p-Block Elements-II

Level - 1		DTS 1 - 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	B	D	A	A	B	C	A	A	B	A	A	A	A	D
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
D	B	B	B	B	B	C	D	C	A	B	A	A	C	B
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
D	C	D	B	B	B	C	C	D	C	B	D	C	A	B
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
B	B	B	D	D	B	C	C	D	D	A	D	D	D	D
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
A	D	B	D	D	B	D	A	D	A	D	C	A	C	D

Level - 2		DTS 6 - 10

76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
A	D	A	C	D	B	B	A	A	D	D	B	A	B	A
91	92	93	94					95	96		97	98	99	100
B	D	D	[A–q, r, s] [B–q] [C–p, r, s] [D–p, r, s]					A	[A-s] [B-r] [C-p]		C	D	D	A
101	102	103	104	105			106	107	108	109	110	111	112	113
D	D	B	C	[A-q] [B-r] [C-s] [D-p]			A	C	BD	BC	C	A	B	D
114	115	116	117	118	119	120	121				122			
A	ACD	D	ABCD	B	D	B	[A-p, q, s] [B-r] [C-p, s] [D-t]				[A-s] [B-q] [C-r] [D-q] [E-p]			
123		124		125										
BCD		AD		ABC										

Numerical Value Type		DTS - 11

126	127	128	129	130	131	132	133	134	135
4	8	4	2	2	4	4	8	8	7

JEE Main (Archive)		DTS 1 - 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	D	D	A	D	D	C	C	C	A	C	C	C	A	D
16	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
D	A	D	C	B	4	B	B	B	D	D	D	D	B	D
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**
A	C	A	C	A	D	A	C	A	D	A	B	B	C	C
46	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
A	C	B	A	A	C	A	A	A	D	D	D	D	B	B

61	62	63	64	65	66	67	68	69
D	A	C	D	A	C	D	D	A

70	71	72	73	74	75	76
A	B	C	D	C	1.67	D

JEE Advanced (Archive)		DTS 1 - 12

1.(D) **2.(A)**

3. **(i)** HBr is a reducing agent. Therefore, it reduces H_2SO_4 to SO_2. So can not be prepared by conc. H_2SO_4 action on NaBr.

(ii) Blue litmus turns red because of the acidic nature of HClO, later on, colour is decolourised as it is also an oxidising agent.

4. **(A)**
(i) NO_2 gas is evolved
(ii) Ag_2SO_4 is formed & SO_2 gas is evolved
(iii) H_2 is evolved & $NaAlO_2$ is formed
(iv) N_2 gas is evolved
(v) Sulphur is precipitate & $KMnO_4$ is decolourised

(B)
(i) $Al_2O_3 + 3C + 3Cl_2 \xrightarrow{heat} 2AlCl_3 + 3CO$
(ii) $Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 + H_2O$
(iii) $SnO_2 + 2C \longrightarrow Sn + 2CO$
(iv) $2NaCl + 2H_2SO_4 + MnO_2 \xrightarrow{heat} Na_2SO_4 + MnSO_4 + 2H_2O + Cl_2$
(v) $3Cu + 8HNO_3 \longrightarrow 3Cu(NO_3)_2 + 4H_2O + 2NO$

5.(C)

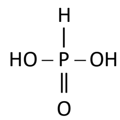
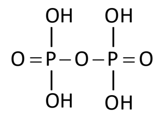
6. **(i)** Concentrated nitric acid partially decomposes to give NO_2 which gas dissolved in nitric acid. As NO_2 has a brownish red colour, it imparts colour to the nitric acid.

(ii) In contact with moisture in air, bleaching powder releases chlorine. Therefore, on keeping it in an open bottle for a long time it looses its capacity to bleach.

$$CaOCl_2 + H_2O \longrightarrow Ca(OH)_2 + Cl_2 \uparrow$$

7.(A) **8.(C)** **9.(A)** **10.(D)** **11.(C)** **12.(D)**

13. In S_8 we have van der Waals forces to hold the rings. Due to this sulphur has a melting point of 119°C. When sulphur melts, the van der Waals forces are overcome and the S_8 rings slip and roll over one another. It gives rise to a clear mobile liquid. Above 160°C, the S_8 ring starts to open up and form long chains which get tangled with each other, and it gradually increases the viscosity of sulphur.

14. **(i)**  **(ii)** 

15. $Na_2SO_3 + S \longrightarrow Na_2S_2O_3$

16. H_2SO_4 oxidises HI to I_2 but H_3PO_4 does not oxidise HI.

17. 

(H_3PO_4) (H_3PO_3)

18. $P_4 + 3NaOH + 3H_2O \longrightarrow PH_3 + 3NaH_2PO_2$ **19.(C)** **20.(B)** **21.(B)**

22. Liquor ammonia possesses high vapour pressure at room temperature so before opening a bottle of liquor ammonia, it should be cooled to lower down the vapour pressure of ammonia inside the bottle, otherwise the NH_3 will dump out of the bottle.

23.(C) **24.(A)**

25. Anhydrous HCl is a non-polar compound so it is a bad conductor. In aqueous solution HCl ionises to give H^+ and Cl^- ions and then it becomes a good conductor.

26. F is the strongest oxidising agent **27.** $(NH_4)_2SO_4 + NO + NO_2 \longrightarrow 2N_2 + 3H_2O + H_2SO_4$

28. H_2S changes to S.

$SO_2 + 2H_2S \longrightarrow 3S + 2H_2O$

29. $\underset{(conc.)}{Sn + 4HNO_3} \longrightarrow \underset{\text{Metastannic acid}}{H_2SnO_3} + 4NO_2 + H_2O$ **30.** $Pb_3O_4 + 4HNO_3 \longrightarrow 2Pb(NO_3)_2 + 2H_2O + PbO_2$

31.(B) **32.** $HI < HBr < HCl < HF$ **33.** $FeCl_3$ & Br_2 **34.** $SnCl_4$ & SnI_4

35. Na_2SO_4 & HCl **36.(B)** **37.(AB)** **38.(B)** **39.(A)** **40.(D)**

41. $Sn + \text{dil. } 10HNO_3 \to 4Sn(NO_3)_2 + NH_4NO_3 + 3H_2O$ **42.** $4P + 10HNO_3 + H_2O \to 5NO + 5NO_2 + 4H_3PO_4$

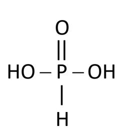
43. $HOCl < HOClO < HOClO_2 < HOClO_3$ **44.** $SiO_2 < CO_2 < N_2O_5 < SiO_3$

45. Oxygen is second most electronegative (fluorine being the most electronegative) and so oxygen shows negative oxidation state in its compounds. Because it needs 2 electrons to complete its octet $(O; 1s^2 2s^2 2p^4)$ it shows -2 oxidation state.

Sulphur also needs 2 electrons to complete its octet $(ns^2 np^2$ like oxygen) so it shows -2 oxidation state. However due to availability of vacant d-orbitals in its valence orbital it also shows oxidation states of $+2$, $+4$ and $+6$.

46.(AD) **47.** $2H_3PO_2 \xrightarrow{\text{heat}} PH_3 + H_3PO_4$ **48.** $NaBrO_3 + F_2 + 2NaOH \longrightarrow NaBrO_4 + 2NaF + H_2O$

49. $NaClO_3 + SO_2 + 10H^+ \to NaCl + S + 5H_2O$ **50.** H-bonding is not possible in PH_3

51.  **52.(AD)** **54.** $15CaO + 4P_4 + 30H_2O \longrightarrow 15Ca(OH)_2 + 3P_2O_5 + 10PH_3\uparrow$

55. $CaSO_4 + 2NH_3 + CO_2 + H_2O \to CaCO_3\downarrow + (NH_4)_2SO_4$ **56.** $NaNO_2 + Zn + NaOH \to Na_2ZnO_2 + NH_3 + H_2O$

57.(D) **58.** When NH_4Cl is added to liquid ammonia, it increases the $[NH_4^+]$, thus acting as an acid

59. $4KMnO_4 + 2H_2O \rightarrow 4MnO_2 + 4KOH + 3O_2$

$4NH_3 + 3O_2 \rightarrow 2N_2 + 6H_2O$

60. $P + 5HNO_3 \xrightarrow[\text{(catalyst)}]{I_2} H_3PO_4 + 5NO_2 + H_2O$

61. $2H_2S + NaHSO_3 + H^+ \rightarrow 3S\downarrow + 3H_2O + Na^+$

62. $2P + 3I_2 + 6H_2O \longrightarrow 2H_3PO_3 + 6HI$

63. Repulsions between lone pair electrons on the fluorine atoms due to its small size.

64. $2NH_3 + NaOCl \longrightarrow \underset{\text{(Hydrazine)}}{H_2N \cdot NH_2} + NaCl + H_2O$

65.(BC) **66.(B)** **67.(B)** **68.(B)** **69.(C)**

70. In both (nitrogen and fluorine) the atomic size is small and both have high electron density, they repel the bonded pair of electrons leadings to larger bond length than expected.

71. N^{3-} is smaller in size and having high charge so it becomes more susceptible to hydrolysis.

$N^{3-} + 3H_2O \longrightarrow NH_3 + 3OH^-$

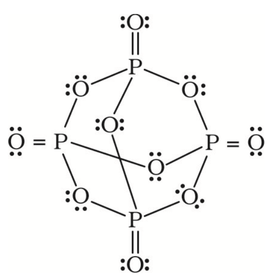
Cl^- being a weak conjugate bease (HCl is a strong acid) does not undergo hydrolysis.

72. In case of $(SiH_3)_3N$, lone pair of electrons on nitrogen is involved in $p\pi\text{-}d\pi$ back bonding, white in case of $(CH_3)_3N$, the $p\pi\text{-}d\pi$ back bonding is not possible due to the absence of vacant d-orbitals in carbon. Because of this $(CH_3)_3N$ is more basic than $(SiH_3)_3N$.

73.(C) **74.(C)** **75.(C)**

76. $Bi(NO_3)_3$ get hydrolysed to form HNO_3. HNO_3 oxidises KI to form I_2(Brown ppt.). In excess of KI, I_2 gets dissolved due to formation of complex KI_3 to give a clear yellow solution.

77.



Number of $P-O$ bonds (single bonds) $= 12$

Number of $P=O$ bonds (single bonds) $= 4$

78.(B) **79.(D)** **80.(A)** **81.(B)**

82. $M = As$ and $N = AsH_3$

83. $[2HNO_3 \rightarrow H_2O + 2NO_2 + [O]] \times 5$

$2P + 5O + 3H_2O \rightarrow 2H_3PO_4$

$2P + 10HNO_3 \rightarrow 2H_3PO_4 + 10NO_2 + 2H_2O$

84. **(a)** $2KI + Cl_2 \rightarrow I_2$ **(b)** $2KClO_3 + I_2 \rightarrow 2KClO_3 + Cl_2$

85.(ACD) **86.(ABD)**

87. $Ca_5(PO_4)_3F + 7H_3PO_4 \rightarrow \underset{\substack{\text{Triple super phosphate} \\ \text{(Fertilizer)}}}{5Ca(H_2PO_4)_2} + HF$

88. $SO_2 + PCl_5 \rightarrow \underset{\text{Thionyl chloride}}{SOCl_2} + POCl_3$

$FeCl_3 \cdot 6H_2O + 6SOCl_2 \rightarrow FeCl_3 + 12HCl + 6SO_2$

$FeCl_3 \cdot 6H_2O + 6CH_3 - C(OCH_3)_2 - CH_3 \rightarrow FeCl_3 + 12CH_3OH + 6CH_3COCH_3$

89. $P_4O_{10} + 6PCl_5 \rightarrow 10POCl_3$

90.(C) **91.(A)** **92.(B)** **93.(D)** **94.(C)** **95.(C)**

96. In contact process the SO_3 produced is dissolved in concentrated H_2SO_4 to produce oleum. SO_3 produced is not dissolved in water because it forms dense fog of sulphuric acid particles. In contact process the catalyst used is V_2O_5.

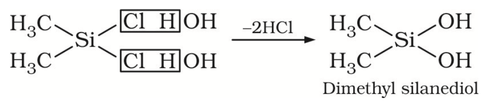
97. $D = H_2SO_4$ **98.(C)** **99.(C)**

100. In its elemental form nitrogen exists as a diatomic molecule (N_2). This is due to the fact that nitrogen can form $p\pi\text{-}p\pi$ multiple bonds $(N\equiv N)$. However formation of multiple bonds is not possible in case of phosphorus because repulsion between non-bonded electrons of the core. In case of small nitrogen atom there is no such repulsion as they have only $1s^2$ electrons in their inner core.

101. $XeF_2 : sp^3d;\ XeF_4 : sp^3d^2 : XeO_2F_2 : sp^3d$ **102.** $Cl_2 + 2KBr \rightarrow 2KCl + Br_2$ **103.(D)**

104. **(i)** $SiCl_4 + 2Mg\,(\text{or Zn}) \longrightarrow Si + 2MgCl_2\,(\text{or } ZnCl_2)$

(ii) $SiCl_4 + 2CH_3MgCl \longrightarrow (CH_3)_2SiCl_2 + 2MgCl_2$



$$HO-\underset{CH_3}{\overset{CH_3}{Si}}-OH + OH-\underset{CH_3}{\overset{CH_3}{Si}}-OH \xrightarrow{-H_2O} HO-\underset{CH_3}{\overset{CH_3}{Si}}-O-\underset{CH_3}{\overset{CH_3}{Si}}-OH$$

This type of polymerisation continues at both ends to form linear silicone.

(iii) $SiCl_4 + 4H_2O \xrightarrow{-4HCl} \underset{(\text{unstable})}{Si(OH)_4}$

$Si(OH)_4 \xrightarrow{\Delta} SiO_2 + 2H_2O$

$SiO_2 + Na_2CO_3 \xrightarrow{1400°C} Na_2SiO_3 + CO_2$ **105.(C)** **106.(A)**

107. **(i)** $Al_4C_3 + 12H_2O \longrightarrow 4Al(OH)_3 + 3CH_4\uparrow$

(ii) $CaNCN + 3H_2O \longrightarrow \underset{\text{ppt.}}{CaCO_3} + 2NH_3$

Ammonia (NH_3) formed when dissolved in water yields NH_4OH

$2NH_3 + 2H_2O \longrightarrow 2NH_4OH + CaCO_3$

$CaNCN + 5H_2O \longrightarrow 2NH_4OH + CaCO_3$

(iii) $4BF_3 + 3H_2O \longrightarrow \underset{(\text{Boric acid})}{H_3BO_3} + \underset{(\text{Fluorobasic acid})}{3HBF_4}$

(iv) $NCl_3 + 3H_2O \longrightarrow NH_3 + \underset{(\text{Hypochlorous acid})}{3HClO}$

(v) $2XeF_4 + 3H_2O \longrightarrow Xe + \underset{(\text{Xenon trioxide})}{XeO_3} + F_2 + 6HF$

108. $A = NaHSO_3$; $B = Na_2SO_3$; $C = Na_2S_2O_3$; $D = Na_2S_4O_6$ **109.(C)** **110.(C)** **111.(B)**

$\therefore$ Oxidation states of S

$A = +4,\ B = +4,\ C = +2,\ D = +2.5$

112.(B) **113.(B)** **114.(C)**

115. $A = \text{conc. } H_2SO_4,\ B = Br_2,\ C = NO_2^+\ (\text{intermediate}),\ D = \text{Trinitrotoluene (TNT)}$ **116.** 1008 g

117.(B)	**118.(B)**	**119.** [A-q] [B-s] [C-p] [D-r]		**120.(D)**	**121.(A)**	**122.(C)**
123.(A)	**124.(C)**	**125.(A)**	**126.(B)**	**127.(C)**	**128.(C)**	**129.(B)**
130.(AB)	**131.(C)**	**132.(B)**	**133.(ABC)**	**134.** [A-p, s] [B-q, s] [C-r, t] [D-q, t]		
135. [A-p, r, t] [B-s, t] [C-p, q, r] [D-p, r, s]			**135.(6)**	**136.** [A-p, r, t] [B-s, t] [C-p, q, r] [D-p, r, s]		
137.(6)	**138.** [A-p, s] [B-p, q, r, t] [C-q, r] [D-p]			**139.(3)**	**140.(D)**	**141.(5)**
142.(ACD)	**143.(5)**	**144.(A)**	**145.(C)**	**146.(B)**	**147.(C)**	**148.(D)**
149.(C)	**150.(B)**	**151.(ACD)**	**152.(A)**	**153.(A)**	**154.(D)**	**155.(A)**
156.(7)	**157.(BD)**	**158.(BC)**	**159.(B)**	**160.(8)**	**161.(6)**	
162.(BD) N_2O_5 is formed		**163.(A)**	**164.(ACD)**	**165.(D)**	**166.(BC)**	**167.(ABD)**
168.(A)	**169.(B)**	**170.(BC)**	**171.(ABC)**	**172. (5 or 6)**	**173.(4)**	**174.(19)**