Oxidation States

How to draw a structure

Fundamentals

Hydrolysis

Oxyacid’s

Oxides

Polymers

Colour

Contents:

1. **All about Oxidation states**

2. **How to draw any structure**

1. What is Oxidation State ?

Charge real or imaginary acquired by an atom in a group, calculated by attributing all the electrons of the bond to the more electro negative atom

$KMnO_4$ **(+7)**

Mn^{2+}

2. Electro Negativity Order

F > O > N > Cl >Br…… Other non metals ……. H > B > …… Half Metals

(I, S, P, C, Si)

4. What is the Oxidation State of the below elements ?

$$P_4\ , S_8, O_2$$

ZERO

O.S of atoms in elementary state is ZERO

5. Max O.S = Group Number

(Except for Cu, Fe, O, F)

Min O.S = Group No. - 8

IV A to VII A only

What is the minimum oxidation of Zn, Al ?

Ans: Zero

The minimum oxidation sate of metals is zero.

6. Oxygen

O^{2-} ……. Oxide

O_2^{2-} or O^- or $-O-O-$ ……Per oxide

O_2^- or $O^{\frac{-1}{2}}$ ……Super oxide

7. Who exhibit Fixed Oxidation state ?

I A …….. +1

II A …….. +2

F …….. -1

A few other like Zn , Al

ONLY

8. Oxygen will take what ever is given …… **Most Flexible**

9. In the absence of above fixed Oxidation state

……..give (-2) to oxygen

If the other atom gets impossible O.S (higher than Max)

……then it’s a Peroxy

$Cr_2O_7^{2-}$

Conclusions

a. Metals act as reducing agents

b. Compound in Max O.S can act as oxidising agent **ONLY**

$$KMnO_4, K_2Cr_2O_7, HNO_3$$

c. Compound in min O.S can act as reducing agent **ONLY**

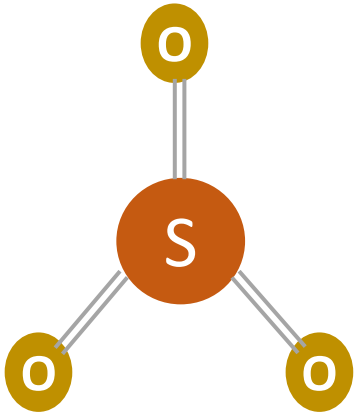
$$NH_3, H_2S, NaBH_4$$

How to Draw any structures

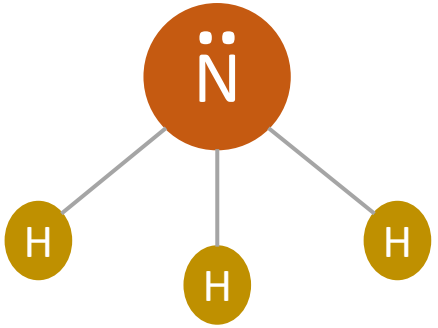
1. H, F, Cl, Br, I, O^{-}……. 1 Bond

   O …….2 Bonds

SO_3



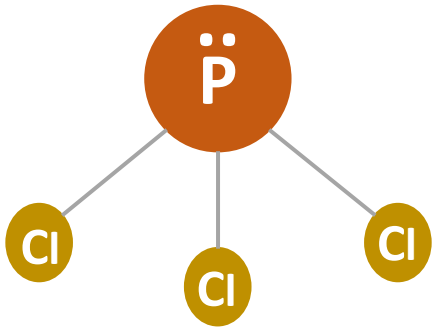
NH_3



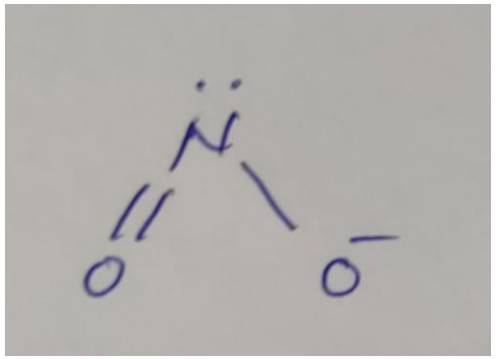
H_2O

SO_2

PCl_3



NO_2^-

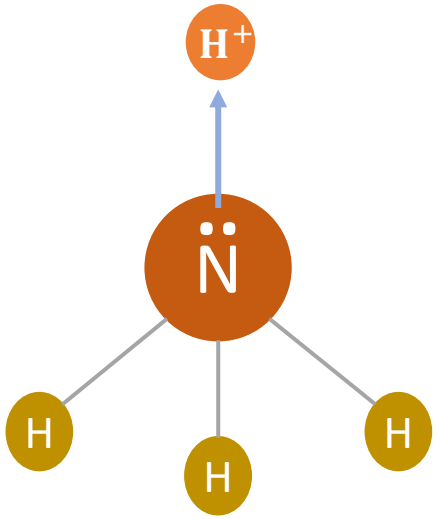


2. Any (+) in a group accepts a **Lone pair** of electrons.

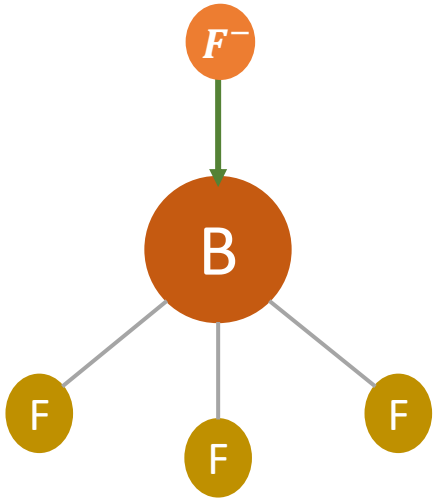
Eg: NH^+

Any (-) in a group donates a **Lone pair** of electrons.

Eg: BF_4^-, BeF_2^-



To get rid of Lone pair

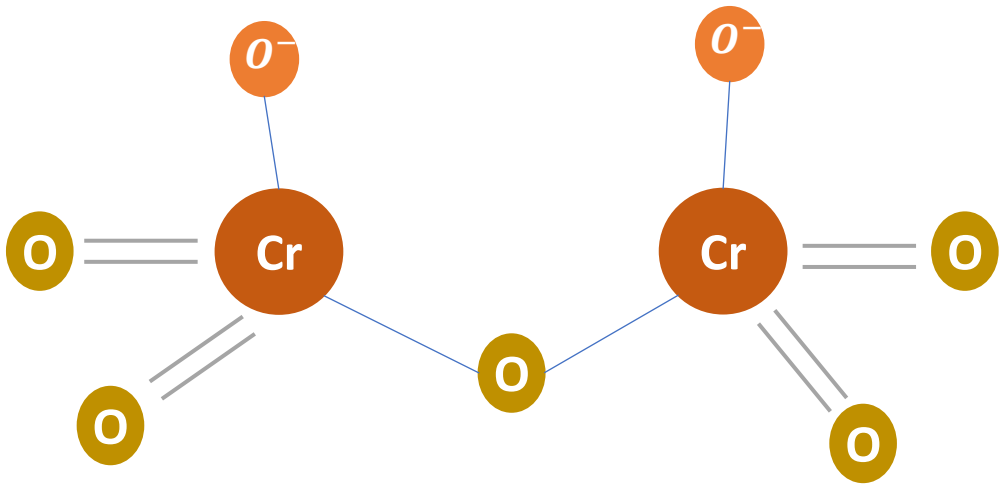


Incomplete Octet

3. More than one central atom

……Distribute Equally

$Cr_2O_7^{2-}$

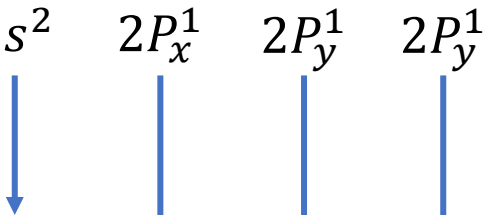


4. For (N) atom only

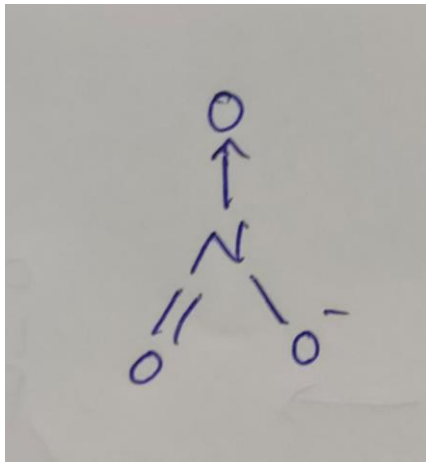
……If there are more than 3 bonds

……its Dative bond

$2s^2$ $2P_x^1$ $2P_y^1$ $2P_y^1$



Eg. NO_3^-

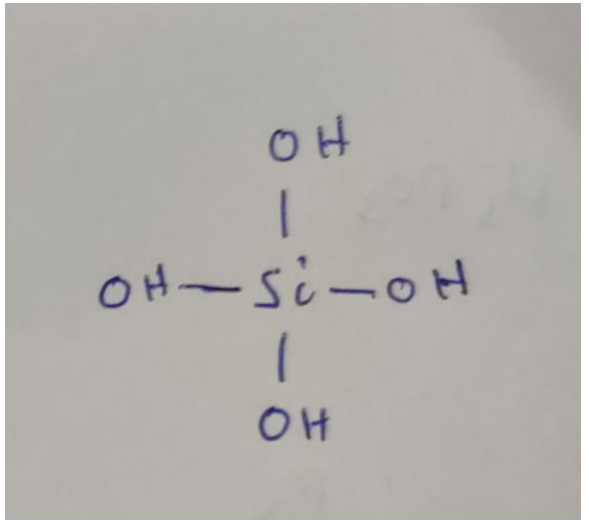


5. Try to avoid Lone pairs as much as possible

6. For Oxoacids (H…….O)

H_4SiO_4

Silicic Acid

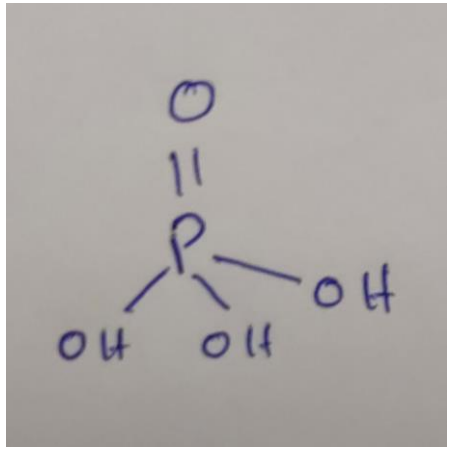


No of –OH = No of (H) present

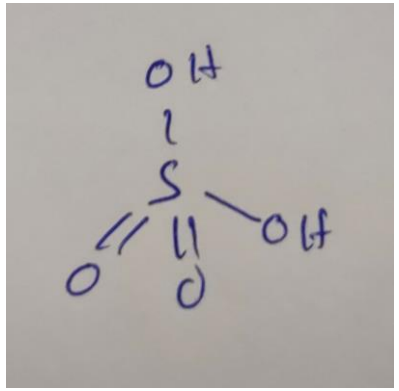
(Except: H_3PO_3, H_3PO_2)

2 -OH 1 -OH

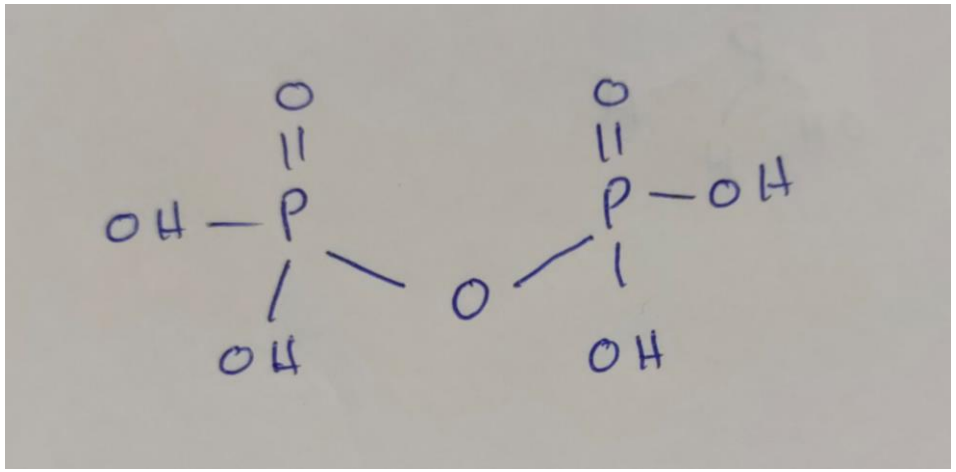
H_3PO_4



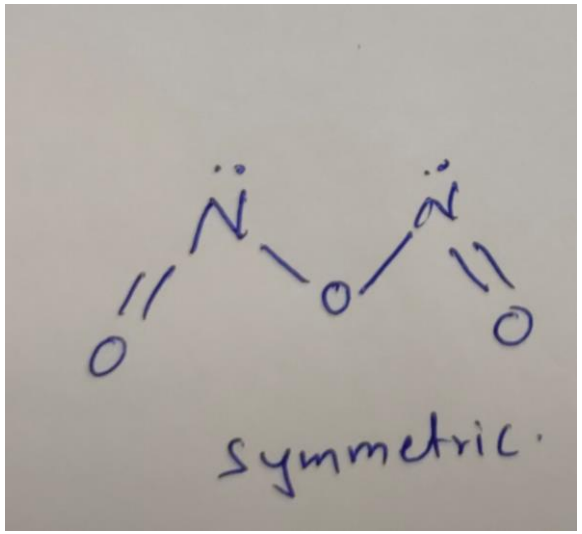
H_2SO_4

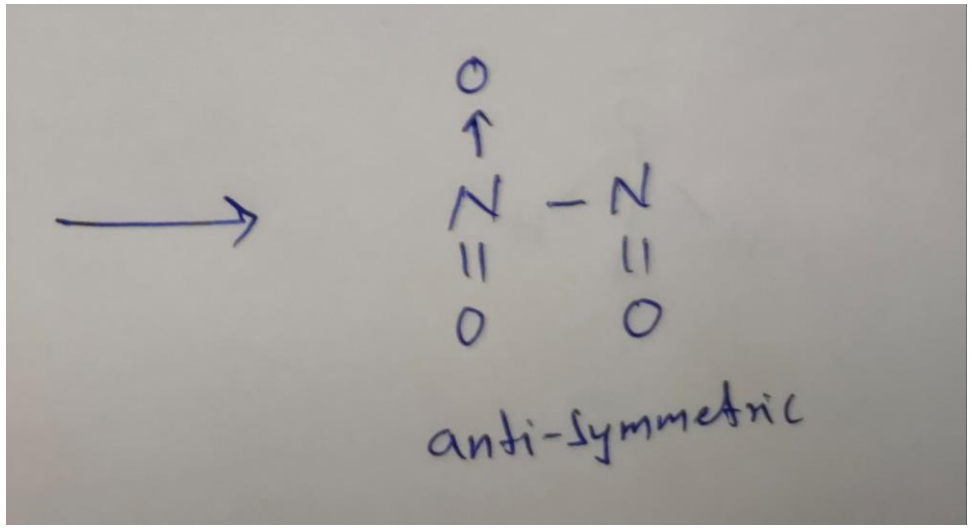


$H_4P_2O_7$



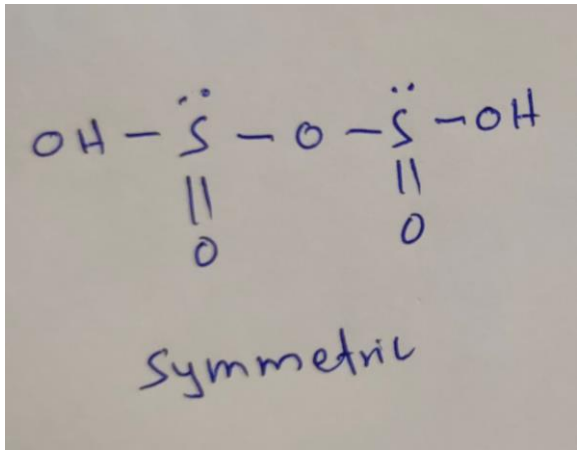
N_2O_3

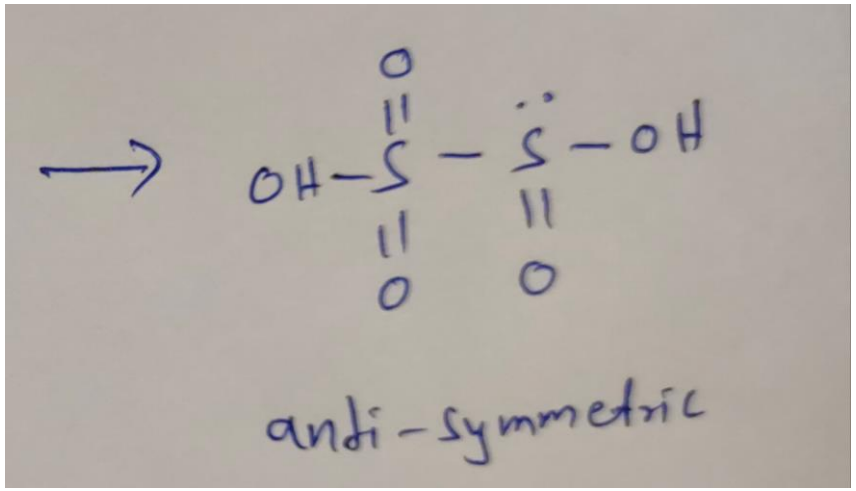




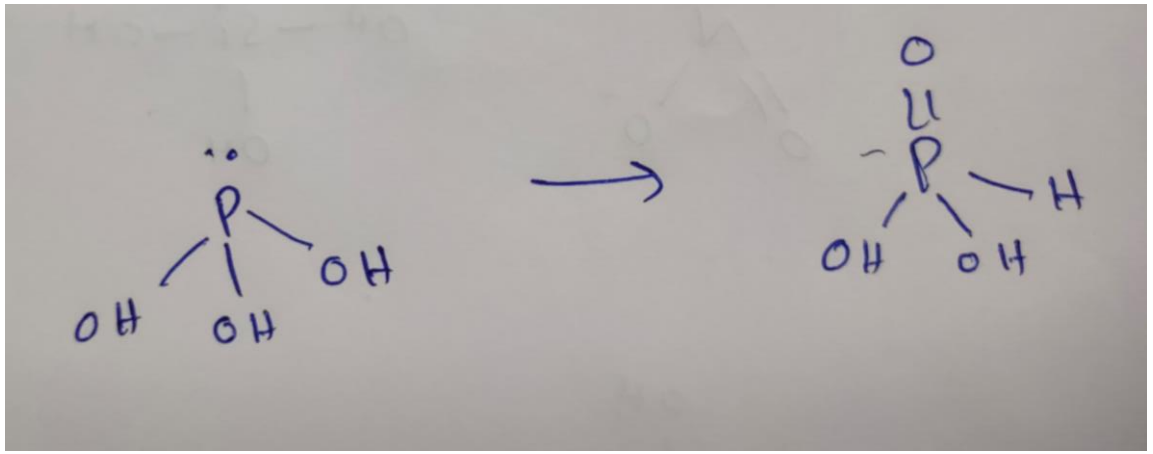
$H_2S_2O_5$

To avoid Lone pairs…at the cost of symmetry





H_3PO_3



H_3PO_2