

CHEMISTRY STUDY MATERIALS FOR CLASS 12

(NCERT Based Reasoning of Chapter -07)

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P – block elements

Question 1: Why is Bi(v) a stronger oxidant than Sb(v)?

Answer:

The stability of +5 oxidation state decreases and that of +3 state increases due to inert pair effect down the group therefore Bi(v) accepts two electrons and gets reduced to Bi (v). $\text{Bi}^{5+} + 2e^- \rightarrow \text{Bi}^{3+}$

Question 2: Which is a stronger oxidizing agent Bi(v) or Sb(v)?

Answer: Bi(v) is stronger oxidizing agent due to inert pair effect.

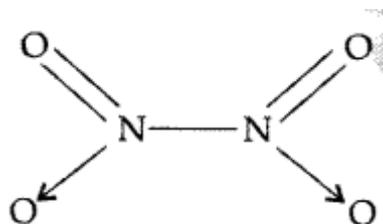
Question 3: Why is red phosphorus less reactive than white phosphorus?

Answer: Because white phosphorus has angular strain in its P₄ molecules where the angle is only 60°.

Question 4: Why does NO₂ dimerise?

Answer:

NO₂ contains 7 + 2 × 8 i.e. 23 odd electrons. In the valence shell N has seven electrons and hence less stable. To acquire stability it dimerises to form N₂O₄



Question 5: What is the oxidation number of phosphorus in H₃PO₂ molecule?

Answer:



$$3 + x - 4 = 0$$

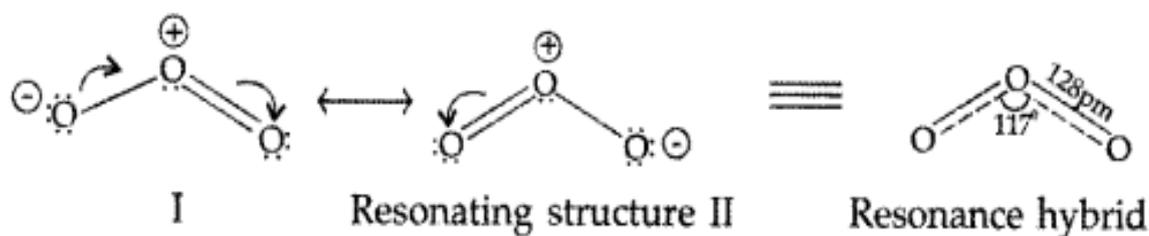
$$\text{Or, } x - 1 = 0$$

$$\therefore x = +1$$

Thus oxidation number of P in H₃PO₂ = +1.

Question 6: Draw the structure of O₃ molecules.

Answer: Structure of Ozone (O₃) : Angular structure

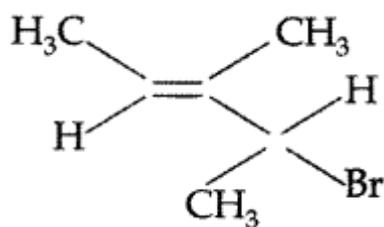


Question 7 : Fluorine does not exhibit any positive oxidation state. Why?

Answer:

Since fluorine is the most electronegative element and does not have d-orbitals in its valence shell, therefore, it cannot expand its octet and hence does not show positive oxidation state (O.S.) while other halogens have d-orbitals and therefore exhibit many oxidation states.

Question 8: Give the IUPAC name of the following compound:



Answer: IUPAC name : 2-Bromo-3-methylpent-3-ene

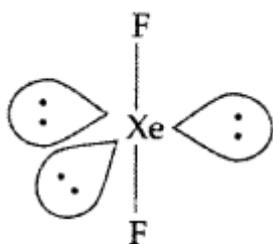
Question 9: Nitrogen is relatively inert as compared to phosphorus. Why?

Answer:

Because P-P single bond is much weaker than N=N triple bond and the bond length of nitrogen is small and bond dissociation energy is very large which makes it inert and unreactive and thus phosphorus becomes more reactive.

Question 10: Draw the structure of XeF₂ molecule.

Answer: XeF₂:



Shape : Linear

Question 11: Name the structure of XeF₄ molecule.

Answer: XeF₄ : sp³d² hybridization, Shape → Square planar

Question 13 : Which one of PCl₄⁺ and PCl₄⁻ is not likely to exist and why?

Answer: PCl₄⁻, because P has 10 electrons which cannot be accommodated in sp³ hybrid orbitals.

Question 14: Of PH₃ and H₂S which is more acidic and why?

Answer: H₂S, because of higher electronegativity of sulphur.

Question 15: Which is a stronger reducing agent, SbH₃ or BiH₃, and why?

Answer: BiH₃ : Because it is stronger reducing agent as its tendency to liberate H is maximum.

Question 16: What is the basicity of H₃PO₂ acid and why?

Answer: H₃PO₂ has one replaceable H atom so it is monobasic.

Question 17: Though nitrogen exhibits +5 oxidation states, it does not form pentahalide. Why?

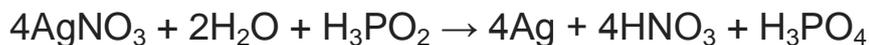
Answer: Due to non-availability of d-orbitals in its valence electronic configuration nitrogen does not form pentahalide.

Question 18: Noble gases have low boiling points. Why?

Answer: Noble gases being monoatomic have no interatomic forces except weak dispersion force and therefore, they are liquefied at very low temperature. Hence, they have low boiling point.

Question 19: Write a reaction to show the reducing behaviour of H₃PO₂.

Answer: H₃PO₂ reduces AgNO₃ to metallic Ag :



Question 20: Why does PCl₃ fume in moisture?

Answer: PCl₃ hydrolyses in moisture giving fumes of HCl.