COMPOUNDS OF XENON

	Gr. 18
Period 5	**Xe** **Mass No. 131.29** **Atomic No. 54** **No. Of isotopes = 9**

Electronic configuration:

$$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6\ 4d^{10}\ 5s^2\ 5p^6$$

It was 1933 LINUS PAULING , from a consideration of ionic radii, suggested that KrF_6 & XeF_6 should be prepared.

While investigating the chemistry of PtF_6 N BARTLETT noticed that its accidental exposure to air produce a change in colour, and with D H LOHMANN he later showed this to be **$O_2^+[PtF_6]$.** BARTLETT also noted that first ionisation energy of xenon is comparable to that of molecular oxygen.

$$Xe \rightarrow Xe^+ \quad 1170\ KJmol^{-1}$$
$$O_2 \rightarrow O_2^+ \quad 1175\ KJmol^{-1}$$

He quickly proceeded to show that deep-red PtF_6 vapour spontaneously oxidised Xe to produce an orange-yellow solid $XePtF_6$.

Oxidation state of xenon in its compounds ranges from +2 - +8.

COMPOUNDS OF XENON

Coordination number	Stereochemistry	Example	Structure
2	Linear	XeF_2 Colourless crystals	DRAW YOURSELF,CONSULT BOOK
3	Pyramidal	XeO_3 Colourless crystals	DRAW YOURSELF,CONSULT BOOK
4	Tetrahedral	XeO_4 Explosive, colourless gas.	DRAW YOURSELF,CONSULT BOOK
4	Square-planer	XeF_4 Colourless crystals	DRAW YOURSELF,CONSULT BOOK
4	See-saw	XeO_2F_2	DRAW YOURSELF,CONSULT BOOK
5	TBP	XeO_3F_2	DRAW YOURSELF,CONSULT BOOK
6	Distorted octahedral or capped octahedral	XeF_6 Colourless crystals	DRAW YOURSELF,CONSULT BOOK
8	Square anti-prismatic	XeF_8^{2-}	DRAW YOURSELF,CONSULT BOOK

***XENON DIFLUORIDE*:**

PREPARATIONS:

1. **$Xe + F_2$ =light from a mercury lamp= XeF_2**
2. **Xe (excess)+ F_2 [Xe : F_2 =2:1] =sealed Ni tube, 400°C= XeF_2**
3. **$Xe + O_2F_2$ =-118°C= $XeF_2 + O_2$**

HYDROLYSIS:

1. **$2XeF_2 + 2H_2O = 2Xe + 4HF + O_2$**

   Hydrolysis is slow in dilute acid medium and rapid in basic medium.
2. **$XeF_2 + 2OH^- = Xe + ½\ O_2 + 2F^- + H_2O$**

REDOX PROPERTY:

$XeF_2(aq) + 2H^+ + 2e = Xe + 2HF$ $E° = +2.64$ V

Fluorinating property:

1. **$C_6H_6 + XeF_2 \rightarrow C_6H_5F + Xe + HF$**
2. **$2XeF_2 + 2H_2C=CH_2 \rightarrow FH_2C-CH_2F + F_2CH-CH_3 + 2Xe$**

XeF_2 is a strong oxidant & can oxidise Cl^- to Cl_2 , Ce^{3+} to Ce^{4+} , NH_3 to N_2 etc. XeF_2 can also behave as Lewis base towards SbF_5 **,** IF_5 etc. to produce XeF_2. $2SbF_5$ & $XeF_2.IF_5$

XENON TETRAFLUORIDE:

PREPARATIONS:

1. **$Xe + 2F_2$ [Xe : F_2 =1:5] =sealed Ni Vessel, 400°C,6 ATM, 6 Hrs= XeF_4**

HYDROLYSIS:

1. **$2XeF_4 + 3H_2O = Xe + 6HF + XeO_3 + F_2$**
2. **$6XeF_4 + 12H_2O = 4Xe + 24HF + 2XeO_3 + 3O_2$**

Hydrolysis of XeF_4 at -80°C gives xenonoxydifluoride, $XeOF_2$

$XeF_4 + H_2O = XeOF_2 + 2HF$

Fluorinating property:

3. **$2C_6H_6 + XeF_4 \rightarrow 2C_6H_5F + Xe + 2HF$**
4. **$XeF_4 + 2H_2C=CH_2 \rightarrow FH_2C-CH_2F + F_2CH-CH_3 + Xe$**

XeF_4 can oxidise a number of compounds & itself is reduced to Xe.

1. **$XeF_4 + 2H_2$ =130°C= $4HF + Xe$**
2. **$XeF_4 + 2Hg = 2HgF_2 + Xe$**
3. **$XeF_4 + 2Cl^-$ =$4F^- + Xe + 2Cl_2$**
4. **$XeF_4 + 6NH_3 = 4NH_4F + Xe + H_2 + N_2$**

XENON HEXAFLUORIDE: (XeF_6)

PREPARATIONS:

1. **$Xe + 3F_2$ [Xe : F_2 =1:20] =sealed Ni Vessel, 250°C,50 ATM, = XeF_6**
2. **$XeF_4 + O_2F_2$ (-130°C) $\rightarrow O_2 + XeF_6$**

HYDROLYSIS:

1. **$XeF_6 + H_2O = XeOF_4 + 2HF$**
2. **$XeF_6 + 3H_2O = 6HF + XeO_3$**

In strongly basic solution [2.5 M NaOH] XeF_6 is converted in xenate ion, $HXeO_4^-$ which slowly disproportionates in to perxenate ion, XeO_6^{4-} and Xe.

$XeF_6 + 7OH^- = HXeO_4^- + 6F^- + 3H_2O$

$2HXeO_4^- + 2OH^- = XeO_6^{4-} + Xe + 2H_2O + O_2$

$2XeF_6 + 16NaOH = 8H_2O + 12NaF + Na_4XeO_6 + Xe + O_2$

ACTION OF HEAT: $2XeF_6 = XeF_2 + XeF_4 + 3F_2$

Fluorinating property: Out of three xenon fluorides XeF_6 is best fluorinating agent.

1. **$2C_6H_6 + XeF_6 \rightarrow 2C_6H_5F + Xe + 2HF$**
2. **$XeF_6 + 2H_2C=CH_2 \rightarrow FH_2C-CH_2F + F_2CH-CH_3 + Xe$**

OXIDISING PROPERTY:

XeF_6 can oxidise a number of compounds & itself is reduced to Xe.

1. $XeF_6 + 3H_2 = 6HF + Xe$
2. $XeF_6 + 6HCl = 3Cl_2 \uparrow + 6HF + Xe$
3. $XeF_6 + 8NH_3 = 6NH_4F + Xe + N_2 \uparrow$

REACTION WITH SILICA: Xenon hexafluoride reacts with silica to produce colourless silicon tetrafluoride gas and solid xenon trioxide.

$2XeF_6 + SiO_2 = 2XeOF_4 + SiF_4$

$XeOF_4 + SiO_2 = SiF_4\uparrow + XeO_3$