**Name: Period: Seat#:**

**Worksheet #4**

“No human investigation can be called real science if it cannot be demonstrated mathematically.”

- Leonardo da Vinci (1452 – 1519)

1. Write the electron configurations of the following elements using the shorthand notation for the noble gas cores.

|  |
| --- |
| 1. phosphorus |
| 1. nickel |
| 1. osmium |
| 1. lead |
| 1. titanium |

|  |  |  |  |
| --- | --- | --- | --- |
| 1. 3d | 1. 4s | 1. 5p | 1. 5f |

1. Which orbital is filled following (after) these orbitals?

1. How many electrons can be accommodated in:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. A d subshell | 1. A set of f orbitals | 1. The n = 4 shell | 1. The 7s orbital | 1. A px orbital |

1. Are the following ground state electron configurations OK or is there something WRONG with each one? Explain why they are OK or why they are WRONG.

|  |  |  |
| --- | --- | --- |
| **Configurations** | **OK or Wrong?** | **Explain** |
|  |  |  |
|  |  |
|  |  |
|  |  |
|  |  |

1. How many unpaired electrons are there in:

|  |  |  |  |
| --- | --- | --- | --- |
| 1. A Nitrogen atom | 1. An iodine atom | 1. A nickel (II) cation | 1. An oxide ion |

1. **SKIP -** Which of the following sets of quantum numbers describe an impossible situation? Explain why.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Quantum #s** | **X if impossible** | **Explain why impossible** |
|  | n = 2, l = 1, ml = 2, ms = +½ |  |  |
|  | n = 5, l = 2, ml = 1, ms = −½ |  |  |
|  | n = 6, l = 5, ml = 0, ms = 0 |  |  |
|  | n = 3, l = 3, ml = 1, ms = −½ |  |  |
|  | n = 4, l = 2, ml = 1, ms = +½ |  |  |

1. Arrange the following elements in increasing order of whichever trends specified.

|  |  |  |
| --- | --- | --- |
| 1. S, Ge, P, and Si | atomic size | \_\_\_\_\_\_\_\_\_\_ < \_\_\_\_\_\_\_\_\_\_ < \_\_\_\_\_\_\_\_\_\_ < \_\_\_\_\_\_\_\_\_\_ |
| 1. Na+, K+, Cl−, and Br− | increasing size | \_\_\_\_\_\_\_\_\_\_ < \_\_\_\_\_\_\_\_\_\_ < \_\_\_\_\_\_\_\_\_\_ < \_\_\_\_\_\_\_\_\_\_ |
| 1. Be, Ca, N, and P | ionization energy | \_\_\_\_\_\_\_\_\_\_ < \_\_\_\_\_\_\_\_\_\_ < \_\_\_\_\_\_\_\_\_\_ < \_\_\_\_\_\_\_\_\_\_ |

1. Which item in each of the following pairs would you expect to have the higher electron affinity? Explain why.

|  |  |  |
| --- | --- | --- |
|  | Cl or Cl− |  |
|  | Na or K |  |
|  | Br or I |  |

1. Which elements fit the following descriptions?

|  |  |  |  |
| --- | --- | --- | --- |
| 1. the smallest alkaline earth metal | 1. has a valence shell configuration  4f14 5d10 6s1 | 1. the halogen with the lowest ionization energy | 1. has 13 more electrons than argon |
| 1. the smallest non metal | 1. the Group 4A element with the largest ionization energy | 1. its 3+ ion has the electron configuration [Kr] 4d10 |  |

1. Given the following series of ionic radii, estimate the atomic radius of Neon.

Do you think it is a fair estimate? Why or why not?

|  |
| --- |
| C4- 260 pm; N3- 171 pm; O2- 126 pm; F- 119 pm;  Na+ 116 pm; Mg2+ 86 pm; Al3+ 68 pm, |