

SUBJECT - CHEMISTRY

Page No - 01  
Date - 18.05.20

CLASS - BSc(Hons) PART-11

PAPER - III

GROUP - B

TOPIC - THE GROUP VI(B) ELEMENTS; SULFUR, SELENIUM  
TELLURIUM, AND POLONIUM

Dr Hare Mohan Prasad Singh

Department of Chemistry

Dr. L.K.V.D College Tujpur Samastipur

- 1 Sulfur, Selenium, tellurium, and polonium have lower electronegativities than oxygen; Consequently, their compounds have less ionic character. The relative stabilities of their bonds to other elements are also different. In particular, the importance of hydrogen bonding is drastically lowered. Only very weak  $S \cdots H-S$  bonds exist, and  $H_2S$  is totally different from  $H_2O$ .
- 2 For Sulfur particularly, as in other third-row elements, there is multiple  $d\pi-p\pi$  bonding, but little if any  $p\pi-p\pi$  bonding. The short  $S-O$  distances in  $SO_4^{2-}$  (where  $s$  and  $p$  orbitals are used in  $\sigma$  bonding) is a result of multiple  $d\pi-p\pi$  bond character. The latter arises from the flow of electrons from filled  $p\pi$  orbitals on  $O$  atoms to empty  $d\pi$  orbitals on  $S$  atoms.
- 3 The valence for  $S, Se, Te$  and  $Po$  atoms is not confined to 2, and  $d$  orbitals can be utilized to form more than four bonds to other elements. Examples are  $SF_6$  and  $Te(OH)_6$ .
- 4 Sulfur has a strong tendency to catenation, equaled or exceeded only by Carbon. Sulfur forms compounds for which there are no known  $O, Se, or Te$  analogs. Examples are polysulfide ions  $S_n^{2-}$ , polythionate ions  $[O_3S-S_n-SO_3]^{2-}$  and compounds of the type  $XS_nX$ , where  $X = H, Cl, CN$  or  $NR_2$ .

The changes in the properties of compounds on going from  $S$  to  $Po$  can be associated with the increasing size of the atoms and with the decreasing electronegativity, from top to bottom in the group.

Some examples of trends in properties of Compounds that arise for these reason are

1. The decreasing stability of the hydrides  $H_2E$
2. The increasing tendency to form complex ions such as  $SeBr_6^{2-}$
3. The appearance of metallic properties for Te and Po atoms.  
Thus the oxides  $MO_2$  are ionic and basic, reacting with HCl to give the chlorides.