Chemistry Study Materials for Class 12

(NCERT Intext Questions –Answers)

Ganesh Kumar Date:- 11/07/2020

The p-Block Elements

Question 15: Why H_2O is a liquid and H_2S a gas?

Solution 15: H_2O has oxygen as the central atom. Oxygen has smaller size and electronegativity as compared to sulphur. Therefore, there is extensive hydrogen bonding in H_2O , which is absent in H_2S molecule. H_2S are held together only by weak Vander Waal's forces of attraction. Hence, H_2O exists as a liquid while H2S as a gas.

Question 16: Which of the following does not react with oxygen directly?

Zn, Ti, Pt, Fe

Solution 16: Pt is a noble metal and does not react very easily. All other elements, Zn, Ti, Fe, are quite reactive. Hence, oxygen does not react with platinum (Pt) directly.

Question 18: Why does O3 act as a powerful oxidizing agent?

Solution 18: Ozone is not a very stable compound under normal conditions and decomposes readily on heating to give a molecule of oxygen and nascent oxygen. Nascent oxygen, being a free radical, is very reactive.

$$O_3 \longrightarrow O_2 + O$$

Ozone *Oxygen* *Nascent Oxygen*

Therefore, ozone acts as a powerful oxidizing agent

Question 19: How is O_3 estimated quantitatively?

Solution 19: Quantitatively, ozone can be estimated with the help of potassium iodide. When ozone is made to react with potassium iodide solution buffered with a borate buffer *pH* 9.2 , iodine is liberated. This liberated iodine can be titrated against a standard solution of sodium thiosulphate, using starch as an indicator. The reactions involved in the process are given below.

$$2I^- + O_3 \longrightarrow 2OH^- + I_2 + O_2$$

Iodide *Ozone* *Iodine*

$$I_2 + 2Na_2S_2O_2 \longrightarrow Na_2S_2O_6 + 2NaI$$

Sodium Thiosulphate *Sodium tetrathionate*

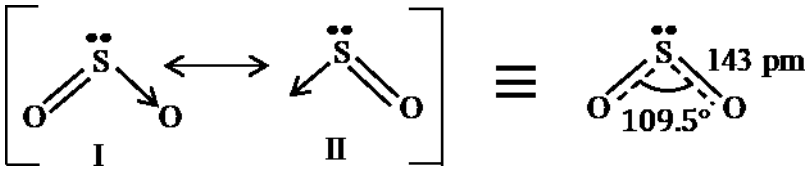
Question 20: What happens when sulphur dioxide is passed through an aqueous solution of *Fe* (*III*)

Solution 20: SO2 acts as a reducing agent when passed through an *Fe*(*III*) salt. Itaqueous solution containing reduces *Fe*(*III*) to *Fe*(*II*) i.e., ferric ions to ferrous ions.

$$2Fe^{3+} + SO_2 + 2H_2O \longrightarrow 2Fe^{2+} + SO_4^{2-} + 4H^{1+}$$

Question 21: Comment on the nature of two S-O bonds formed in SO_2 molecule. Are the two S-O bonds in this molecule equal?

Solution 21: The electronic configuration of S is $1s^2\ 2s^2\ 2p^2 3s^2 3\ p^4$, During the formation of SO_2, one electron from 3p orbital goes to the 3d orbital and S undergoes sp^2 hybridization. Two of these orbitals form sigma bonds with two oxygen atoms and the third contains a lone pair. p-orbital and d-orbital contain an unpaired electron each. One of these electrons forms pπ - pπ bond with one oxygen atom and the other forms pπ- dπ bond with the other molecule. This is the reason SO_2 hybrid of structures I and II. has a bent structure. Also, it is a resonance Both S-O bonds are equal in length (143 pm) and have a multiple bond character.



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