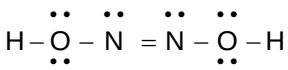
Oxyacids of Nitrogen :

Hyponitrous acid ($H_2N_2O_2$) :

- It is hydrate of N_2O
- It's salts are called hyponitrites.
- Acid and its salts are reducing agent.

Structure :



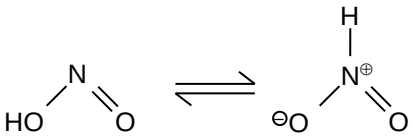
Nitrous acid (HNO_2):

- Dilute acids on reaction with Alkali nitrites gives HNO_2.
- It is highly unstable.
- Salts are called as nitrites and are stable.
- Itself and it's salts are oxidizing and reducing agents.

Eg: It oxidizes $FeSO_4 \rightarrow Fe(SO_4)_3$

It reduces $I_2 \rightarrow I^-$ and $KMnO_4 \rightarrow Mn^{2+}$

Structure :



Mono basic. Used in the preparation of Ozodyes.

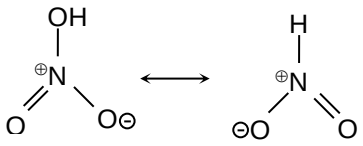
Nitric acid (HNO_3) (Aqua fortis) :

- 1 : 1 ratio of KNO_3, H_2SO_4 gives HNO_3.
- Manufactured by Ostwald and Birkland – Eyde process.
- In ostwald process the raw material is Ammonia.
- Catalyst in ostwald process is platinum guaze.
- Ammonia is oxidized in the process.
- 96 – 98 % HNO_3 is called as fuming nitric acid.
- With Cu dil HNO_3 gives NO with conc. HNO_3 gives NO_2.
- Due to dissolved oxides of Nitrogen it is yellow.
- 1 : 3 mixture of conc. HNO_3 and HCl is called as aqua regia, which dissolves noble metals like Au, Pt, Rh etc,.
- NOCl produced is responsible for the solubility of Au.

  $HNO_3 + 3HCl \rightarrow Cl_2 + 2H_2O + 2NOCl$
- Mixture of HNO_3 and H_2SO_4 is called as nitration mixture.
- HNO_3 is good oxidizing agent.

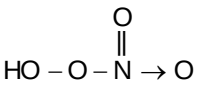
$S \rightarrow H_2SO_4$; $P \rightarrow H_3PO_4$; $C \rightarrow CO_2$

- Due to formation of xanthoproteins it produces yellow stains on skin.
- Metals like Al become passive (in active) with conc. HNO_3 due to formation of their oxide layer.
- It is used to prepare fertilizers like Ammonium nitrate (NH_4NO_3) and explosives like TNT (trinitrotoluene) teargas CCl_3NO_3.



Pernitric acid :

- HNO_4 is called as per nitric acid.

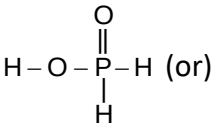
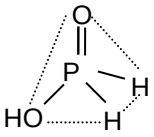


- Oxyacids of phosphorous :

Hypophosphorous acid : (H_3PO_2)

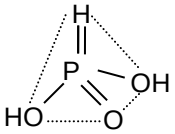
- Salts are called as hypophosphates.
- It decomposes on heating to give PH_3.
- The acid and its salts are powerful reducing agents.
- Basicity of H_3PO_2 is one.

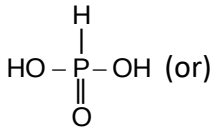
  Structure :


(or)


Ortho Phosphorous acid : (H_3PO_3)

- Forms two series of salts phosphite (Normal) and hydrogen phosphite (Acidic).
- Decomposes on heating to give PH_3 and H_3PO_4.
- It gives two series of salts primary phosphites (H_2PO_3) and secondary phosphites (HPO_3^{-2}).
- H_3PO_4 and its salts are good reducing agents.
- Structure :

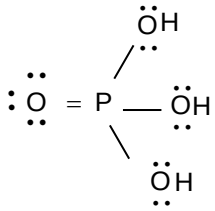




Orthophosphoric acid (H_3PO_4) :

- $Ca_3(PO_4)$ with H_2SO_4 gives H_3PO_4.
- P_2O_5 on hydrolysis gives H_3PO_4.
- Forms three types of salts (basicity is three).
  Dihydrogen phosphate $\left(H_2PO_4^-\right)$.
  Hydrogen phosphate $\left(HPO_4^{2-}\right)$.
  Phosphate $\left(PO_4^{3-}\right)$.
- It is syrupy liquid due to hydrogen bonding.
- The acid looses water steadily on heating.
  $H_3PO_4 \xrightarrow{\text{gently heating}} H_4P_2O_7 \xrightarrow{\text{strong heating}} HPO_3$
  (orthophosphoric acid) (pyrophosphoric acid) (meta phosphoric acid)

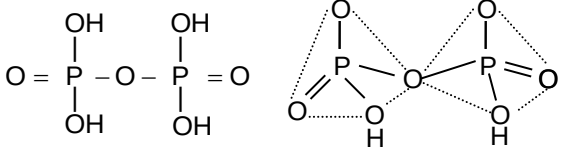
  Structure :



- Used in the preparation of HBr and HI.

Pyrophosphoric acid : ($H_4P_2O_7$) :

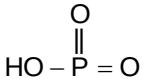
- It forms salts of type $M_4P_2O_7$ and $M_2H_2P_2O_7$.
- $Ca_2P_2O_7$ is used in fluoride tooth pastes.
- $Na_2H_2P_2O_7$ is used in making bread.
- It is a Tetrabasic acid.
  Structure :



Metaphosphoric acid (HPO_3) :

- By heating H_3PO_4 or $H_4P_2O_7$ it is obtained.
- As it is transparent, glassy solid it is known as glacial phosphoric acid.
- It's salts are known as metaphosphates .
- Free monophosphate (PO_3^-) ions doesn't exist where as it forms a ring compounds like triphosphates, tetraphosphates or polyphosphates.
- It's polymeric sodium metaphosphates are called as Graham's salt , Kurrol's salt and madrell's salt $(NaPO_3)_n$.
- It is a monobasic acid.

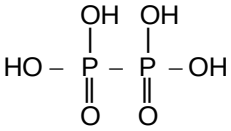
  Structure :

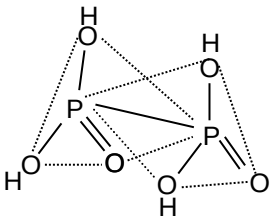


Hypophosphoric acid ($H_4P_2O_6$) :

It is a tetrabasic acid.

Structure :





Peroxy phosphoric acid(H_3PO_5) :

It is a Tribasic acid.

Structure :