

NOBLE GASES

Section - 4

 Group 18

Physical Properties of Noble Gases

1. They are monoatomic, colourless, odourless, tasteless and sparingly soluble in water.
2. They have very low m.p. and b.p due to weak dispersion forces. Helium has the lowest known b.p. (4K) and shows superfluidity.
3. All noble gases can diffuse through glass, rubber, plastic and some metals making them difficult to handle in the laboratory.

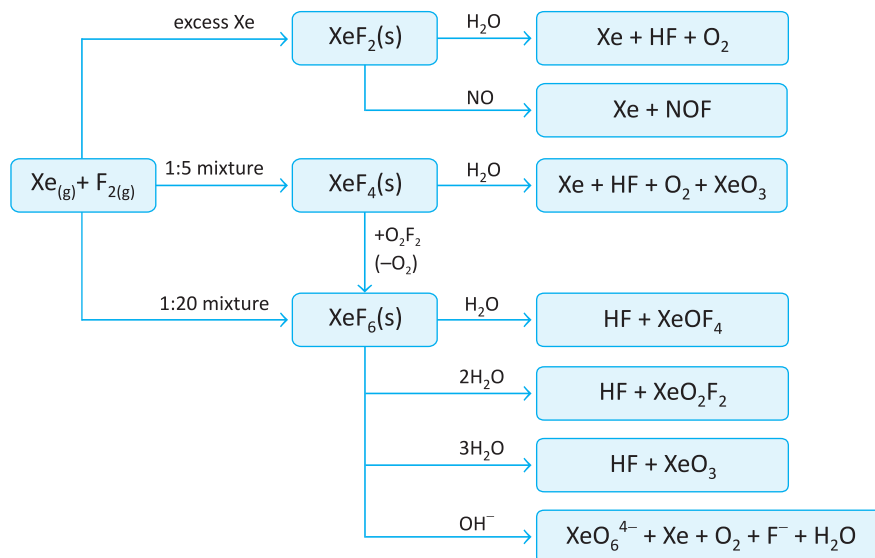
Clathrate Compounds

In the clathrates atoms or molecules of the appropriate size are trapped in cavities in the crystal lattice of other compounds. These atoms do not form any bond. Clathrates provide a convenient means of storing radioactive isotopes of Kr and Xe produced in nuclear reactors.

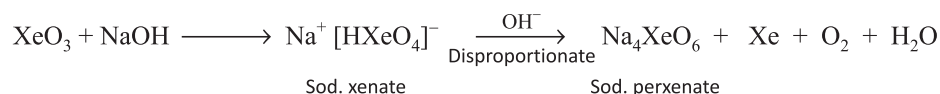
Chemistry of Xenon

Xe reacts directly only with F_2 . Oxygen compounds can be obtained from the fluoride.

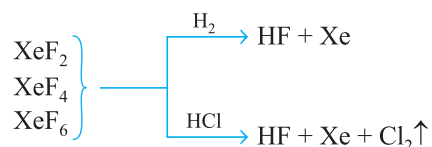
1. Xenon fluorides are white solids which are extremely powerful oxidising and fluorinating agents. They sublime readily at room temperature and are hydrolysed even by traces of water. Thus they are stored in Ni or Monel containers.



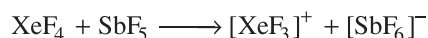
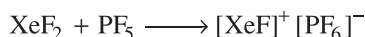
XeO_3 is a hygroscopic white explosive solid. XeOF_4 is a colourless volatile liquid.



2. All xenon fluorides react with hydrogen and oxidise Cl^- to Cl_2 , I^- to I_2 and Ce(III) to Ce(IV)



3. Xenon fluorides reacts with fluoride ion acceptors to form cationic species and fluoride ion donors to form fluoro anions.



(M = Na, K, Rb, Cs)

4. Xe compounds show a variety of shapes :

XeF_2 is linear, XeF_4 is square planar, XeF_6 is a capped octahedron, XeO_3 is pyramidal, XeOF_4 is square pyramidal, XeO_2F_2 is see saw shaped, XeOF_2 is bent T - shaped, XeO_4 is tetrahedral, XeO_3F_2 is trigonal bipyramidal and $[\text{XeO}_6]^{4-}$ ion is octahedral. [Draw geometries of all these compounds].

IN-CHAPTER EXERCISE-D

1. Why xenon does not form fluorides XeF , XeF_3 or XeF_5 ?

Choose the correct alternative. Only One choice is correct. However, question marked with “*” may have More than One Correct option.

Paragraph for Q.2 - 4

The noble gases have closed - shell electronic configuration and are monoatomic gases under normal conditions. The low boiling points of the lighter noble gases are due to weak dispersion forces between the atoms and the absence of other interatomic interactions.

The direct reaction of xenon with fluorine leads to a series of compounds with oxidation number +2, +4 and +6. XeF_4 reacts violently with water to give XeO_3 . The compounds of xenon exhibit rich stereochemistry and their geometries can be deduced considering the total number of electron pairs in the valence shell.

2. Argon is used in arc welding because of its.
- | | |
|-------------------------------|-------------------------------------------------|
| (A) low reactivity with metal | (B) ability to lower the melting point of metal |
| (C) flammability | (D) high calorific value |
3. The structure of XeO_3 is :
- | | | | |
|------------|------------|---------------|--------------|
| (A) linear | (B) planar | (C) Pyramidal | (D) T-shaped |
|------------|------------|---------------|--------------|
4. XeF_4 and XeF_6 are expected to be :
- | | | | |
|---------------|--------------|----------------|--------------------|
| (A) oxidizing | (B) reducing | (C) unreactive | (D) strongly basic |
|---------------|--------------|----------------|--------------------|
- *5. Which of the following fluorides produce O_2 or hydrolysis ?
- | | | | |
|--------------------|--------------------|--------------------|-------------------|
| (A) XeF_2 | (B) XeF_4 | (C) XeF_6 | (D) None of these |
|--------------------|--------------------|--------------------|-------------------|