

The Periodic Table : Notes/W.S. - 10

The Russian scientist Dmitri Mendeleev noticed that if the elements were arranged in order of increasing atomic mass, then elements with similar properties would appear periodically. He arranged the elements in a table that we now call the periodic table. The columns contained elements that have similar properties. At the time of his discovery, many elements had not been discovered, but Mendeleev predicted the properties of the undiscovered elements.

Notes on the Modern Periodic Table

Henry Moseley found that the elements should be arranged according to atomic number not atomic mass. This cleared up some discrepancies, such as, potassium behaves like an alkali but it has an atomic mass that is slightly less than that of argon.

The rows of the table are called **periods**. There are seven periods. The Lanthanides and Actinides are placed at the bottom of the table so the table isn't too long.

The eighteen columns are called **groups**. Each group (or family) consists of elements with similar properties. For example the elements of the first group form similar compounds with oxygen; H_2O , Li_2O , Na_2O , etc. Also, the noble gases are not reactive. Atoms in a group have similar properties because they have the same number of valence electrons.

At room temperature most elements are solid. There are two liquids; mercury and bromine. The gases are; hydrogen, nitrogen, oxygen, fluorine, chlorine and the noble (or inert) gases.

The metals are to the left of the "staircase", the crooked line between boron and astatine. Metals that are more metallic are to the left and down. For example, Ni and Ag are more metallic than Cu. The non-metals are to the right of the staircase. Elements near the staircase are the metalloids (or semiconductors). These are; B, Si, Ge, As, Sb, Te, and Po.

The metals are shiny, malleable, ductile, and are good conductors. The non-metals have opposite properties. The metalloids have intermediate properties.

The alkali metals are the first group. The alkaline earth metals are the second group. The last group are the noble gases. The second last group are the halogens. The alkali metals and the halogens are very reactive. Groups 3 to 12 are called the transition metals. The element hydrogen is unusual in that it can be placed in group 1 above Li or above F.

Questions :

- 1)a) Name the group that has 1 electron in its outermost shell.
- b) Name the group that has 7 electrons in its outermost shell.
- 2) Why are the Noble gases not reactive?
- 3) Explain why the alkali metals and the halogens are very reactive.
- 4) Classify the following as metal, non-metal or metalloid.
a) K b) Br c) Rn d) Ge e) S f) Pu
- 5) Classify the elements in question 4) as solid, liquid or gas.
- 6)a) How many periods are there?
- b) How many elements are in; period 1, period 2, period 4, period 6.
- 7)a) What is the usual charge on an alkali ion?
- b) What is the usual charge on a halogen ion?
- 8) Name an element that is more metallic than cesium.
- 9) Give three properties of metals.
- 10) Find elements that are not in the proper positions according to their atomic mass (like Ar and K).

Answers : 1)a) alkali metals, b) halogens, 2) They have 8 electrons in their outermost shell. This is a very stable arrangement., 3) The alkali metals lose an electron easily and the halogens gain an electron easily to become more like the noble gases, with 8 electrons in the outermost energy level., 4)a) metal, b) non-metal, c) non-metal, d) metalloid, e) non-metal, f) metal, 5)a) s, b) l, c) g, d) s, e) s, f) s, 6)a) 7, b) 2, 8, 18, 32, 7)a) +1, b) -1, 8) francium, 9) shiny, malleable, ductile, good conductor, 10) Co and Ni, Te and I, Th and Pa, U and Np.