* Imides of Sulphur:-

These compound may be regarded as having been obtained by replacing one or more S-atoms in S_8 by imide group (NH). These compounds can be represented by the general formula, $S_n(NH)_{8-n}$. The compounds having two or more NH groups exist as isomers.

Ex:- $S_7(NH)$, 1,3-$S_6(NH)_2$; 1,4-$S_6(NH)_2$; 1,5-$S_6(NH)_2$; 1,3,5-$S_5(NH)_3$; 1,3,6-$S_5(NH)_3$; $S_4(NH)_4$ etc. The numbering system is based on S_8 ring.

* preparation:- Tetrasulphur tetraimide

When S_2Cl_2 reacts with NH_3 in dimethyl formide, $S_7(NH)$, 1,3-$S_6(NH)_2$, 1,4-$S_6(NH)_2$ 1,3,5-$S_5(NH)_3$, 1,3,6-$S_5(NH)_3$ etc., are obtained. These products are separated from each other by Chromotography and/fractional crystallisation.

Tetra sulpher tetraimide, $S_4(NH)_4$ is prepared by reducing S_4N_4 with S_4N_4 with $SnCl_2$ in C_2H_5OH

$$S_4N_4 + 4H \xrightarrow{\text{Red}^n \text{ by } SnCl_2 \text{ in } C_2H_5OH} S_4(NH)_4$$

Tetra sulpher tetraimde

* properties of $S_4(NH)$:-

i) The reaction of $S_4(NH)$ with C_6H_5Na gives $S_4(NNa)$.

$$S_4(NH) + C_6H_5Na \longrightarrow S_4(NNa) + C_6H_6$$

ii) N-H bonds in $S_4(NH)$ can be acetylated and benzoylated.

iii) The reaction of $S_4(NH)$ with the salts of Hg(II) and Hg(I) in non-aqueous solvents gives $Hg(NS_4)_2$ and $Hg_2(NS_4)_2$ respectively.

* properties of $S_4(NH)_4$:-

i) It is colourless compound and reacts with

C_6H_5Na to form $S_4(NNa)_4$.

$$S_4(NH)_4 + 4\ C_6H_5Na \rightarrow S_4(NNa)_4 + 4\ C_6H_6$$

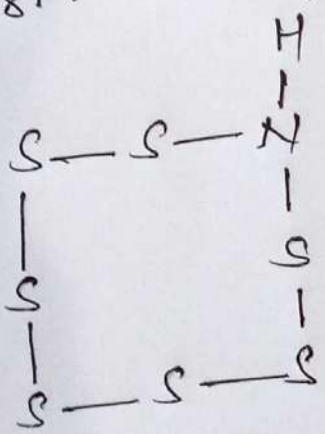
Tetra sulpher tetra sodium imide.

iii) N-H bonds in $S_4(NH)_4$ molecule can be acetylated and benzoylated.

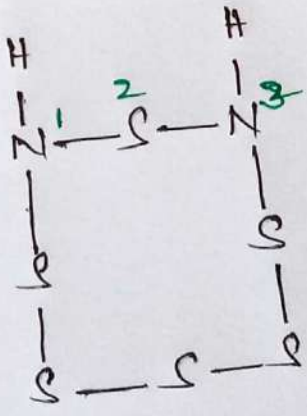
iii) Air oxidation of $S_4(NH)_4$ at 100°c gives tetra meric thionyl imide $(OS)_4(NH)_4$ or $(OSNH)_4$

* Structure of imides of sulpher:—

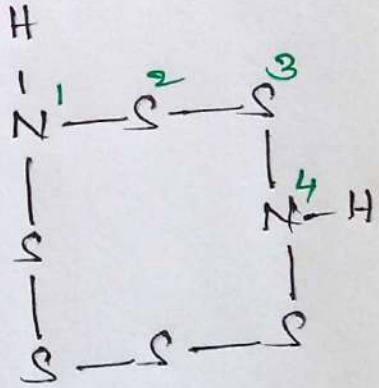
None of the imides has N-N bonds. the structure of some imides as follows.



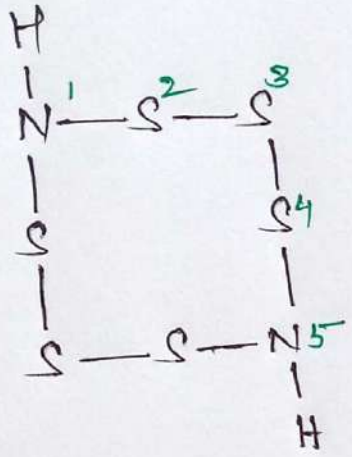
$S_4(NH)$



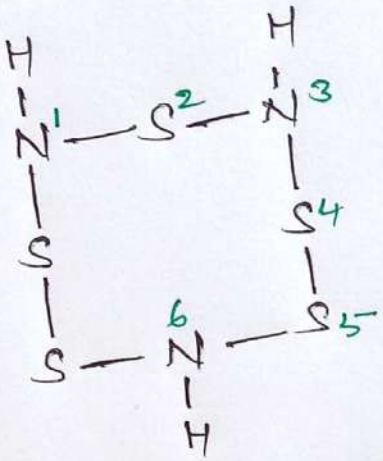
1,3 - $S_6(NH)_2$



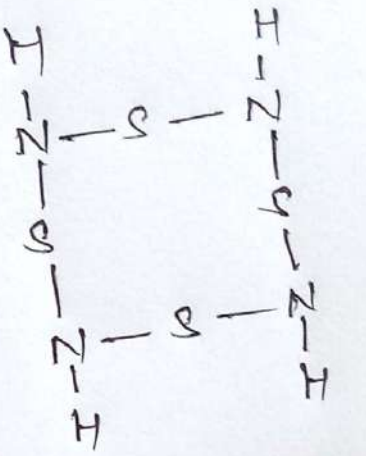
1,4 - $S_6(NH)_2$,



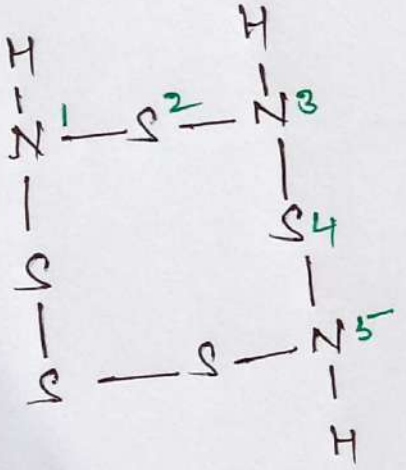
1,5-$S_6(NH)_2$



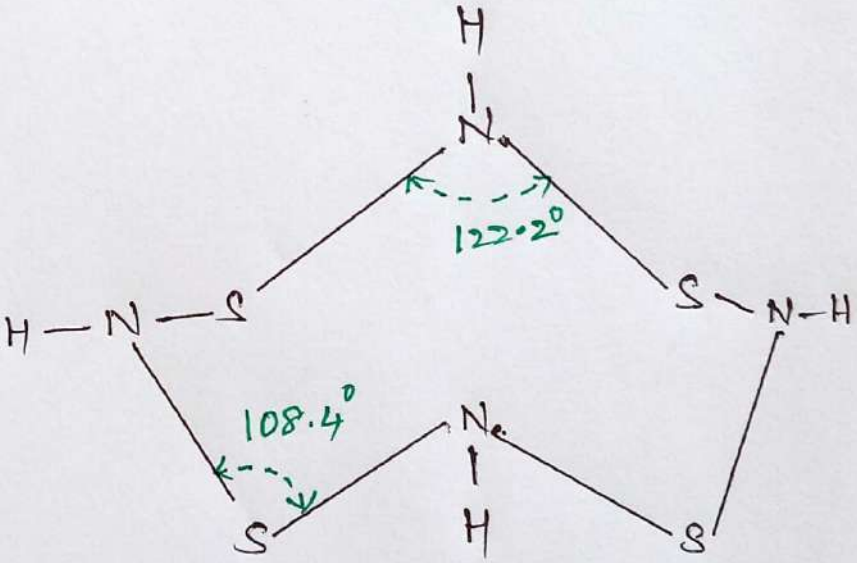
1,3,6-$S_5(NH)_3$



$S_4(NH)_4$



1,3,5,-$S_5(NH)_3$



Structure of $S_4(NH)_4$

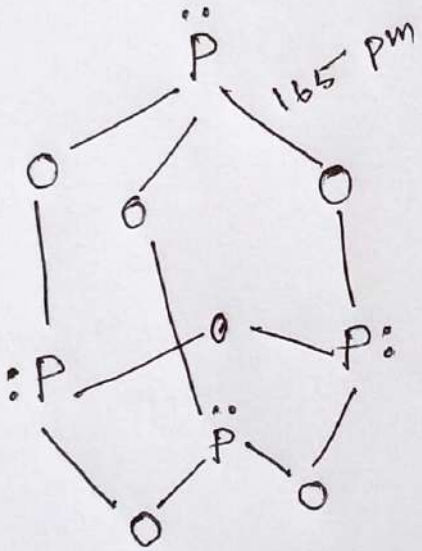
Structure shown in fig. It has one N–H bond. $S_6(NH)_2$ has three isomers namely 1,3; 1,4 and 1,5 while $S_5(NH)_3$ exists in two isomeric forms which are 1,3,5 and 1,3,6. The str of

each isomer of $S_6(NH)_2$ and $S_5(NH)_3$ has been shown in fig. The str of $S_4(NH)_4$ is the same as that of S_8. NSN and SNS bond angles are 108.4° and 122.2°. NOTE that SSS bond angle in S_8 is 107.8°. All N-S bond lengths in $S_4(NH)_4$ are the same (=1.67 A°). $S_4(NH)_4$ cannot be reduced to hydrazine. This shows no two N-atoms are directly linked to each other in $S_4(NH)_4$ molecule i.e $S_4(NH)_4$ does not have any N-H bonds. $S_4(NH)_4$ molecule does not have any isomer and hence represented by a single structure.

* CAGES :-

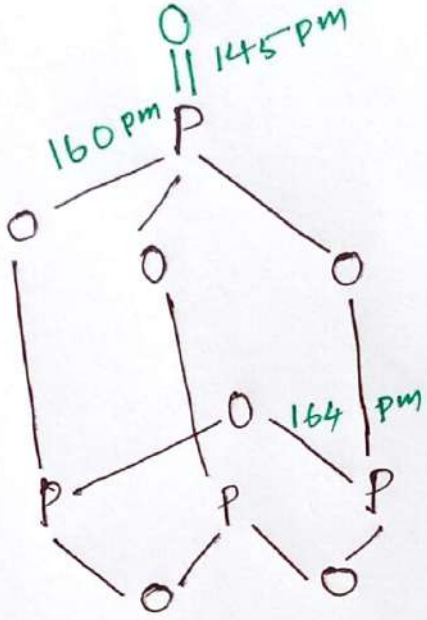
Cage structures rouge from clothrate compounds on the one hand to metal-metal clusters.

1) Structure of P_4O_6 :-



* P_4O_6 is Four lone pairs of electrons
* P_4O_6 is also P_2O_3 form
* P_4O_6 is Tetrahedral symmetry

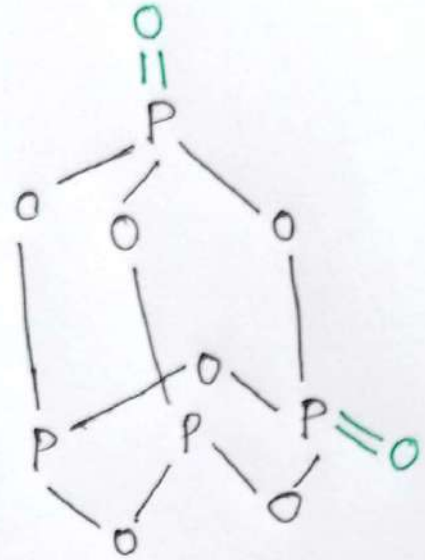
2) Structure of P_4O_7 :—



* The P_4O_7 molecule reacts to form both phosphoric acid and phosphorous acid
* P_4O_7 is crystalline black phosphorous has a corrugated layer str..

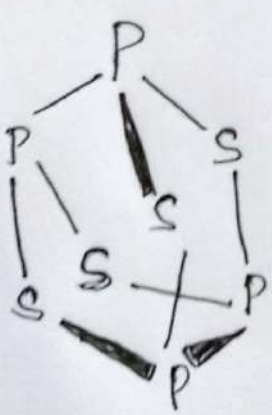
NOTE :- Molecular structures of some phosphorous and sulphide distance in "picometer" (pm)

3) Structure of P_4O_8 :—

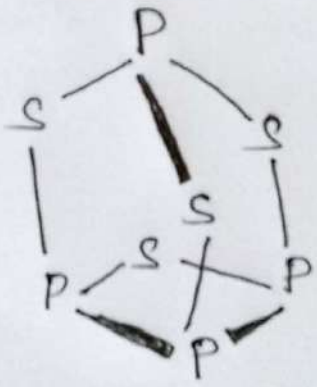


4) Structure of P_4S_4 :—

P_4S_4 exhists two stores i) α-P_4S_4 ii) β-P_4S_4

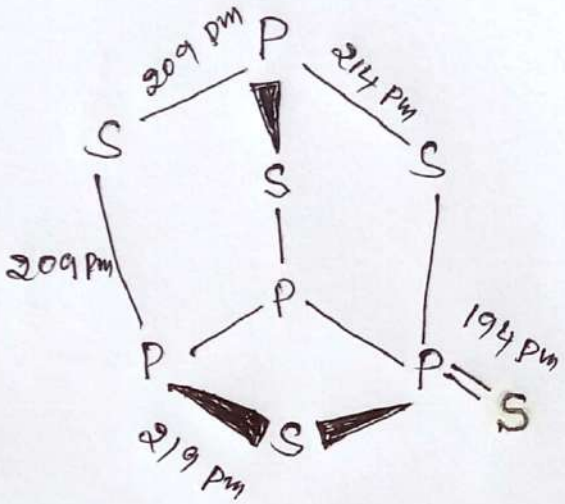


Str of α-P_4S_4



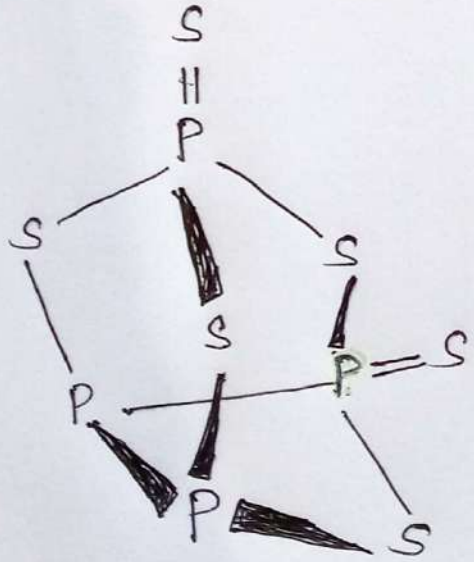
Str of β-P_4S_4

5) Structure of P_4S_5 :-

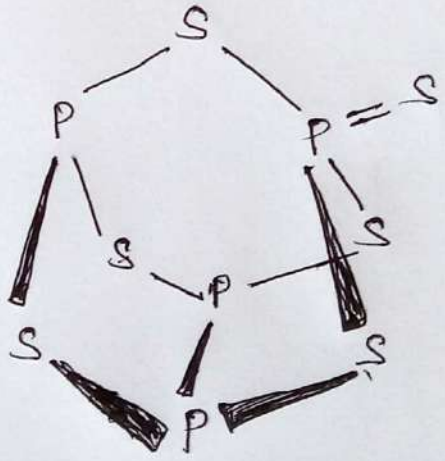


6) Structure of P_4S_6 :-

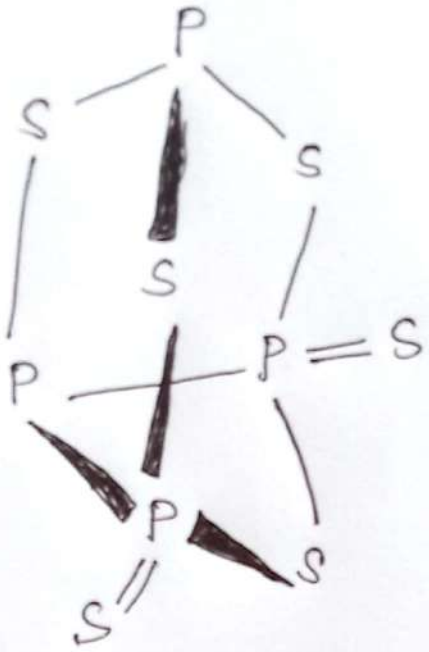
P_4S_6 is exhibits three forms of str such as $\alpha-P_4S_6$, $\beta-P_4S_6$ and $\gamma-P_4S_6$



$\alpha-P_4S_6$

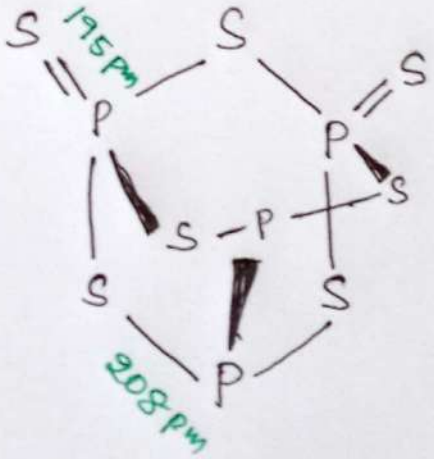


$\beta-P_4S_6$



√- P_4S_6

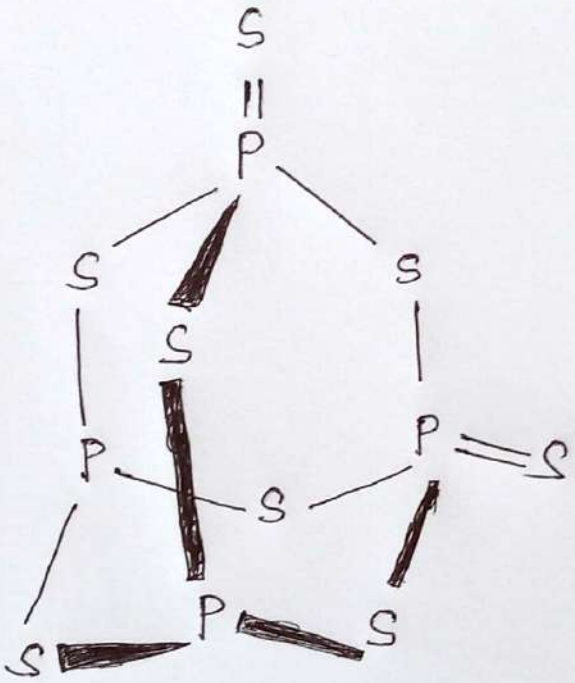
7) Structure of P_4S_7 :-



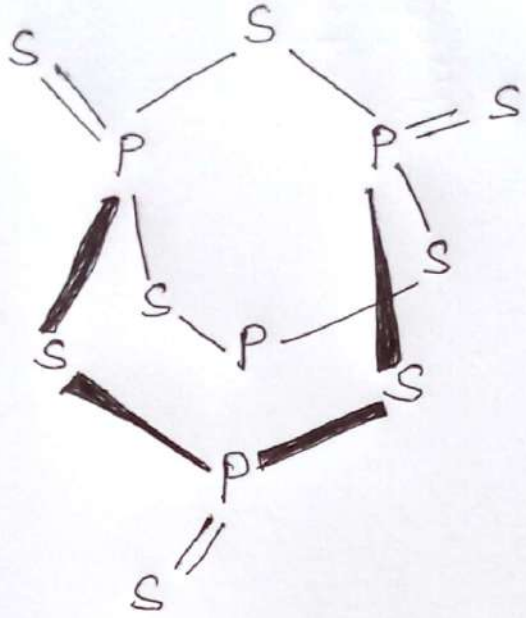
* 8) Structure of P_4S_8 Tetraphosphorous octa sulphide :-

The str of P_4S_8 exhibits three structure such as $\alpha-P_4S_8$, $\beta-P_4S_8$ and $\gamma-P_4S_8$

i) $\alpha-P_4S_8$:-



ii) β- P_4S_8 :—



iii) γ- P_4S_8 :—