ANSWERS

I. Multiple Choice Questions (Type-I)

1. (iii)	2. (ii)	3. (i)	4. (iii)	5. (i)	6. (i)
7. (iv)	8. (iii)	9. (iii)	10. (iii)	11. (ii)	12. (i)
13. (iii)	14. (i)	15. (i)	16. (ii)	17. (i)	18. (i)
19. (iii)	20. (iii)	21. (i)	22. (iii)	23. (i)	24. (iii)
25. (iv)	26. (iii)	27. (ii)			

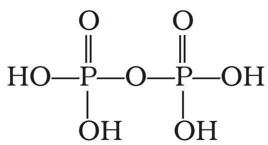
II. Multiple Choice Questions (Type-II)

28. (i), (iii)	29. (ii), (iii)	30. (ii), (iv)	31. (i), (iii), (iv)
32. (i), (iii)	33. (iii), (iv)	34. (i), (iv)	35. (i), (ii)
36. (ii), (iii)	37. (i), (ii)		

III. Short Answer Type

38. Acid fog is formed, which is difficult to condense.

39. $4NH_3 + \underset{\text{(From air)}}{5O_2} \xrightarrow[\text{500K, 9 bar}]{\text{Pt/Rh gauge catalyst}} 4NO + 6H_2O$

40. 
Pyrophosphoric acid

41. NH_3 forms hydrogen bonds with water therefore it is soluble in it but PH_3 cannot form hydrogen bond with water so it escapes as gas.

42. [**Hint :** It has trigonal bipyramidal geometry]

43. In gaseous state NO_2 exists as monomer which has one unpaired electron but in solid state it dimerises to N_2O_4 so no unpaired electron is left hence solid form is diamagnetic.

44. Because fluorine is more electronegative as compared to chlorine.

45. Bond angle of H_2O is larger, because oxygen is more electronegative than sulphur therefore bond pair electron of O–H bond will be closer to oxygen and there will be more bond-pair bond-pair repulsion between bond pairs of two O–H bonds.

46. Due to small size of fluorine six F^- ion can be accomodated around sulphur whereas chloride ion is comparatively larger in size, therefore, there will be interionic repulsion.

47. A is PCl_5 (It is yellowish white powder)

$$P_4 + 10Cl_2 \longrightarrow 4PCl_5$$

B is PCl_3 (It is a colourless oily liquid)

$$P_4 + 6Cl_2 \longrightarrow 4PCl_3$$

Hydrolysis products are formed as follows :

$$PCl_3 + 3H_2O \longrightarrow H_3PO_3 + 3HCl$$

$$PCl_5 + 4H_2O \longrightarrow H_3PO_4 + 5HCl$$

48. $NO_3^- + 3Fe^{2+} + 4H^+ \longrightarrow NO + 3Fe^{3+} + 2H_2O$

$[Fe(H_2O)_6]^{2+} + NO \longrightarrow [Fe(H_2O)_5(NO)]^{2+} + H_2O$

(brown complex)

49. Oxygen is more electronegative than chlorine, therefore dispersal of negative charge present on chlorine increases from ClO^- to ClO_4^- ion because number of oxygen atoms attached to chlorine is increasing. Therefore, stability of ions will increase in the order given below :

$$ClO^- < ClO_2^- < ClO_3^- < ClO_4^-$$

Thus due to increase in stability of conjugate base, acidic strength of corresponding acid increases in the following order

$$HClO < HClO_2 < HClO_3 < HClO_4$$

50. See the NCERT textbook for Class XII, page 186.

51. $P_4O_6 + 6H_2O \longrightarrow 4H_3PO_3$

$H_3PO_3 + 2NaOH \longrightarrow Na_2\ HPO_3 + 2H_2O] \times 4$ (Neutralisation reaction)

$P_4O_6 + 8NaOH \longrightarrow 4Na_2\ HPO_4 + 2H_2O$

1 mol 8 mol

Product formed by 1 mol of P_4O_6 is neutralised by 8 mols of NaOH

$\therefore$ Product formed by $\frac{1.1}{220}$ mol of P_4O_6 will be neutralised by $\frac{1.1}{220} \times 8$ mol of NaOH

Molarity of NaOH solution is 0.1M

$\Rightarrow$ 0.1 mol NaOH is present in 1 L solution

$\therefore$ $\frac{1.1}{220} \times 8$ mol NaOH is present in $\frac{1.1 \times 8}{220 \times 0.1}L = \frac{88}{220}L = \frac{4}{10}L = 0.4\ L =$ 400 mL of NaOH solution.

52. $P_4 + 6Cl_2 \longrightarrow 4PCl_3$

$PCl_3 + 3H_2O \longrightarrow H_3PO_3 + 3HCl] \times 4$

$P_4 + 6Cl_2 + 12H_2O \longrightarrow 4H_3PO_3 + 12HCl$

1 mol of white phosphorus produces 12 mol of HCl

62g of white phosphorus has been taken which is equivalent to $\frac{62}{124} = \frac{1}{2}$ mol.

Therefore 6 mol HCl will be formed.

$$\text{Mass of 6 mol HCl} = 6 \times 36.5 = 219.0 \text{ g HCl}$$

53. Three oxoacids of nitrogen are

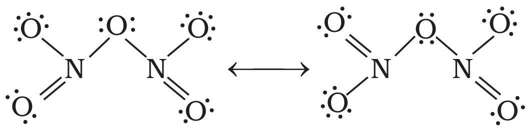
(i) HNO_2, Nitrous acid

(ii) HNO_3 , Nitric acid

(iii) Hyponitrous acid, $H_2N_2O_2$

$$3HNO_2 \xrightarrow{\text{Disproportionation}} HNO_3 + H_2O + 2NO$$

54. $4HNO_3 + P_4O_{10} \longrightarrow 4HPO_3 + 2N_2O_5$



55. (a) • Structures (See NCERT textbook for Class XII)

• White phosphorus is discrete tetrahedral molecule. Thus it has tetrahedral structure with six P–P bonds.

• Red phosphorus has polymeric structure in which P_4 tetrahedra are linked together through P—P bonds to form chain.

(b) Reactivity

White phosphorus is much more reactive than red phosphorus. This is because in white phosphorus there is angular strain in P_4 molecules because the bond angles are only of 60°.

56. Dilute and concentrated nitric acid give different oxidation products on reaction with copper metal.

$$3Cu + 8HNO_3 \text{ (dil.)} \longrightarrow 3Cu(NO_3)_2 + 2NO + 4H_2O$$

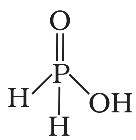
$$Cu + 4HNO_3 \text{ (Conc.)} \longrightarrow 3Cu(NO_3)_2 + 2NO + 2H_2O$$

57. $PCl_5 + 2Ag \longrightarrow 2AgCl + PCl_3$

$AgCl + 2NH_3(aq) \longrightarrow [Ag(NH_3)_2]^+Cl^-$

(soluble complex)

58. Structure of phosphinic acid (Hypophosphorous acid) is as follows :



Reducing behaviour of phosphinic acid is observable in the reaction with silver nitrate given below :

$4AgNO_3 + 2H_2O + H_3PO_2 \longrightarrow 4Ag + 4HNO_3 + H_3PO_4$

IV. Matching Type

59. (i) 60. (ii) 61. (i) 62. (ii) 63. (iii)

V. Assertion and Reason Type

64. (iii) 65. (iii) 66. (ii) 67. (i) 68. (i) 69. (i)

VI. Long Answer Type

70. 'A' is S_8 'B' is SO_2 gas

$$S_8 + 8O_2 \xrightarrow{\Delta} 8SO_2$$

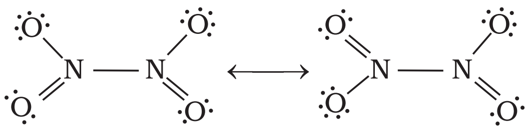
$$\underset{\text{(violet)}}{2MnO_4^-} + 5SO_2 + 2H_2O \longrightarrow 5\,SO_4^{2-} + 4H^+ + \underset{\text{(colourless)}}{2Mn^{2+}}$$

$$2Fe^{3+} + SO_2 + 2H_2O \longrightarrow 2Fe^{2+} + SO_4^{2-} + 4H^+$$

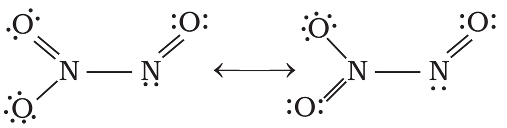
71. $$Pb(NO_3)_2 \xrightarrow[673K]{\Delta} 2PbO + \underset{\text{(Brown colour)}}{\underset{(A)}{4NO_2}}$$

$$2NO_2 \underset{\text{Heating}}{\overset{\text{On cooling}}{\rightleftharpoons}} \underset{\text{(Colourless solid)}}{\underset{(B)}{N_2O_4}}$$

$$2NO + N_2O_4 \xrightarrow{\Delta\ 250\ K} \underset{\text{(Blue solid)}}{\underset{(C)}{2\,N_2O_3}}$$



(Structure of N_2O_4)



(Structure of N_2O_3)

72. A = NH_4NO_2 B = N_2 C = NH_3 D = HNO_3

(i) $NH_4NO_2 \rightarrow N_2 + 2H_2O$

(ii) $N_2 + 3H_2 \rightarrow 2NH_3$

(iii) $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$

$4NO + O_2 \rightarrow 2NO_2$

$3NO_2 + H_2O \rightarrow 2HNO_3 + NO$