Chemistry Study Materials for Class 12

(NCERT Intext and Exercise Questions –Answers)

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The p-Block Elements

Question 31: What are the oxidation states of phosphorus in the following:

(i) H_2PO_3 (ii) PCl_3 (iii) Ca_3P_2 (iv) Na_3PO_4 (v) POF_3 ?

Solution 31: Let the oxidation state of p of x.

(i) H_3PO_3

3 + x +3(-2) = 0

3 + x -6 = 0

x = +3

(ii) PCl_3

x+ 3(-1) = 0

x – 3 = 0

x = + 3

(iii) Ca_3P_2

3 (+2) + 2(x) = 0

6 + 2x = 0

2x = 6 x = -3

(iv) Na_3PO_4

3(+1)+ x +4(-2) = 0

3+ x – 8 = 0

x – 5 = 0

x = + 5

(*v*) POF_3

x +(-2) +3(-1) = 0

x – 5 = 0

x = + 5

Question 32:Write balanced equations for the following:

(i) *NaCl* is heated with sulphuric acid in the presence of MnO_2

(ii) Chlorine gas is passed into a solution of NaI in water.

Solution 32: (*i*) $4NaCl + MnO_2 + 4H_2SO_4 \longrightarrow MnCl_2 + 4NaHSO_4 + 2H_2O + Cl_2$

(*ii*) $Cl_2 + NaI \longrightarrow 2NaCI + I_2$

Question 35: How are XeO_3 and $XeOF_4$ prepared?

Solution 35: (i) XeO_3 can be prepared in two ways as shown.

$6XeF_4 + 12H_2O \longrightarrow 4XeO_3 + 24HF + 1O_2$

$XeF_6 + 3H_2O \longrightarrow XeO_3 + 6HF$

(ii) $XeOF_4$ can be prepared using XeF_6.

$$XeF_6 + H_2O \qquad XeOF_4 + 2HF$$

Question 36: Arrange the following in the order of property indicated for each set:

(i) F_2, Cl_2, Br_2, I_2 increasing bond dissociation enthalpy.

(ii) HF, HCl, HBr, HI increasing acid strength.

(iii) $NH_3, PH_3, AsH_3, SbH_3, BiH_3$ increasing base strength

Solution 36: (i) Bond dissociation energy usually decreases on moving down a group as the atomic size increases. However, the bond dissociation energy of F_2 is lower than that of Br_2 and Cl_2. This is due to is due to the small atomic size of fluorine. Thus, the increasing order for bond dissociation energy among halogens is as $F_2 < Cl_2 < Br_2 < I_2$

(ii) The bond dissociation energy of H-X molecules where X = F, Cl, Br, I, decreases with an increase in the atomic size. Since H-I bond is the weakest, HI is the strongest acid.

(iii) On moving from nitrogen to bismuth, the size of the atom increases while the electron density on the atom decreases. Thus, the basic strength decreases.

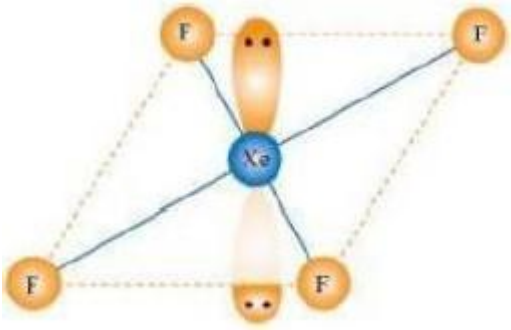
$$BiH_3 < SbH_3 < AsH_3 < PH_3 < NH_3$$

Question 37: Which one of the following does not exist? (i) XeF_4 (ii) NeF_4 (iii) XeF_2 (iv) XeF_6

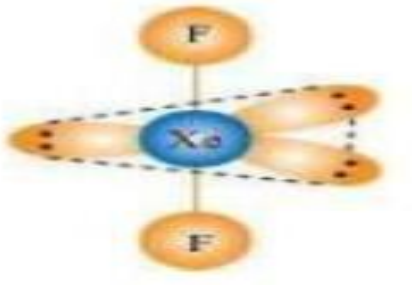
Solution 37: NeF_2 **does not exist.**

Question 38 : Describe the structure of a noble gas species (i) XeF_4 **(ii)** XeF_2 **(iii)** XeO_3

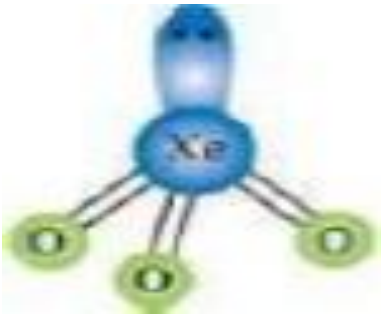
Solution 38 : (i) The structure of XeF_4



(ii) The structure of XeF_2



(iii) The structure of XeO_3



Question 39: Why do noble gases have comparatively large atomic sizes?

Solution 39: Noble gases do not form molecules. In case of noble gases, the atomic radii correspond to vander Waal's radii. On the other hand, the atomic radii of other elements correspond to their covalent radii. By definition, van der Waal's radii are larger than covalent radii. It is for this reason that noble gases are very large in size as compared to other atoms belonging to the same period.

Question 40: List the uses of Neon and argon gases.

Solution 40: Uses of neon gas:

(i) It is mixed with helium to protect electrical equipment's from high voltage

(ii) It is filled in discharge tubes with characteristic colours.

(iii) It is used in beacon lights.

Uses of Argon gas:

(i) Argon along with nitrogen is used in gas-filled electric lamps. This is because Ar is more inert than N.

(ii) It is usually used to provide an inert temperature in a high metallurgical process.

(iii) It is also used in laboratories to handle air-sensitive substances.

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