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| **Lab Write Up** |
| **Title:** Electron Configuration  **Introduction:** Electronic configuration, also called electronic structure, the arrangement of electrons in energy levels around an atomic nucleus. According to the older shell atomic model, electrons occupy several levels from the first shell nearest the nucleus, K, through the seventh shell, Q, farthest from the nucleus. Note that orbital sets are numbered by electron shells, but ordered in terms of energy. The order for filling orbitals is as follows: 1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 6s, 4f, 5d, 6p, 7s, 5f, 6d, 7p, 8s. The purpose of this experiment is to find out the order of electron configuration on the periodic table.  **Material:**   * Periodic Table * Paper * Pen * List of electrons configuration for element 1 - 54   **Method**   1. List first 54 atoms on a sheet of paper in vertical column of the table 2. Write each of the electron configuration on the right of the atoms 3. On another table, list the symbol and the atomic number of the elements in the correct vertical column by using the following way:    1. Ends in “s^1”    2. Ends in “s^2”    3. Ends in “p^1”    4. Ends in “p^2”    5. Ends in “p^3”    6. Ends in “p^4”    7. Ends in “p^5”    8. Ends in “p^6” 4. Then create a two rows table and list the following in each rows:    1. List the elements that end in 3d orbital in the first row    2. List the elements that end in 4d orbital in the second row   **During the Lab**  **Result**  Data Sheet 1   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | | H (1) | He (2) | B (5) | C (6) | N (7) | O (8) | F (9) | Ne (10) | | Li (3) | Be (4) | Al (13) | Si (14) | P (15) | S (16) | Cl (17) | Ar (18) | | Na (11) | Mg (12) | Ga (31) | Ge (32) | A (33) | Se (34) | Br (35) | Kr (36) | | K (19) | Ca (20) | In (49) | Sn (50) | Sb (51) | Te (52) | I (53) | Xe (54) | | Rb (37) | Sr (38) |  |  |  |  |  |  |   Data Sheet 2   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Sc  (21) | Ti  (22) | V  (23) | Cr  (24) | Mn  (25) | Fe  (26) | Co  (27) | Ni  (28) | Cu  (29) | Zn (30) | | Y  (39) | Zr  (40) | Nb  (41) | Mo  (42) | Tc  (43) | Ru  (44) | Rh  (45) | Pd  (46) | Ag  (47) | Cd  (48) |   **Conclusion**  They all have a similar electron configuration in their valence shells: a single s electron. Because much of the chemistry of an element is influenced by valence electrons, we would expect that these elements would have similar chemistry—and they do. The organization of electrons in atoms explains not only the shape of the periodic table but also the fact that elements in the same column of the periodic table have similar chemistry.  The same concept applies to the other columns of the periodic table. Elements in each column have the same valence shell electron configurations, and the elements have some similar chemical properties. This is strictly true for all elements in the s and p blocks. In the d blocks, because there are exceptions to the order of filling of subshells with electrons, similar valence shells are not absolute in these blocks. However, many similarities do exist in these blocks, so a similarity in chemical properties is expected.  Similarity of valence shell electron configuration implies that we can determine the electron configuration of an atom solely by its position on the periodic table. Consider Se, it is in the fourth column of the p block. This means that its electron configuration should end in a p4 electron configuration. Indeed, the electron configuration of Se is [Ar]4s23d104p4, as expected.  **After the Lab**  **Analysis Questions**   1. How does Your Date Sheet 1 compare with the periodic table? Explain any similarities or differences.   The s block contains the elements in Groups 1A and 2A and the noble gas helium. The p block contains the elements in Groups 3A, 4A, 5A, 6A, 7A, and 8A, with the exception of helium.   1. Which elements does not appear to be in the correct place in your data shee compared to the periodic table? Explain why it is in a different place on the periodic table.   Helium has an electron configuration of 1s^2 that is a configuration of should be in the s block of the periodic table. But it is not placed because its properties match with inert gases:   * Unlike element in the s block that is solid, helium is gas just like other inter gases * Helium is non-metal while s block contains only metals * Instead the elements in s block are most reactive, helium is much less reactive like other inert gases * Helium also possesses a completely filled electronic configuration like other inert gases.   For all such reason, helium is place inert gases group which lies in p block   1. Compare Data Sheet 2 with the periodic table. Explain what part of the periodic table is similar.   All elements that end with 3d are in period 4; elements end with 4d are all in period 5. Both elements that end with 3d and 4d have 10 elements each.   1. Explain why there are 10 elements in each row of Data Sheet 2?   The maximum capacity of d-subshell is to accommodate 10 electrons. Thus, there are 10 elements each in 3d and 4d.   1. Write the electron configuration for the following elements: Cs, La, P b, Rn. Predict the vertical column or horizontal row were these elements would fit into the charts on date sheet #1 or #2.State a reason for the prediction.   **Electron configuration:**   * Cs: [Xe] 6s^1 * La: [Xe] 6s^2 5d^1 * Pb: [Xe] 6s^2 4f^14 5d^10 6p^2 * Rn: [Xe] 6s^2 4f^14 5d^10 6p^6   **Prediction:**  Cs will be in group A of the Data Sheet #1since its electron configuration end with s^1; Pb will be in group D of the Data Sheet #1 because its electron configuration end with p^2; Rn will be in the group H of Data Sheet #1 because its electron configuration ends with p^6; La will not fit in any of the data sheets since it fit any of the conditions on the data sheets.   1. Look at the *highest energy level electrons* in your original electron configuration. How many total valence electrons do you observe for each element in column A - H on Data Sheet 1? How does that compare with what you have already learned about valence electrons and the groups on the periodic table?   **Valence Electrons**   * Group A: 5 total, 1 each * Group B: 10 total, 2 each * Group C: 12 total, 3 each * Group D: 16 total, 4 each * Group E: 20 total, 5 each * Group F: 24 total, 6 each * Group G: 28 total, 7 each * Group H: 32 total, 8 each   The number of valence electrons in an atom is reflected by its position in the periodic table of the elements. Across each row, or period, of the periodic table, the number of valence electrons in groups 1–2 and 13–18 increases by one from one element to the next. |