ATOMIC ENERGY CENTRAL SCHOOL-3 TARAPUR

HANDOUT

TOPIC-p- PBLOCK ELEMENTS

CHAPTER: 16-GROUP ELEMENTS

The Group 16 elements have general electronic configuration *ns*2*np*4. They show
maximum oxidation state, +6. Gradation in physical and chemical properties is
observed in the group 16 elements. In laboratory, dioxygen is prepared by heating
KClO3 in presence of MnO2. It forms a number of oxides with metals. Allotropic form of oxygen is O3 which is a highly oxidising agent. Sulphur forms a number of allotropes. Of these, a– and b– forms of sulphur are the most important. Sulphur combines with oxygen to give oxides such as SO2 and SO3. SO2 is prepared by the direct union of sulphur with oxygen. SO2 is used in the manufacture of H2SO4. Sulphur forms a number of oxoacids. Amongst them, the most important is H2SO4. It is prepared by contact process. It is a dehydrating and oxidising agent. It is used in the manufacture of several compounds.

Due to extra stable half-filled *p* orbitals electronic configurations of Group 15 elements, larger amount of energy is required to remove electrons compared to Group 16 elements.

Due to the decrease in bond (E–H) dissociation enthalpy down the group, acidic character increases.

In vapour state sulphur partly exists as S2 molecule which has two unpaired electrons in the antibonding π^* orbitals like O2 and, hence, exhibits paramagnetism.

H_2O is liquid at room temperature but H_2S is a gas, this due to H-bonding between the H_2O molecules.

O_3 is an endothermic compound. On heating, it readily decomposes to give nascent oxygen, since nascent oxygen is very reactive, therefore O_3 act as a powerful oxidizing agent.

SO_2 acts as a reducing agent & hence reduces an aqueous solution of Fe^{3+} ion to Fe^{2+} ion.
Due to resonance the two S-O bonds in SO_2 are equal.

SO_2 turns pink colour of $KMnO_4$ solution colourless due to reduction of MnO^- to Mn^{2+} ions. This reaction can be use to detect the presence of SO_2.

The K_{a2} of H_2SO_4 is less than the K_{a1}, because the HSO_4^- ion has less tendency to donate proton to H_2O as compared to H_2SO_4.

SO_2 acts as an air pollutant because, it strongly irritating to the respiratory tract. It causes throat and eye irritation. It causes breathlessness and affects larynx, i.e., voice box. It has a very damaging effect on the plants, it dissolves in rain water and produces acid rain.

Oxygen, the first element of group-16, differs considerably from the rest of the elements of group, due to its small size, high electronegativity, absence of vacant d- orbital, it can form $p\pi$-$p\pi$ multiple bonds but other can not.