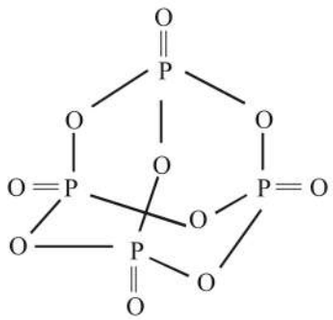
The p-Block Elements (Group 15, 16, 17 & 18)

1. Find the number of sigma bonds in P_4O_{10}.
2. How many bonding electron pairs are there in white phosphorus ?
3. Find the number of P – O – P bonds in cyclic metaphosphoric acid.
4. Calculate the total number of bond pairs and lone pairs of electrons present in OF_2 molecule.
5. How many forms of SO_3 exists
6. What is the number of S–S bonds in sulphur trioxide trimer (S_3O_9)?
7. What is the number of P–O–P bonds in cyclic metaphosphoric acid?
8. Find the number of P–O–P bonds in P_4O_{10}
9. 25 mL of household bleach solution was mixed with 30 mL of 0.50 M KI and 10 mL of 4N acetic acid. In the titration of the liberated iodine, 48 mL of 0.25 N $Na_2S_2O_3$ was used to reach the end point. Calculate the molarity of the household bleach solution.
10. What is the value of *n* in the molecular formula $Be_nAl_2Si_6O_{18}$?
11. Reaction of Br_2 with Na_2CO_3in aqueous solution gives sodium bromide and sodium bromate with evolution of CO_2 gas. Find the number of sodium bromide molecules involved in the balanced chemical equation.
12. Among the following, find the number of compounds that can react with PCl_5 to give $POCl_3$

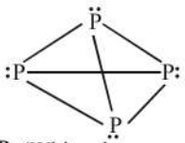
    O_2, CO_2, SO_2, H_2O, H_2SO_4, P_4O_{10}
13. What is the sum of number of sigma (σ) and pi (π) bonds present in sulphuric acid molecule ?
14. H_3PO_2 is the molecular formula of an acid of phosphorus. What is its basicity?
15. How many hygroscopic compounds are formed when Cl_2 reacts with hot aqueous NaOH.

SOLUTIONS

1. (16)



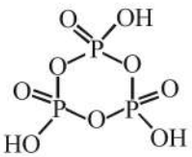
2. (3)



P_4 (White phosporus)

$\because$ Each P-atom forms 3 bonds. Thus it has 3 bond pairs of electrons.

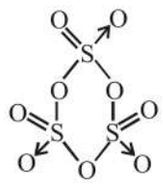
3. (3) In cyclic metaphosporic acid number of P–O–P bonds is three.



4. (10) $:\ddot{F}-\ddot{O}-\ddot{F}:$ Number of bond pairs = 2, Number of lone pairs = 8.

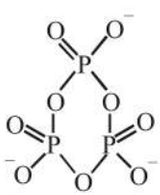
5. (3) SO_3 exists in 3 solid allotropic forms.

6. (0) S_3O_9 (also called α- sulphur trioxide) is an ice like solid with the following molecular structure.



There is no S–S bond is S_3O_9

7. (3)



No. of P–O–P bonds = 3. It is the most stable among all the cyclic metaphosphates.

8. (6) There are 6 P–O–P bond in P_4O_{10}.

9. (3) Number of millimole of hypo $= 0.25 \times 48$

$= 2 \times$ millimole of Cl_2

$$\therefore \text{Number of millimole of } Cl_2 = \frac{0.25 \times 48}{2} = 6$$

millimole of Cl_2 = millimole of $CaOCl_2$

Molarity of bleaching solution

$$= \frac{\text{Millimoles of } CaOCl_2}{\text{Vol.(in mL) of } CaOCl_2} = \frac{6}{25} = 0.24$$

10. (3) Total cationic charge = Total anionic charge

$2n + 6 + 24 = 36$

$n = \mathbf{3}$

11. (5) $3Br_2 + 3Na_2CO_3 \longrightarrow$

$5NaBr + NaBrO_3 + 3CO_2$

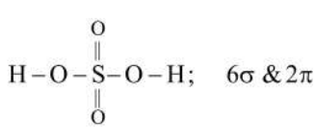
12. (4) $PCl_5 + SO_2 \longrightarrow POCl_3 + SOCl_2$

$PCl_5 + H_2O \longrightarrow POCl_3 + 2HCl$

$PCl_5 + H_2SO_4 \longrightarrow POCl_3 + SO_2Cl_2 + 2HCl$

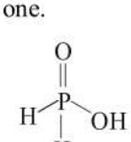
$6PCl_5 + P_4O_{10} \longrightarrow 10POCl_3$

13. (8)



6σ & 2π

14. (1) H_3PO_2 is named as hypophosphorous acid. It is monobasic as it contains only one P – OH bond, its basicity is one.



15. (2) $3Cl_2 + 4NaOH \longrightarrow 5NaCl + NaClO_3 + 3H_2O$

NaCl and $NaClO_3$, both are hygrocopic in nature.