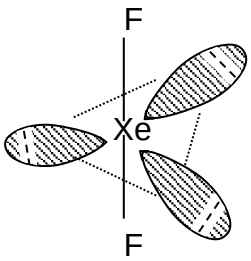
Compounds of xenon:

- Xenon combines with flourine to form XeF_2, XeF_4, XeF_6 under various conditions.

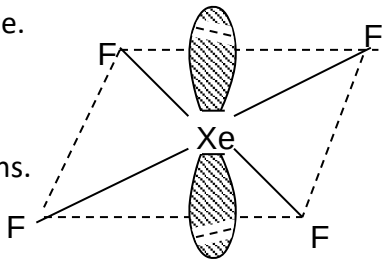
Structure of XeF_2:

- In the formation of XeF_2, xenon atom undergoes sp^3d hybridization in it's first excited state.
- The hybrid orbitals are pointed towards the corners of a trigonal bipyramid.
- Three orbitals occupy the equitorial positions and the remaining two orbitals occupy the axial positions.
- The equitorial orbitals have lone pairs of electrons and the axial orbitals have shared pairs of electrons.
- XeF_2 molecule is linear and the bond angle is 180^0.



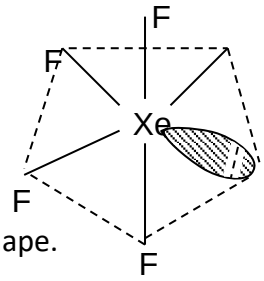
Structure of XeF_4:

- The hybridization of Xe is sp^3d^2. Xe is hybridized in it's 2^{nd} excited state.
- The molecule has square planar structure.
- Xe contains 4 bond pairs and 2 lone pairs. The 4 bonding orbitals are at equatorial positions and 2 nonbonding orbitals are at axial positions.



Structure of XeF_6:

- The hybridization of Xe is sp^3d^2. Xe is hybridized in it's 3^{rd} excited state.
- Xe contains 6 bond pairs and 1 lone pair. Out of these 7 sp^3d^3 orbitals, five are at equatorial plane and two are at axial positions. Lone pair occupies one of the axial positions.
- Due to the presence of a lone pair of electrons it possesses distorted octahedral shape.

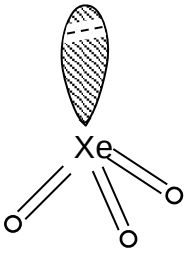


Oxides of xenon:

- Xenon combines with oxygen to form XeO_3 and XeO_4.
- In XeO_3, xenon is in + 6 oxidation state. It is hygroscopic and explosive.

Structure:

- Xe atom undergoes sp^3 hybridization
- The three 'p' electrons are excited to vacant d - orbitals.
- Xe has 3 sigma bond pairs and 1 lone pair. Therefore shape of XeO_3 is pyramidal and bond angle is decreased from $109^0.28^1$ to $103^{0.}$
- In XeO_3, there are 3 σ bonds and 3π bonds.
- All the 3σ bonds involve sp^3 - p overlapping.



- All the 3π bonds involve d - p overlapping.
- The bond angle decreases from $109^0 28^1$ to 103^o due to the lone pair bond pair repulsions.
- Xe is linked to each oxygen atom by a double bond.

Xenon tetraoxide XeO_4:

- It is formed when sodium or barium perxenate is treated with conc. H_2SO_4 at room temperature.

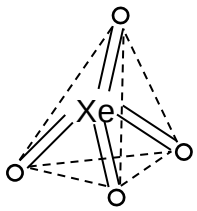
  $Na_4XeO_6 + 2H_2SO_4 \rightarrow XeO_4 + 2Na_2SO_4 + 2H_2O$

  $Ba_2XeO_6 + 2H_2SO_4 \rightarrow XeO_4 + 2BaSO_4 + 2H_2O$
- It is an unstable compound and readily dissociates into Xe and O_2.

  $XeO_4 \rightarrow Xe + 2O_2$

Structure:

- The hybridixation of Xe is sp^3. The three 'P' electrons and one 'S' electron are excited to vacant d – orbitals.
- It has regular tetrahedral shape and bond angle is 109^0.
- Each oxygen atom is linked to Xe atom by a double bond.
- The molecule contains 4σ bonds and 4π bonds and there is no lone pair.
- All the 4σ bonds involve sp^3 – p overlapping
- All the 4π bonds involve d – p overlapping



Uses of noble gases:

Helium:

- As helium is a light and non combustible gas it is used in filling the meteorological balloons.
- A mixture of 20% oxygen and 80% helium is used for artificial respiration by deep sea divers. This mixture is used by asthma patients for respiration.
- Liquid He is used as a cryogenic liquid for producing low temperatures.
- He gas is used in gas thermometers.
- It is used as heat transfer agent in nuclear reactors.
- It is used in electric transformers.
- It is used in welding of Mg, Al and stainless steel.
- It is used to provide inert atmosphere in the preparation of Mg, Al etc.

Neon:

- It gives orange red glow in a discharge tube at 2 mm of pressure.
- It is extensively used in glow lamps known as neon tubes for advertising purposes.
- When Ne is mixed with Hg vapor or Ar it produces various colors.
- The glow of neon lamps is visible even in fog and mist hence it is used in signal lights.
- It is used in safety devices, relays and rectifiers as it has a capacity for carrying high voltage currents.

Argon:

- A mixture of Ar and mercury vapour is used in fluorescent tubes.
- It is used in filling electric bulbs.
- It is used in filling electric counter tubes, thermoionic tubes and other discharge tubes.

Krypton:

- It is used in miners cap - lamps.
- The isotope Kr-85 is used in measuring the thickness of plastic sheets, metal sheets, joints and in electronic tubes for voltage regulations.

Xeon:

- It is used in photographic flash bulbs.
- Liquid xenon is used in detecting neutral mesons and gamma photons in the bubble chamber.

Radon:

- Radon is used in the treatment of cancer.
- Radon is used in detecting the defects in steel castings.