---|
| Am: $[Rn]\,7s^2 5f^7$ | Lu: $[Xe]\,6s^2 4f^{14} 5d^1$ |
| Rb: $[Kr]\,5s^1$ | In: $[Kr]\,5s^2 4d^{10} 5p^1$ |
| Sg: $[Rn]\,7s^2 5f^{14} 6d^4$ | W: $[Xe]\,6s^2 4f^{14} 5d^4$ |
| Ba: $[Xe]\,6s^2$ | Ne: $[He]\,2s^2 2p^6$ |
| Pb: $[Xe]\,6s^2 4f^{14} 5d^{10} 6p^2$ | Cd: $[Kr]\,5s^2 4d^{10}$ |

More on Back!

IONS! Write electron configurations or noble gas configurations for each of these ions. Go back to the last noble gas to start!

| Formula: | Name: | # electrons | configuration |
|---|---|---|---|
| $F^{-1}$ | fluoride | 10 | $[He]\,2s^2 2p^6$ |
| $Na^{+1}$ | sodium ion | 10 | $[He]\,2s^2 2p^6$ |
| $S^{-2}$ | sulfide | 18 | $[Ne]\,3s^2 3p^6$ |
| $N^{-3}$ | nitride | 10 | $[He]\,2s^2 2p^6$ |
| $Mg^{+2}$ | magnesium ion | 10 | $[He]\,2s^2 2p^6$ |
| $Rb^{+1}$ | rubidium ion | 36 | $[Ar]\,4s^2 3d^{10} 4p^6$ |
| $P^{-3}$ | phosphide | 18 | $[Ne]\,3s^2 3p^6$ |
| $Mn^{+2}$ | manganese ion | 23 | $[Ar]\,3d^5$ (loses $4s^2$) |
| $Zn^{+2}$ | zinc ion | 28 | $[Ar]\,3d^{10}$ (loses $4s^2$) |
| $Cr^{+6}$ (dangerous!) | chromium (VI) ion | 18 | $[Ar]\,3s^2 3p^6$ (loses 3d and 4s!) |