

15th group

N }
P } — non metal

As }
Sb } metalloids

Bi → metal

① Conf = $n s^2 n p^3$

② Atomic size ↑ down group

N < P < As < Sb < Bi

③ I.E. down the group



④ Catenation prop. $\propto B.E$

$$B.E \propto \frac{1}{\text{size}}$$

$$B.E \propto \frac{1}{l.p - l.p \text{ rep.}}$$

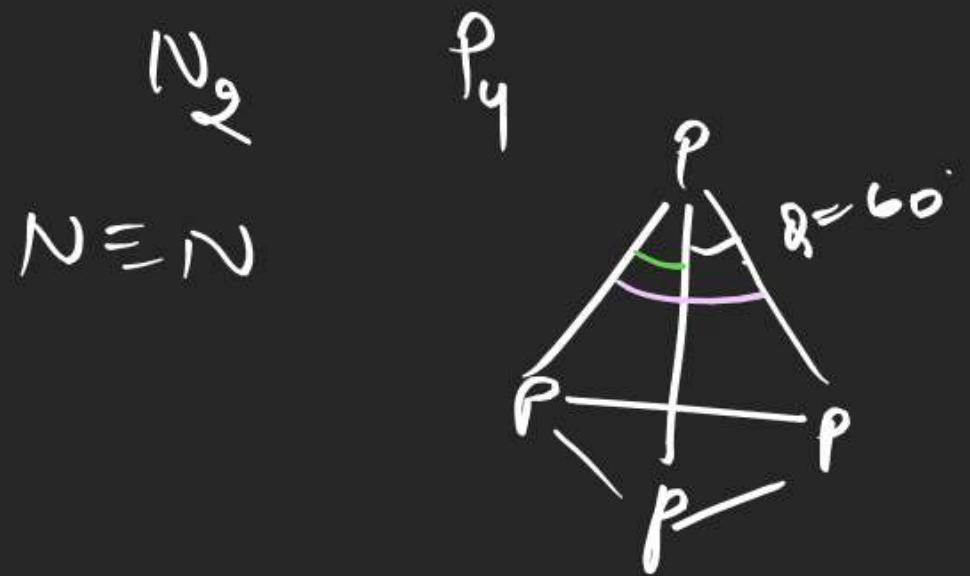
(Only for 2nd period)



so N has lower Catenation prop.

than P that is why N exists as N_2 and P exists as P_4

atomicity = no of atoms in a molecule



$$P - \hat{P} - P = 12$$

P_h As_h Sb_h

① Physical prop.

① all atoms exist as polyatomic molecule
except N it exist as diatomic molecule



P \equiv P does not exist why.

due to large size

P does not form $3p_{\pi} - 3p_{\pi}$ bonding

②

③ Metallic prop ↑ down the group

④ B · P ↑ down the group , but m · p ↑ up to
As then ↓ bottom
due to diff crystalline structure

⑤ allotrope : → Excep N all atoms
show allotropy

Chemical prop.

① Oxidation State → Common O-S-3 +3 +5

-3 O-S Stability ↓ down the group because
Metallic ch. ↑



$$1+x+3(-2)=0$$

$$x=+5$$



$$2x+5(-2)=0$$

$$2x=10$$

$$x=5$$

Pt

$$P = 2 \cdot 12$$

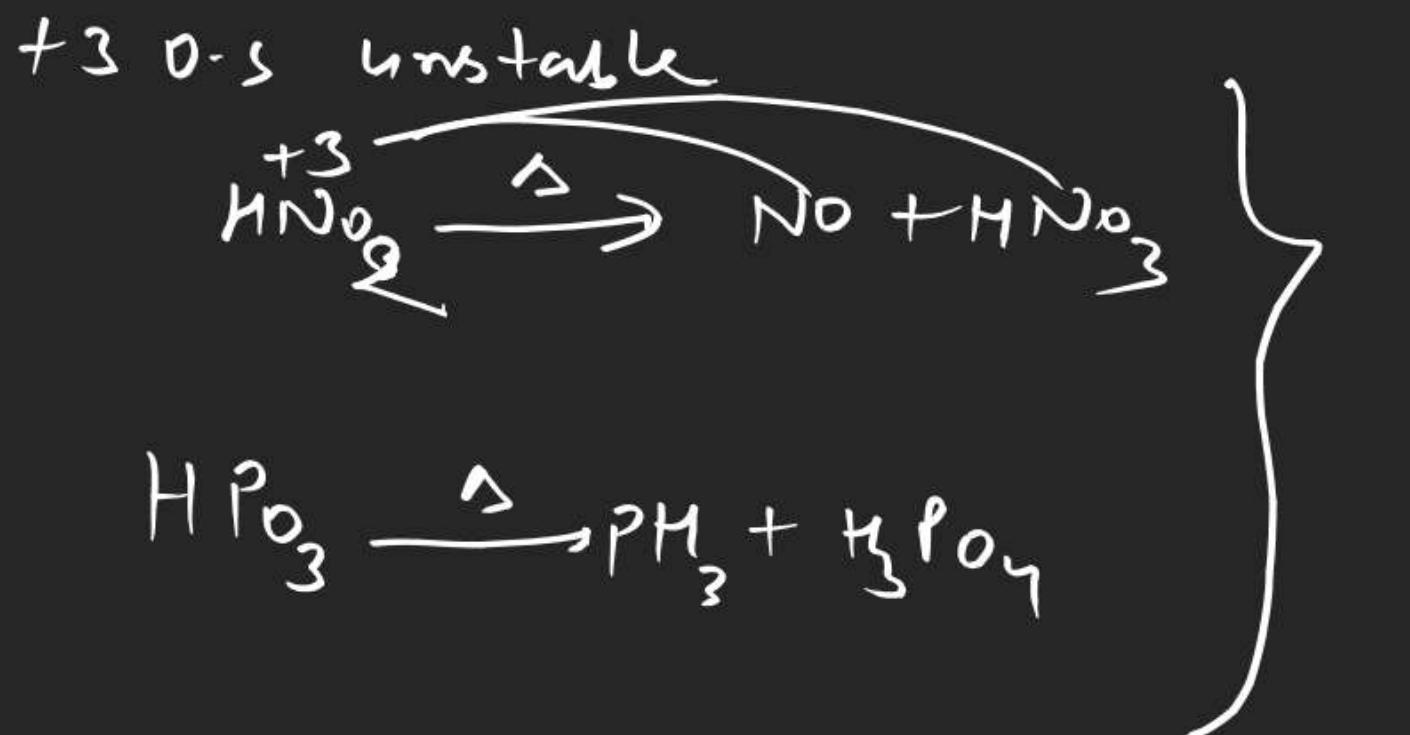
$$H = 2 \cdot 10$$



down the group +5 o.s. ↓ only BiF_5 exist in

+5 o.s

$N = +1 + 2 + 4$ show



reactivity with H₂



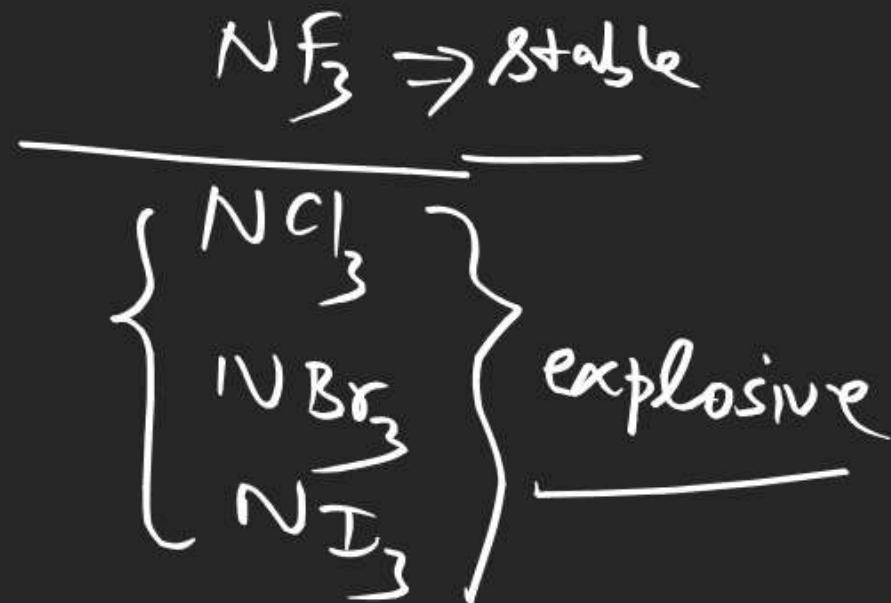
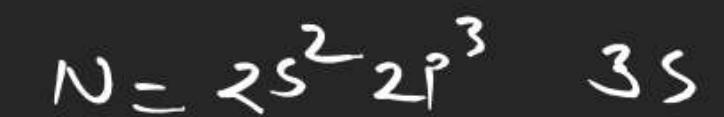
stability of Hydride



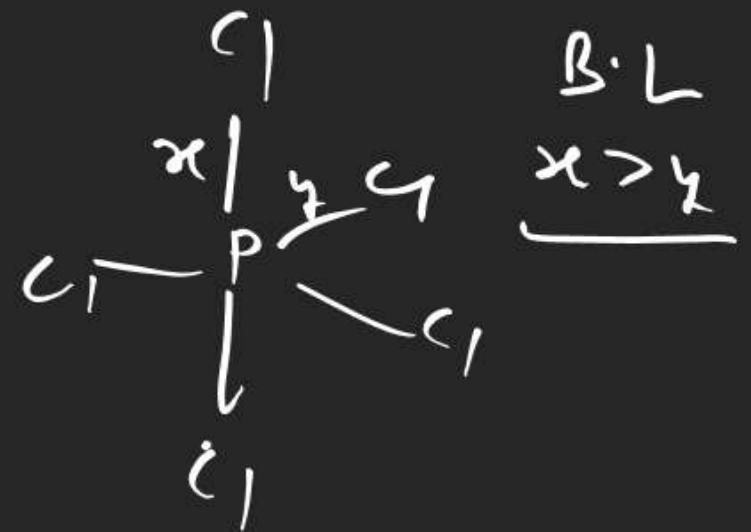
Reducing Power



Reaction with Halogen



because N has 3 valency



In tri halides

all halides are covalent except



Oxides

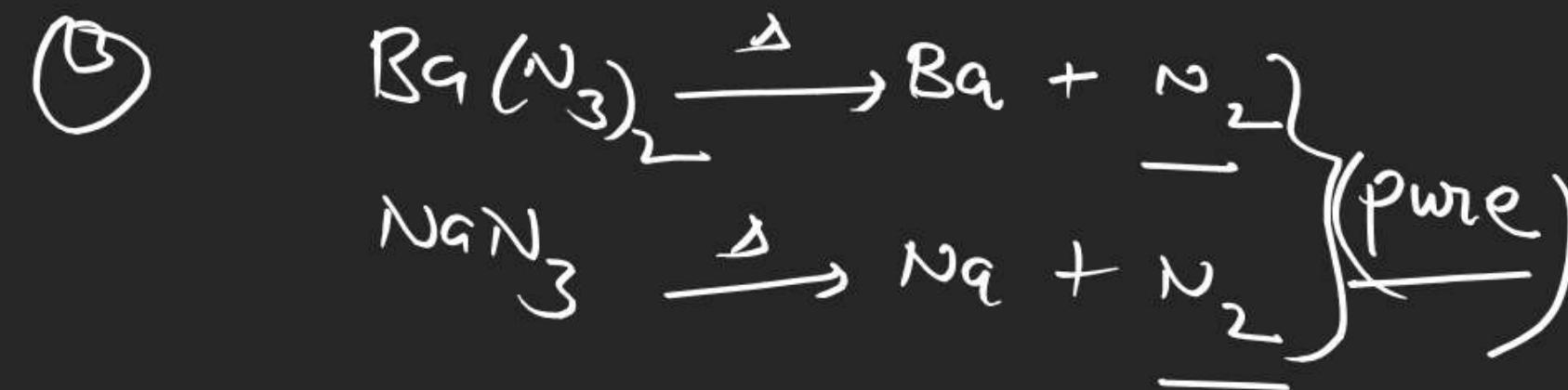
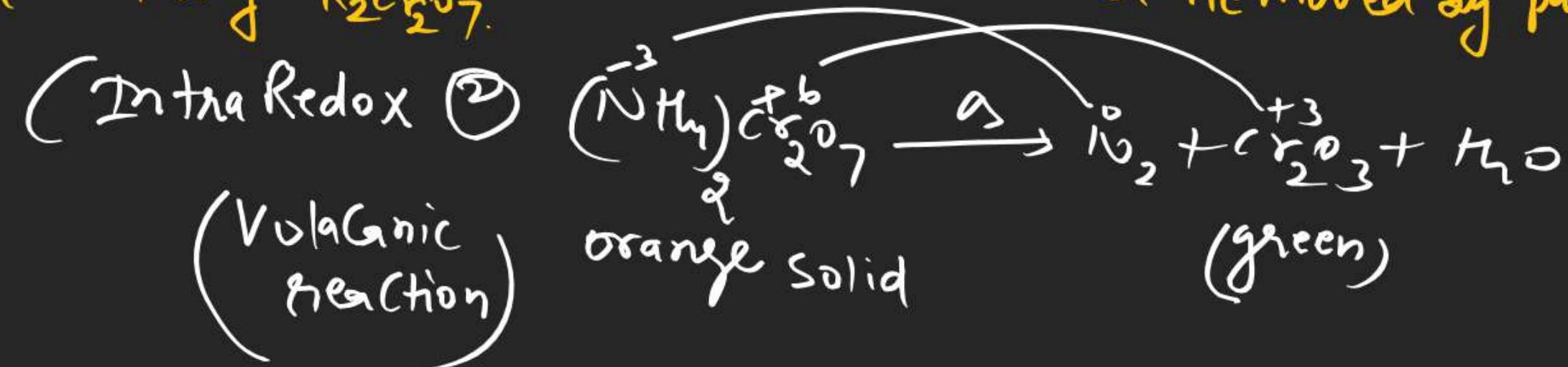
tri oxide N_2O_3 $\text{P}_2\text{O}_3 \rightarrow$ acidic

As_2O_3 $\text{Sb}_2\text{O}_3 \rightarrow$ Amphoteric

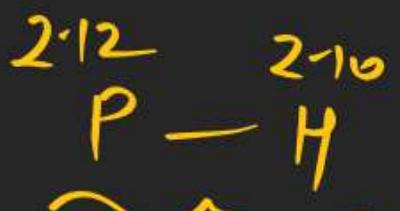
$\text{Bi}_2\text{O}_3 =$ Basic

Prep. of N₂

Small amount of NO and HNO₃ also form and these can be removed by passing them through a sulphuric acid containing K₂Cr₂O₇.



Mohr's Covalent



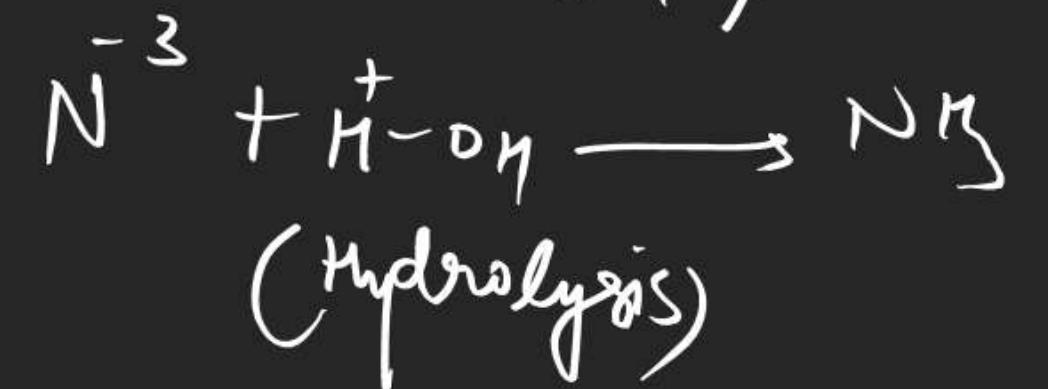
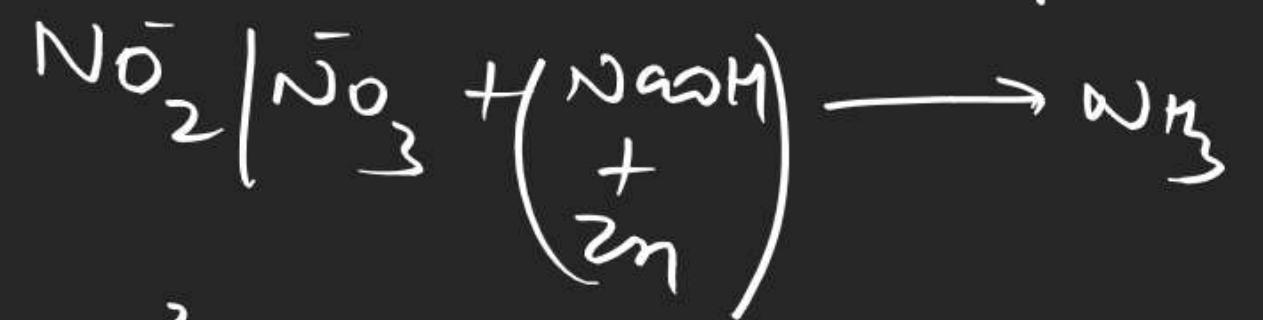
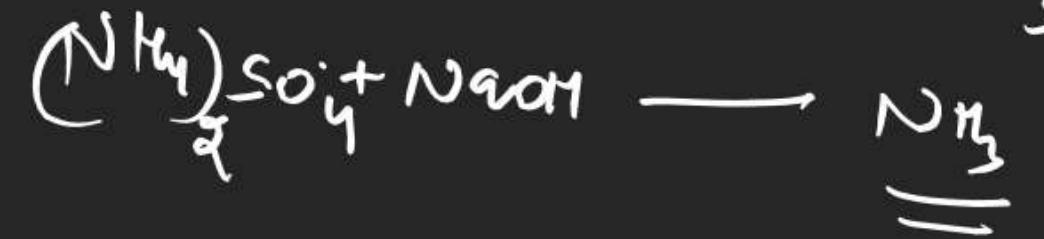
least polar bond,



Prop. of N₂

- ① Colorless | odourless
- ② N has two isotopes / N^{14}
 N^{15}
- ③ it is less soluble in water
- ④ it is use in refrigerant | fertilizer

NH₃



Haber process

$\Delta H = -ive$

Exothermic

Fe = Catalyst

Mo = Promoter [it increases activity of Catalyst]

Note :- Now-a-days iron oxide with small amount of Al_2O_3 and K_2O is used as a Catalyst

Prop.

① NH_3 colourless gas, pungent smell

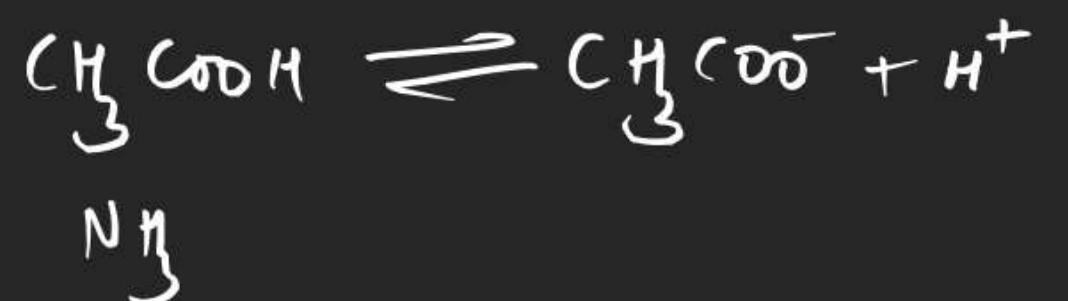
② NH_3 basic (weak)

③ NH_3 soluble in H_2O

④ NH_3 is used as refrigerant.

CH_3COOH acid is a weak acid but

In presence of NH_3 it is act as
Strong acid



Oxides of N

N_2O neutral

(nitrous oxide)

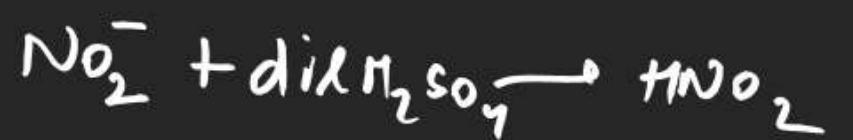
(laughing gas)

Prep.

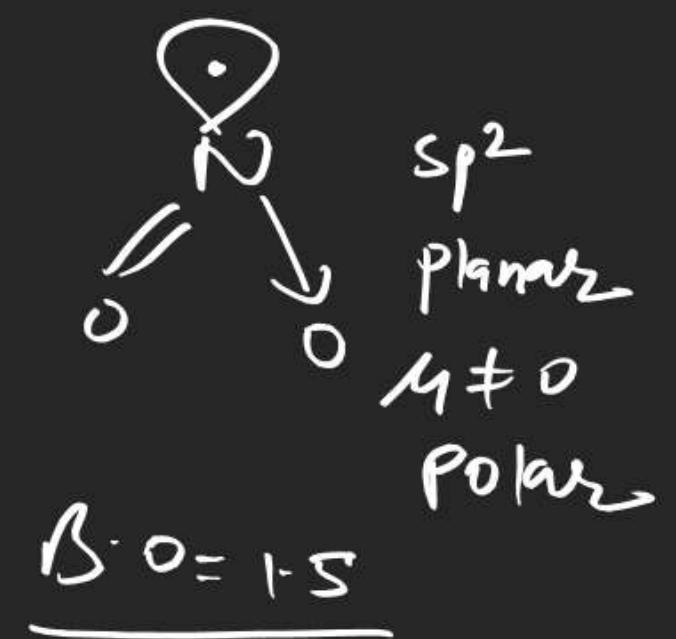




neutral

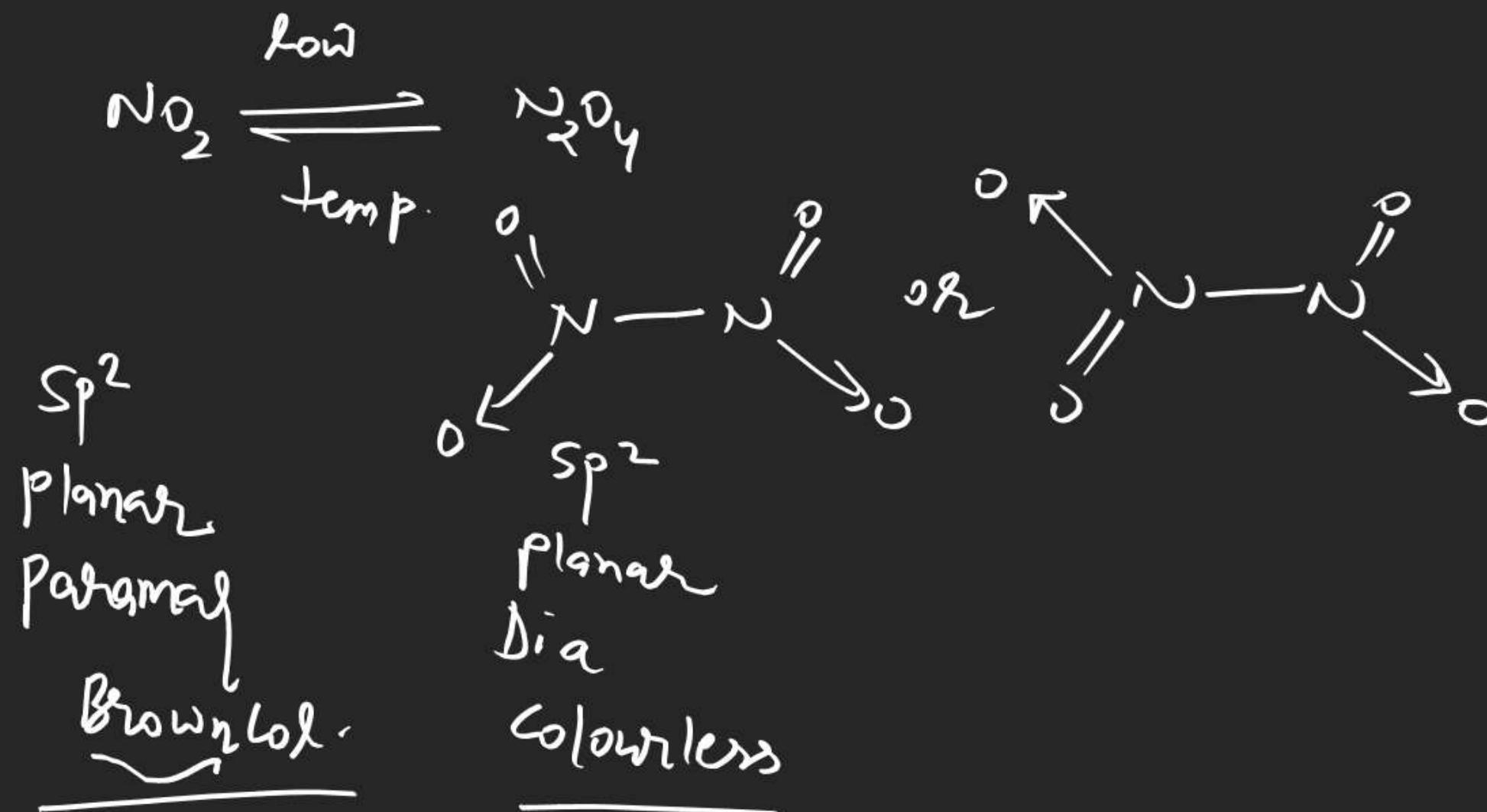
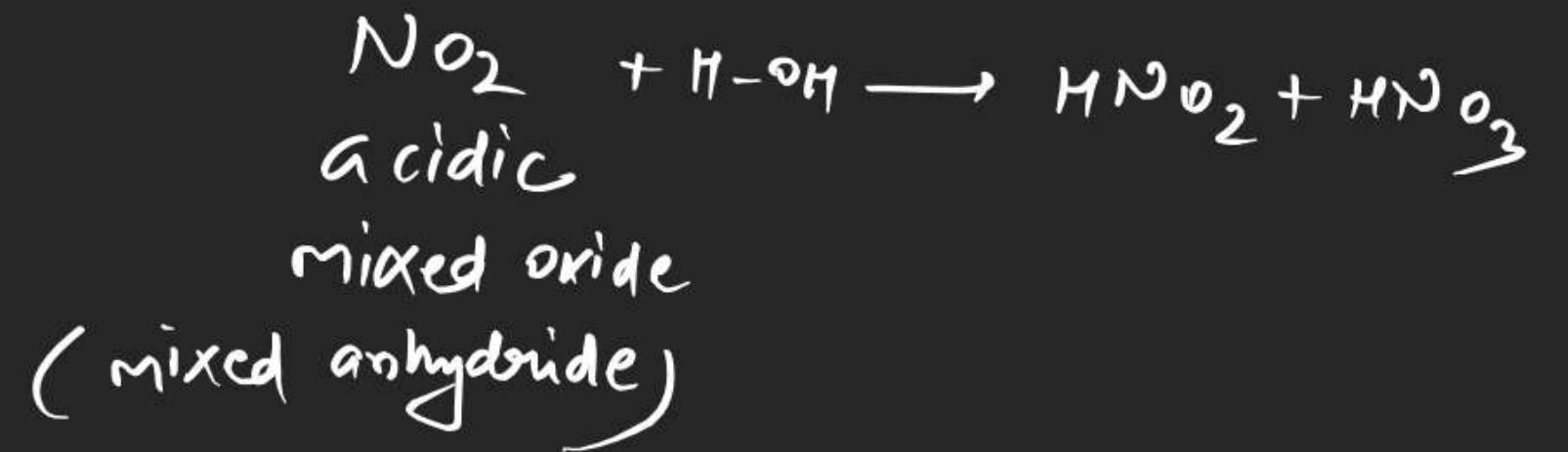


$$\underline{\beta \cdot \text{O} = 2.5}$$



Prep.





N_2O_3 (acidic)
(Blue sol.)



(acidic) Colourless Solid
 N_2O_5

