The p-block Elements

SOLUTIONS

EXERCISE - O

1. **Ans. (D)**

$[B_4O_5(OH)_4]^{2-} + 5H_2O \rightleftharpoons 2B(OH)_3$ (weak acid) $+ 2[B(OH_4)]^-$ (salt)

$2[B(OH)_4]^- + 2HCl \rightarrow B(OH)_3 + 2H_2O + 2Cl^-$

2. **Ans. (B)**

$2B + N_2 \rightarrow 2BN$

$BN + 3H_2O \rightarrow H_3BO_3 + NH_3$ (Pungent smelling gas)

3. **Ans. (C)**

$$\text{Boron} \xrightarrow{F_2} BF_3 \xrightarrow{LiH} B_2H_6(g) + LiBF_4$$

Δ

$B_2H_6 \rightarrow$ electron deficient

$He \rightarrow$ least reaction non-metal

4. **Ans. (D)**

$$B_2H_6 + 2NH_3 \longrightarrow \underset{(X)}{B_2H_6 \cdot 2NH_3} \xrightarrow{450\ K} \underset{(Y)}{B_3N_3H_6} + \underset{(Z)}{H_2}$$

Y & Z are Borazine and H_2 respectively.

5. **Ans. (B)**

EN difference is more, so electron cloud is more localised on the nitrogen atoms.

Due to the difference in electronegativity between boron and nitrogen, the cloud (electron density) is more localised on the nitrogen atoms.

6. **Ans. (C)**

$$\underset{(A)}{BCl_3} + H_2 \xrightarrow[\text{Electric discharge}]{\text{Silent}} \underset{(B)}{B_2H_6} + \underset{(C)}{HCl}$$

$\downarrow H_2O$

$H_3BO_3 + HCl$ (C)

B_2H_6 (B) $\xrightarrow{\text{Red heat}}$ $B + H_2$ (D)

7. **Ans. (C)**

A is B_2H_6

$B_2H_6 + 6\ NaOH \longrightarrow 2\ Na_3BO_3 + 6\ H_2$

B is Na_3BO_3 a salt of SBWA.

8. **Ans. (C)**

$Si_2O_7^{6-} \Rightarrow$ Formed by combining two unit of $Si_2O_4^{4-}$ tetrahedrons shared one oxygen atom.

9. **Ans. (B)**

Boron is a rare element that mainly occurs as orthoboric acid (H_3BO_3), Borax ($Na_2B_4O_7.10H_2O$) and Kernite ($Na_2B_4O_7.4H_2O$).

Bauxite ($Al_2O_3.2H_2O$) and Cryolite (Na_3AlF_6) are the important minerals of aluminium.

Ga, In and Tl are less abundant elements in nature.

10. **Ans. (C)**

All elements are solid except 'Ga' due to its unusually low melting point (303k) it could exist in liquid state during summer.

11. **Ans. (C)**

Air contains both O_2 & N_2 So B in amorphous form reacts with both O_2 & N_2

$4B + 3O_2 \xrightarrow{\Delta} 2B_2O_3$

$2B + N_2 \longrightarrow 2BN$

12. **Ans. (C)**

$B_2H_6 + 6H_2O \longrightarrow 2H_3BO_3 + 6H_2$

13. **Ans. (B)**

Among oxides of group 14 elements.

Amphoteric oxides are :

SnO, SnO_2, PbO_2, PbO

14. **Ans. (C)**

Diamond and Graphite have free surface valency called dangling bond.

But fullerene has no surface valency so, it is purest from of allotrope.

15. **Ans. (A)**

Calcium carbide CaC_2

Or $C_2^{2\ominus}$ $\overset{\ominus}{C} \equiv C^{\ominus} \Rightarrow (1\sigma + 2\pi)$

16. **Ans. (B)**

Metallic character increases from top to bottom as generally ionization energy decreases down the group.

17. **Ans. (D)**

Due to inert pair effect down the group stability of EX_4 decreases

18. **Ans. (D)**

$2PbCO_3.Pb(OH)_2 \xrightarrow{\Delta} Pb_3O_4 + CO + CO_2 + H_2O$

19. **Ans. (C)**

$$nR_2SiCl_2 \xrightarrow[\text{(hydrolysis)}]{H_2O} -O-\underset{\displaystyle R}{\overset{\displaystyle R}{\underset{|}{\overset{|}{Si}}}}-O-\underset{\displaystyle R}{\overset{\displaystyle R}{\underset{|}{\overset{|}{Si}}}}-O-\underset{\displaystyle R}{\overset{\displaystyle R}{\underset{|}{\overset{|}{Si}}}}-$$

(Linear silicone)

20. **Ans. (C)**

Diamond $\rightarrow sp^3$

Graphite $\rightarrow sp^2$ (sheet like structure) $\rightarrow$ bond longer

Fullerence (C_{60}) $\rightarrow sp^2$ (Ring like structure)

C–C Bond length $\Rightarrow$ Diamond > fullerene (C_{60}) > graphite

21. **Ans. (A)**

Size $\rightarrow$ Si > C

Si can expand its octet because availability of 3d-orbits.

22. Ans. (B)

F and Cl $\rightarrow$ most oxidizing agent as compare to Br and I. so Pb^{+4} do not exist with Br^- and I^-.

23. Ans. (A)

$C^{14}O^{18} > C^{14}O^{16} > C^{12}O^{16}$

Mass $\downarrow$ Bond strength $\downarrow$

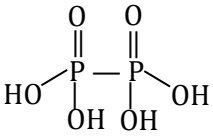
24. Ans. (A)

PCl_5 on reaction with alcohol gives Alkyl halide.

$$R-OH+PCl_5 \longrightarrow R-Cl+POCl_3+HCl$$

25. Ans. (D)

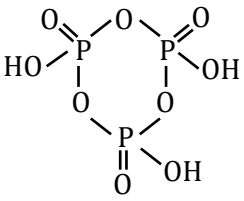
$H_4P_2O_6$ contain P — P band.



26. Ans. (D)

Structure of $(HPO_3)_3$

so zero P–H bond.



27. Ans. (B)

Down the group the X–H bond length increases with increase in size of atom. So bond dissociation energies decrease and therefore, thermal stability decrease. Hence the correct decreasing order is $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$.

28. Ans. (D)

E.A = 3rd period > 2nd period (p-block)

On moving from Top to Bottom in a group electron affinity decreases but Oxygen has minimum EA in 16 group elements.

29. Ans. (B)

Oxygen has highest ionisation energy among the chalcogens.

30. Ans. (C)

H_2O has hydrogen bonding due to which H_2O is in liquid state, but in H_2S there is no H – bonding. So, it exists in gaseous state.

31. Ans. (C)

$$O_2 \Rightarrow \sigma_{1s^2}\sigma^*_{1s^2}\sigma_{2s^2}\sigma^*_{2s^2}\sigma_{2p_z^2}\left(\pi_{2p_x^2} \approx \pi_{2p_y^2}\right)\left(\pi^*_{2p_x^1} \approx \pi^*_{2p_y^1}\right)$$

O_2 has two unpaired electrons. So, O_2 is paramagnetic in nature.

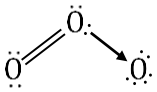
32. Ans. (D)

Industrially dioxygen is obtained from air by first removing carbon dioxide and water vapour and then, the remaining gases are liquefied and fractionally distilled to get dinitrogen and dioxygen.

33. Ans. (D)

In this reaction V_2O_5 used as a catalyst.

34. Ans. (C)

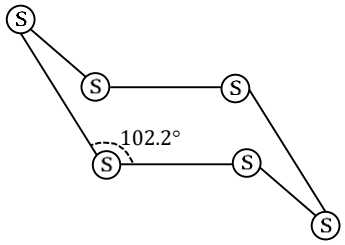
Ozone(O_3) →  is a bent molecule not a linear molecule.

35. Ans. (C)

Rhombic sulphur (α-sulphur) transforms to Monoclinic sulphur (β-sulphur) when heated above 369K.

36. Ans. (B)

The S_6 molecule has chair form as shown below :



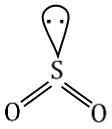
37. Ans. (C)

Cu reacts with conc. H_2SO_4 to form copper sulphate, sulphur dioxide gas and water.

$$Cu + 2H_2SO_4 \rightarrow CuSO_4 + SO_2 + 2H_2O$$

38. Ans. (B)

Hybridization of SO_2 is sp^2 and shape of SO_2 is Bent.



39. Ans. (A)

Conc. H_2SO_4 is used to dry HCl because of its acidic nature conc. H_2SO_4 can't react with HCl gas.

40. Ans. (C)

When HCl is perfectly dry, it has no action on litmus, but in presence of moisture, it turns blue litmus red showing acidic nature.

41. Ans. (C)

Group-17 also known as Halogen family because their salts are usually found in sea water.

42. Ans. (B)

(a) F_2 → (r) Yellow
(b) Cl_2 → (p) Green
(c) Br_2 → (s) Red
(d) I_2 → (q) Violet

43. Ans. (B)

F_2 and Cl_2 exists in gaseous state.

44. Ans. (A)

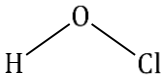
Fluorine is also called super halogen because of its high reactivity among halogens.

45. Ans. (C)

BrO_3 is less stable halogen oxides, it is very powerful oxidizing agents.

46. Ans. (B)

Cl=O bond is not present Hypochlorous acid as shown in the structure below:



Hypochlorous acid

Other acids have at least 1, Cl=O bond.

47. Ans. (B)

Chlorine is manufactured by Deacon process.

$$4HCl + O_2 \xrightarrow[(723K)]{CuCl_2} 2Cl_2 \uparrow + 2H_2O$$

48. Ans. (C)

Chlorine gas is not used in refining of sugar.

49. Ans. (A)

oxy acid: $HOCl$, $HOClO$, $HOClO_2$, $HOClO_3$

oxidation state of Cl: +1 +3 +5 +7

So, increasing order of oxidation number:

$HOCl < HOClO < HOClO_2 < HOClO_3$

50. Ans. (A)

$$\underset{\substack{\text{(P)}\\\text{(Rock salt)}\\\text{(White)}\\\text{(crystalline)}}}{2NaCl} + MnO_2 + 4H_2SO_4 \longrightarrow \underset{\text{(Greenish-yellow gas)}}{Cl_{2(g)}} + \underset{\text{(Q)}}{MnCl_2} + 4NaHSO_4 + 2H_2O$$

$$NaCl + AgNO_3 \longrightarrow NaNO_3 + \underset{\substack{\text{(White ppt)}\\\text{(R)}}}{AgCl\downarrow}$$

So,

$P \Rightarrow NaCl$

$Q \Rightarrow Cl_2$

$R \Rightarrow AgCl$

51. Ans. (C)

Bond energy order is :

Cl_2	>	Br_2	>	F_2	>	I_2	
242.6		192.8		158.8		151.5	[in kJ $mol^{\ominus 1}$]

Bond energy of F_2 is less due to strong repulsion between non-bonding (lone pair) electrons.

52. Ans. (D)

$$I_2Cl_6(s) \longrightarrow \underset{\text{Cationic Part}}{ICl_2^{\oplus}} + \underset{\text{Anionic Part}}{ICl_4^{\ominus}}$$

$ICl_2^{\oplus}$ (Cationic Part)	$ICl_4^{\ominus}$ (Anionic Part)
↓	↓
Hybridization	Hybridization
sp^3	sp^3d^2

Option (D) is correct.

53. Ans. (D)

All the noble gases except Radon occur in the atmosphere.

54. Ans. (C)

Most abundant noble gas in air is Argon (Ar).

55. Ans. (A)

Group 18 elements are called noble gas because they react with few elements only under certain conditions.

56. Ans. (D)

Order of electron gain enthalpy is:-

Ne > Ar ≃ Kr > Xe > Rn > He [experimental]

116 96 96 77 68 48 [in $kJmol^{\ominus 1}$]

57. Ans. (C)

They have low melting and boiling points because the only type of interatomic interaction in these elements is weak dispersion forces [London forces].

58. Ans. (B)

Complete Hydrolysis of XeF_6 →

$$XeF_6 + H_2O \longrightarrow XeOF_4 + 2HF$$
$$XeOF_4 + H_2O \longrightarrow XeO_2F_2 + 2HF$$
$$XeO_2F_2 + H_2O \longrightarrow XeO_3 + 2HF$$
$$\overline{XeF_6 + 3H_2O \longrightarrow XeO_3 + 6HF}$$

So, $XeOF_3$ is not formed during hydrolysis of XeF_6.

59. Ans. (A)

$Al_4C_3 + 12H_2O \rightarrow 4Al(OH)_3 + 3CH_4$

60. Ans. (B)

Carbon only given water gas which can be used as fuel.

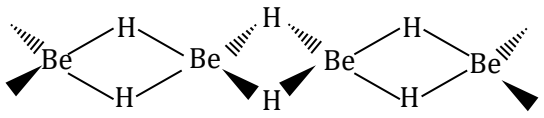
61. Ans. (B)

Diamond is hard substance.

It cannot oxidised with a mixture of $K_2Cr_2O_7$ and H_2SO_4 at 200°C

62. Ans. (B)

BeH_2 in solid state exists as polymer.

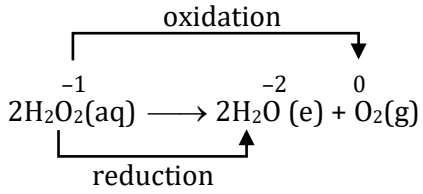


[Non-planar molecule]

63. Ans. (C)

(A) B_2H_6	(Q) 3c-2e$^{\ominus}$ bond present
	(R) central atom is sp^3 hybridised.
(B) Be_2H_4	(Q) 3c-2e$^{\ominus}$ bond present
	(S) central atom is sp^2 hybridised.
(C) Be_2Cl_4	(P) 3c-4e$^{\ominus}$ bond present
	(S) central atom is sp^2 hybridised.
(D) $Al_2(CH_3)_6$	(P) 3c-4e$^{\ominus}$ bond present
	(R) central atom is sp^3 hybridised.

64. Ans. (C)



$\Rightarrow$ Disproportionation : One element get oxidised and reduced simultaneously.

65. Ans. (A)

Acidic character of non–metallic oxides increases along a period (from left to right) of periodic table.

$Cl_2O_7 > SO_3 > P_4O_{10}$

66. Ans. (D)

Ozone is used for bleaching of oils i.e. Ozone can act as bleaching agent.

67. Ans. (A)

Pure ozone is a pale blue gas, dark blue liquid and violet-black solid.

68. Ans. (C)

SO_2 is produced by roasting various metal sulphide ores with air.

$$2FeS_2(s)+\frac{11}{2}O_2(g)\rightarrow Fe_2O_3(s)+4\,SO_2(g)\uparrow$$

SO_2 gas has a smell like burnt Sulphur.

69. Ans. (A)

When moist SO_2 reacts with acidic $KMnO_4$, it behaves as a reducing agent and decolourises acidified potassium permanganate (VII) solution.

70. Ans. (A)

Na_2SO_4 is known as salt cake.

71. Ans. (B)

$2KMnO_4 + 16HCl \longrightarrow 2MnCl_2 + 2KCl + 8H_2O + 5Cl_2$

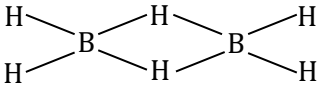
The compound X is $MnCl_2$ and oxidation state of Mn in this is +2.

72. Ans. (B)

Deacon's process is used for manufacturing Cl_2.

$$4HCl + O_2 \xrightarrow[(723K)]{CuCl_2} 2Cl_2 \uparrow + 2H_2O$$

73. Ans. (A,B,C,D)



Non-planar

$(3C–2e^-)$

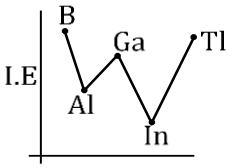
74. Ans. (A, B, C)

Correct order of atomic radii for group 13 is $\underset{88pm}{B} < \underset{135pm}{Ga} < \underset{143pm}{Al} < \underset{167pm}{In} < \underset{170pm}{Tl}$.

75. Ans. (A,C,D)

For group 13, correct order of ionization enthalpy is :

$\underset{801}{B} > \underset{589}{Tl} > \underset{579}{Ga} > \underset{577}{Al} > \underset{558}{In}$ (in kJ/mol)



76. Ans. (A,B,C)

BF_3, $B_3N_3H_6$ and BCl_3 have $p\pi - p\pi$ type back bonding. So, options (A), (B) and (C) are correct

77. Ans. (A,B,C)

Compounds in which 'Pb' is present in +4, 'Tl' in +3 and 'Bi' in +5 oxidation state act as good oxidizing agent.

78. Ans. (B,C,D)

- Melting point order

$$\underset{4373}{C} > \underset{1693}{Si} > \underset{1218}{Ge} > \underset{600}{Pb} > \underset{505}{Sn} (\text{in K})$$

- Boiling point

$$\underset{5600}{C} > \underset{3550}{Si} > \underset{3123}{Ge} > \underset{2896}{Sn} > \underset{2024}{Pb} (\text{in K})$$

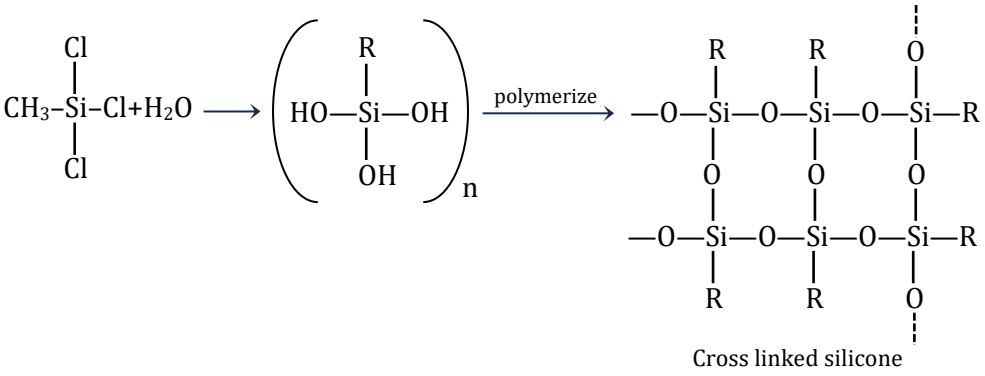
- Metallic nature

$$\underbrace{C < Si}_{\text{non-metal}} < \underbrace{Ge}_{\text{Metalloid}} < \underbrace{Sn < Pb}_{\text{Metal}}$$

79. Ans. (A,C)

As we know purest form of carbon is fullerene not diamond due to surface valency. Graphite is more thermodynamically stable than diamond.

80. Ans. (ABCD)



Silica Attacked by HF & NaOH

Silica fluids are thermally stable

Three oxygen atoms of each tetrahedral

Are shared with adjacent SiO_4^{4-} tetrahedrally

81. Ans. (A,B,C)

The given reaction occurs as following:

$$3Pb_{(S)} + 8HNO_{3(aq)} \xrightarrow{\Delta} \underset{(P)}{3Pb(NO_3)_2} + \underset{(Q)}{2NO} + 4H_2O \xrightarrow{\Delta} 3PbO + 6NO_2\uparrow + \frac{3}{2}O_2\uparrow$$

(Brown Gas)

→ Compound 'Q' NO is a paramagnetic colourless gas.

→ Compound 'P' ($Pb(NO_3)_2$) gives Brown color gas (NO_2) on heating.

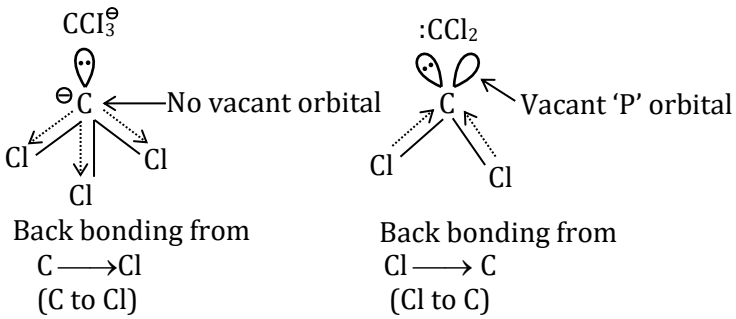
→ $3Cu + 8HNO_{3(aq)} \xrightarrow{\Delta} 3Cu(NO_3)_{2(aq)} + 2NO_{(g)} + 4H_2O_{(l)}$

Compound 'Q' can be obtained by this reaction.

So option (A), (B) and (C) are correct.

82. Ans. (C,D)

Back bonding in $CCl_3^{\ominus}$ and CCl_2 take place as following :

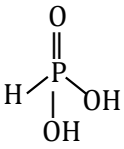


83. **Ans. (A,B,C)**

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

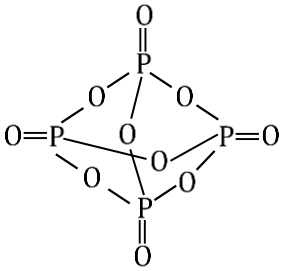
oxy acid

(X)



So A, B, C are correct for H_3PO_3

84. **Ans. (A,B,C)**



85. **Ans. (C,D)**

Options (C) and (D) are correct while options (A) and (B) are incorrect.

The correct statements will be :

(A) Lone pairs in H_2O are present in sp^3 hybridized orbitals while in H_2S lone pairs are present in pure – p – orbitals.

86. **Ans. (A, B)**

→ S_8 has crown shape while S_6 has chair shape.

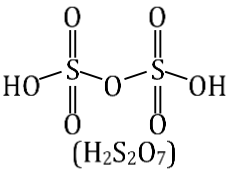
→ S_2 molecule is paramagnetic while $O_2^{2\ominus}$ ion is diamagnetic.

→ α and β sulphur have S_8 molecules which have crown shape.

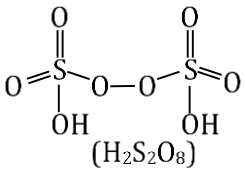
→ α sulphur is insoluble in water while soluble in CS_2.

So option (A) and (B) is incorrect.

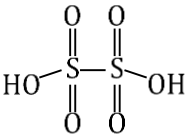
87. **Ans. (A,B,D)**



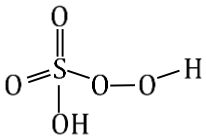
$(H_2S_2O_7)$



$(H_2S_2O_8)$



$(H_2S_2O_6)$



(H_2SO_5)

88. **Ans. (B,D)**

H_2SO_5 = Caro's acid

$H_2S_2O_8$ = Marshall's Acid, both have peroxide linkage

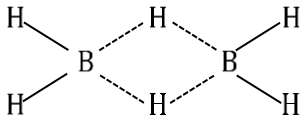
89. **Ans. (A, B, D)**

(C) is incorrect because correct order is HF < HCl < HBr < HI

90. **Ans. (A,B)**

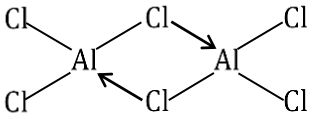
$Pb^{2\oplus}$ > $Pb^{4\oplus}$ and $Bi^{3\oplus}$ > $Bi^{5\oplus}$ due to inert pair effect lower oxidation state is more stable than higher oxidation state.

91. **Ans. (A,C,D)**

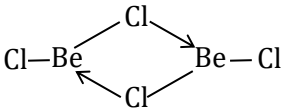
(A) B_2H_6  Bridging bond is 3c–2e$^{\ominus}$.

In B_2H_6 octet of 'B' is not complete

(B) In Al_2Cl_6 octet of 'Al' is complete so it is not electron deficient.



(C) In Be_2Cl_4 octet of 'Be' is not complete. So it is electron deficient molecule.



(D) In Be_2H_4 octet of 'Be' is not complete, So it is electron deficient molecule.

92. **Ans. (A,B,C)**

→ SnO and SnO_2 both are amphoteric oxides.

→ CO is neutral while CO_2 is an acidic oxide.

→ KO_2 is a super oxide while BaO_2 is a peroxide.

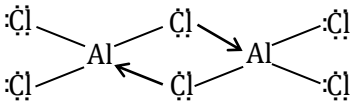
→ PbO and ZnO both are amphoteric so can react with both acids and base.

93. **Ans. (B,C)**

$NaBr/KI + H_2SO_4 \longrightarrow Br_2/I_2 + SO_2 + NaHSO_4/KHSO_4 + H_2O$

EXERCISE - S

1. **Ans. (16)**

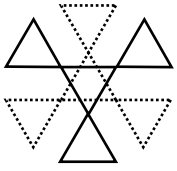


2. **Ans. (3)**

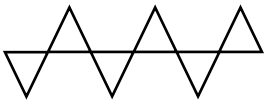
Diamond, SiO_2, SiC

3. **Ans. (3)**

3D silicate – $(SiO_2)_n$

 3D-silicate

Pyroxene Silicate – Chain silicates $\left(SiO_3^{2\ominus}\right)_n$


Chain silicate

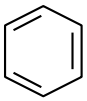
In 3D silicate, no. of shared oxygens (x) = 4

In Pyroxene silicate, no. of shared oxygens (y) = 2

Now, $\frac{2(x+y)}{x}=\frac{2(4+2)}{4}=3$

4. Ans. (78)

$CaC_2 + 2H_2O \longrightarrow Ca(OH)_2 + C_2H_2\uparrow$

$C_2H_2 \xrightarrow{\text{trimerisation}}$  (C_6H_6)

Molar mass = 78g mol^{-1}

5. Ans. (0)

$PbO_2 \Rightarrow$ Oxidation state of 'Pb' (x) = +4

$H_2O_2 \Rightarrow$ Oxidation state of 'O' (y) = –1

$Pb(NO_3)_2 \Rightarrow$ Oxidation state of 'N' (z) = +5

Now the value of z–x–|y|

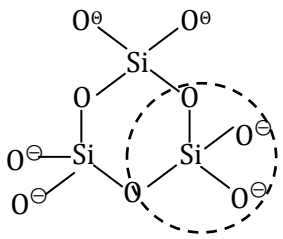
= +5 – (+4) –|–1|

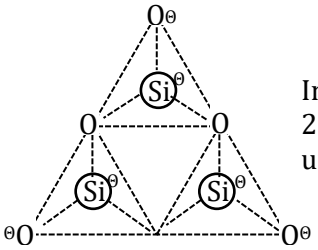
= 5 – 4 – 1 = 0

6. Ans. (26)

26 (a = 12, b = 20, c = 30)

7. Ans. (2)





In cyclic silicates 2 oxygens per unit are shared.

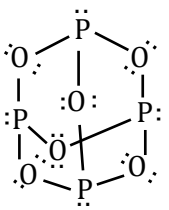
8. Ans. (6)

Stable oxidation sate of Pb is +2, 'Bi' is + 3 and 'Tl' is +1 due to inert pair effect.

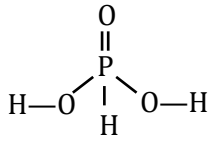
Therefore x = 2, y = 3, z = 1 $\Rightarrow$ 2 + 3 + 1 = 6

9. Ans. (16)

Total number of lone pairs in P_4O_6 is 16 [1 lone pair on each 'P' atom and 2 lone pairs on each 'O' atom.



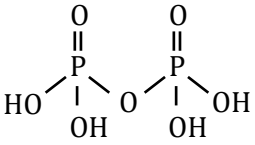
10. Ans. (1)

$H_3PO_3 \Rightarrow$ 

Non-ionisable Hydrogen Atom is 1.

11. Ans. (4)

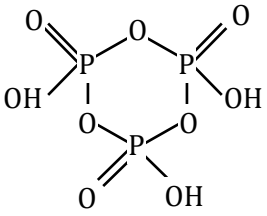
Basicity of $H_4P_2O_7$



$\Rightarrow$ Basicity = 4

12. Ans. (0)

Cyclotrimetaphosphoric acid, $(HPO_3)_3 = H_3P_3O_9$

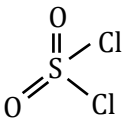


P—H; Bonds = 0

P—OH Bonds = 3

13. Ans. (2)

Sufuryl chloride, SO_2Cl_2;

 ; S $\rightarrow$ sp^3 (hybridised)

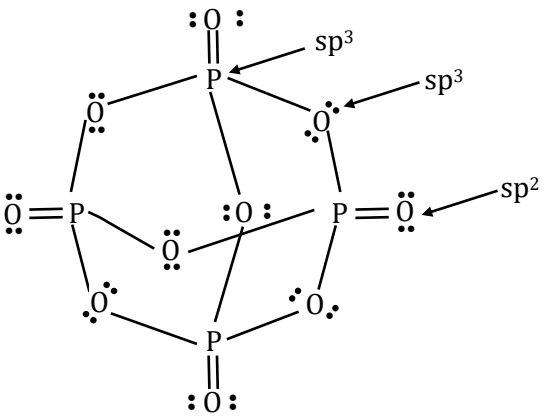
$p\pi - p\pi = 0$

$p\pi - d\pi = 2$

$\Rightarrow$ sum of $p\pi - p\pi$ & $d\pi - p\pi \Rightarrow 0 + 2 = (2)$

14. Ans.(10)

P_4O_{10} ;



$4 \Rightarrow$ phosphours Atom $\Rightarrow sp^3$ hybridised

$6 \Rightarrow$ oxygen atom which having P—O—P linkage

$\Rightarrow 4 + 6 = 10$

15. Ans. (5)

(a, b, c, e, f) are correct.

16. Ans. (0)

Only statement S_1 and S_4 are correct. $\because$ EA = S > O

So value of x is 2. $\therefore$ IE = $S^{\ominus} > O^{\ominus}$

Now $(x-2)^2 = (2-2)^2 = 0$

17. Ans. (20)

Only statement S_1 is incorrect.

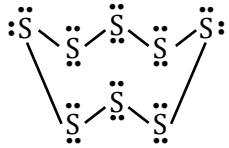
So value of P = 4

and Value of Q = 1

Now $\frac{P}{Q} + P^2 = \left(\frac{4}{1} + 4^2\right) = 20$.

18. Ans. (16)

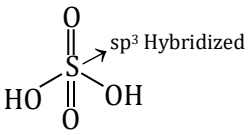
S_8 molecules ; crown shape



$\Rightarrow$ Non-bonding electron pairs (lone pairs)

$\Rightarrow 2 \times 8 = 16$

19. Ans. (2)

Structure of H_2SO_4 is 

In this pπ-pπ bond is zero and pπ-dπ bonds are 2. So, sum of pπ-pπ and pπ-dπ bonds is 2.

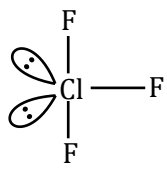
20. Ans. (3)

Compounds $ClBr_3$, BrI_5 and FCl_3 do not exist. Because of small size of central atom than surrounding atoms.

21. Ans. (6)

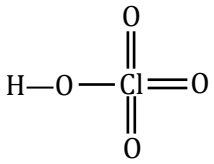
ClF, ClF_3, IF_7 are gases i.e. x = 3 and ICl, IBr, IF_3 are solids i.e. y = 3. Therefore x + y = 6

22. Ans. (2)



23. **Ans. (0)**

$HClO_4$;



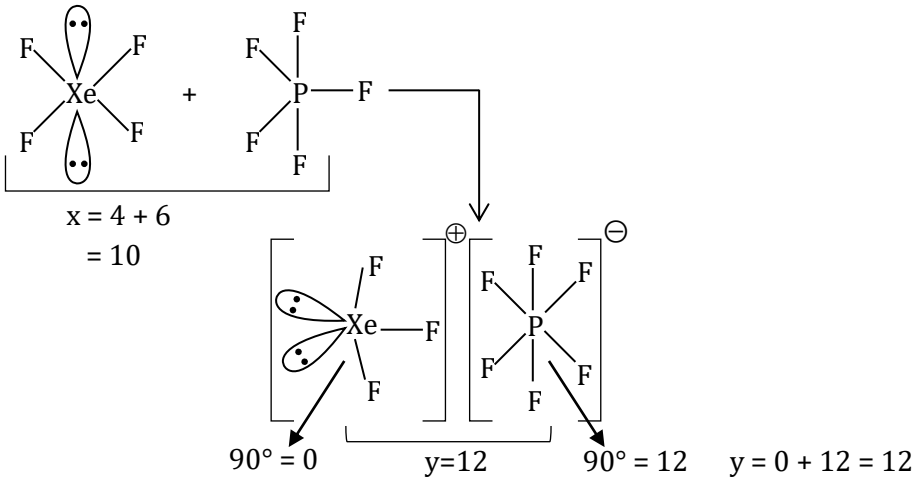
Number of $p\pi - p\pi = 0$

Number of $p\pi - d\pi = 3$

$Cl \rightarrow sp^3$ hybrised atom

Ans. 0

24. **Ans. (2)**



$y - x = 12 - 10 = 2$ Ans.

25. **Ans. (4)**

In BF_3, $BC\ell_3$, PF_3 and $N(SiH_3)_3$ back bonding takes place because in these molecules there is Covalent bond between two atom, one of them have lone pair and another atom have vacant orbital.

26. **Ans. (11)**

(Except a, b, d, m, n)

27. **Ans. (7)**

(Except 3 and 7)

28. **Ans. (5)**

(Except (a, b, g, h))

29. **Ans. (4)**

(a, b, c, e)

30. **Ans. (10)**

$Ca_2Cu_2Si_3O_{10}.2H_2O$

[Charge on Si_3O_{10} unit is –8, it is balanced by two calcium ion & two copper ions with each +2 charge. ratio of given species is 1 : 1 : 1

31. Ans. (6)

$PCl_5 + C_2H_5OH \longrightarrow C_2H_5Cl + POCl_3 + HCl$

$PCl_5 + CH_3COOH \longrightarrow CH_3COCl + POCl_3 + HCl$

$PCl_5 + SO_2 \longrightarrow POCl_3 + SOCl_2$

$PCl_5 + H_2O \longrightarrow POCl_3 + 2HCl$

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

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

32. Ans. (6)

SO_2, Cl_2O_7, Mn_2O_7, CrO_3, CO_2, N_2O_5 are the oxides which are acidic in nature.

33. Ans. (2)

$$\underset{(x)}{2KClO_3} \xrightarrow[MnO_2]{Heat} \underset{(x)}{2KCl} + \underset{(y)}{3O_{2(g)}}$$

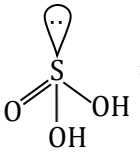
y = $O_{2(g)}$ $\Rightarrow$ Bond order = 2.0 & Paramagnetic Nature.

34. Ans. (3)

Only statement S_3 is incorrect and remaining are correct, because reaction of SO_2 with H_2O takes place as :

$H_2O(\ell) + SO_2\,(g) \longrightarrow H_2SO_3\,(aq)$

Now the structure of H_2SO_3 :

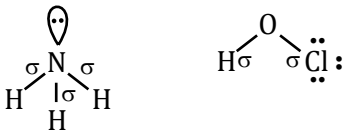


$\Rightarrow$ Here in this Structure only one π–bond is present.

So, answer is 3.

35. Ans. (5)

$NCl_3 + H_2O \longrightarrow \underset{(x)}{NH_3} + \underset{(y)}{HOCl}$



3 + 2 = 5

36. Ans. (7)

E.N. of F = 4

E.N of Cl = 3

4 + 3 = 7

37. Ans. (24)

$SOCl_2 + H_2O \longrightarrow 2HCl + SO_2$	Total 4 moles required (2 for HCl & 2 for SO_2)
$SO_2Cl_2 + 2H_2O \longrightarrow H_2SO_4 + 2HCl$	Total 4 moles required (2 for HCl & 2 for H_2SO_4)
$PCl_3 + 3H_2O \longrightarrow H_3PO_3 + 3HCl$	Total 5 moles required (3 for HCl & 2 for H_3PO_3)
$PCl_5 + 4H_2O \longrightarrow H_3PO_4 + 5HCl$	Total 8 moles required (5 for HCl & 3 for H_3PO_4)
$NCl_3 + 3H_2O \longrightarrow NH_3 + 3HOCl$	Total 3 moles required for HOCl

EXERCISE - JEE (Main) PYQ

1. **Ans. (1)**

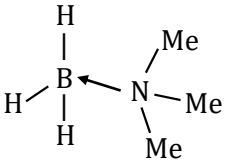
Moving down the group stability of lower oxidation state increases

Al < Ga < In < Tl

2. **Ans. (2)**

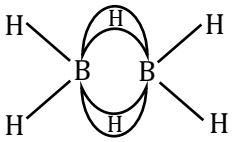
$$BF_3 + NaH \xrightarrow{450K} \underset{(\text{diborane})}{B_2H_6} + NaF$$

$$B_2H_6 + NMe_3 \longrightarrow \underset{\text{symmetrical cleavage}}{2[BH_3 \leftarrow NMe_3]}$$



3. **Ans. (3)**

(1) (2)



Two 3 centre – 2 – electron bonds

(3) B_2H_6 is e^- deficient species

(E) B_2H_6 is non – Planar molecule

(4) $BF_3 + LiAlH_4 \rightarrow 2B_2H_6 + 3LiF + 3AlF_3$

$NaBH_4 + I_2 \rightarrow B_2H_6 + 2NaI + H_2$

4. **Ans. (4)**

$(CH_3)_4Si$ is a silane

$(CH_3)Si(OH)_3$ polymerise to form 2D silicone

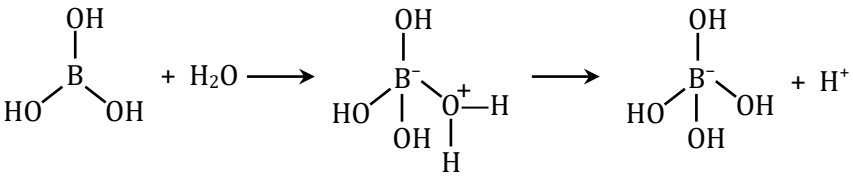
$(CH_3)_2Si(OH)_2$ polymerise to form chain silicone

$(CH_3)_3Si(OH)$ form dimer $(CH_3)_3Si\text{-}O\text{-}Si(CH_3)_3$

5. **Ans. (2)**

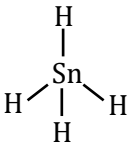
$$3B_2H_6 + 6NH_3 \xrightarrow{\Delta} 2B_3N_3H_6 + 12\,H_2$$

6. **Ans. (1)**



7. **Ans. (3)**

SnH_4 is non planar molecular hydride



Tetrahedral shape, sp^3 hybridisation

8. **Ans. (2)**

$Na_2B_4O_7 \cdot 10H_2O \xrightarrow{\Delta} Na_2B_4O_7 + 10H_2O$

$Na_2B_4O_7 \xrightarrow{\Delta} 2NaBO_2$ (sodium meta borate) $+ B_2O_3$

$B_2O_3 + CoO \rightarrow Co(BO_2)_2$(cobalt (II) meta borate)

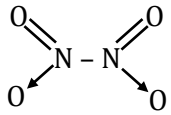
Blue Bead

9. **Ans. (1)**

$$Pb(NO_3)_2 \xrightarrow[673\ K]{\Delta} PbO + NO_2 + O_2$$

(A)

$$\underset{A}{2NO_2} \xrightarrow{\text{Dimerise}} \underset{B}{N_2O_4}$$



(no bridged oxygen)

10. **Ans. (1)**

	M.P
H_2O	273 K
H_2S	188 K
H2Se	208 K
H_2Te	222 K

11. **Ans. (2)**

Red P_4 + Alkali $\rightarrow$ $H_4P_2O_6$ (No P–H bond)

12. **Ans. (2)**

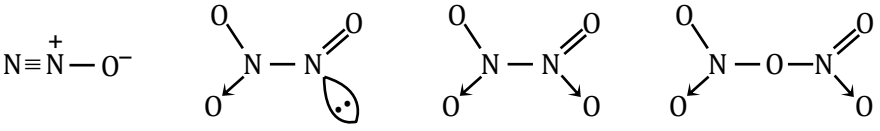
Cl_2O_7 Acidic

Na_2O Basic

Al_2O_3 Amphoteric

N_2O Neutral

13. **Ans. (3)**



N_2O N_2O_3 N_2O_4 N_2O_5

14. **Ans. (4)**

Pyrophosphorous acid $\rightarrow$ $H_4P_2O_5$.

Hypophosphoric acid $\rightarrow$ $H_4P_2O_6$.

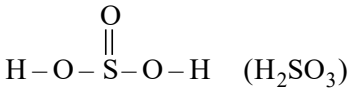
Phosphoric acid $\rightarrow$ H_3PO_4.

Pyrophosphoric acid $\rightarrow$ $H_4P_2O_7$.

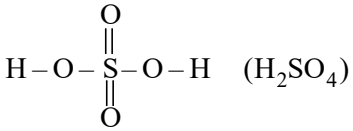
15. **Ans. (3)**

$$I_2 + 10HNO_{3(conc)} \Rightarrow 2HIO_3 + 10NO_2 + 4H_2O$$

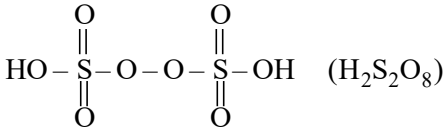
16. **Ans. (1)**



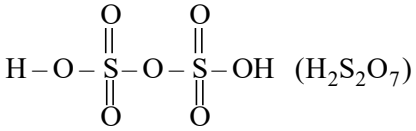
(H_2SO_3)



(H_2SO_4)



$(H_2S_2O_8)$



$(H_2S_2O_7)$

17. **Ans. (3)**

Boric acid has strong hydrogen bonding while BF_3 does not. Therefore boric acid is solid.

18. **Ans. (4)**

Extent of back bonding, reduces down the group leading to more Lewis acidic strength

$$BF_3 > BCl_3 > BBr_3 > BI_3 \left(\text{extent of back bonding}\right)$$

$(2p-2p)\ (2p-3p)\ (2p-4p)\ (2p-5p)$

$$BF_3 < BCl_3 < BBr_3 < BI_3 \left(\text{lewis acidic nature}\right)$$

19. **Ans. (4)**

(Bond enthalpy order

C – C > Si – Si > Ge – Ge > Sn – Sn)

20. **Ans. (2)**

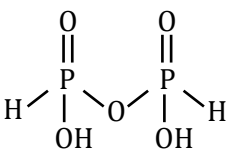
Boron is non- metallic in nature. It is extremely hard and black coloured solid. It exists in many allotropic forms. Due to very strong crystalline lattice, boron has unusually high melting point and boiling point.

Element					
	B	Al	Ga	In	Tl
Melting point/K	2453	933	303	430	576
Boiling point/K	3923	2740	2676	2353	1730

21. **Ans. (1)**

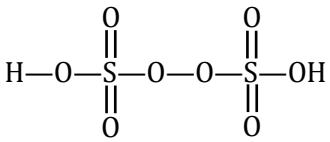
For good quality cement, the ratio of silica (SlO_2) to Alumina (Al_2O_3) should be between 2.5 to 4.

22. **Ans. (2)**

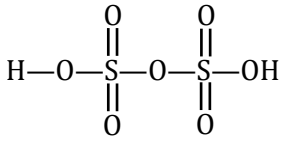


Oxyacid having P–H bond can reduce $AgNO_3$ to Ag.

23. Ans. (8)

Peroxodisulphuric acid - 

No. of π – bonds = 4

Pyro sulphuric acid - 

No. of π – bonds = 4

Total π – bonds = 8

24. Ans. (1)

Chlorine oxides, Cl_2O, ClO_2, Cl_2O_6 and Cl_2O_7 are highly reactive oxidising agents and tend to explode.

25. Ans. (2)

Cl has the most negative ΔH_{eg} among all the elements and Ne has the most positive ΔH_{eg}.

26. Ans. (11)

$XeF_4 + SbF_5 \rightarrow [XeF_3]^+[SbF_6]^-$

m = 3

n = 1

y = 6

z = 1

m + n + y + z = 11

27. Ans. (2)

$6XeF_4 + 12H_2O \longrightarrow 2XeO_3 + 4Xe + 24HF + 3O_2$

in XeO_3, Oxidation state of Xe = +6

in XeF_4, Oxidation state of Xe = +4

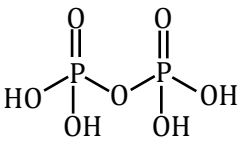
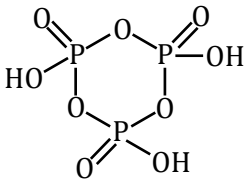
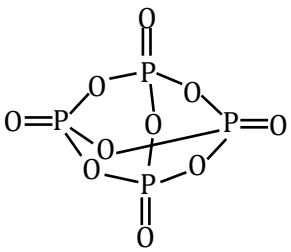
So, difference in oxidation state = 2

28. Ans. (4)

Only I^- among halides can be oxidised to Iodine by oxygen in acidic medium

$4I^-(aq) + 4H^+(aq) + O_2(g) \rightarrow 2I_2(s) + 2H_2O(l)$

29. Ans. (1)

Molecule	Number of P-O-P Bond
$H_4P_2O_7$	1
$(HPO_3)_3$	3
P_4O_{10}	6

EXERCISE - JEE (Advanced) PYQ

1. **Ans. (D)**

(P) $\longrightarrow$ (3) warm

(Q) $\longrightarrow$ Cl_2

(R) $\longrightarrow$ I_2

(S) $\longrightarrow$ NO

2. **Ans. (A)**

Cl_2 + cold dil. NaOH $\longrightarrow$ NaOCl + NaCl

Cl_2 + hot. conc. NaOH $\longrightarrow$ $NaClO_3$ +NaCl

NaOCl is salt of hypochlorous acid = P

$NaOCl_3$ is salt of hypochlorous acid = Q

$Cl_2 + SO_2 \xrightarrow{\text{Charcoal}} SO_2Cl_2$(R)

$SO_2Cl_2 + P_4 \longrightarrow PCl_5(s) + SO_2$

$PCl_5 + H_2O \longrightarrow H_3PO_4$ (T) + HCl

3. **Ans. (A)**

Cl_2 + cold dil. NaOH $\longrightarrow$ NaOCl + NaCl

Cl_2 + hot. conc. NaOH $\longrightarrow$ $NaClO_3$ +NaCl

NaOCl is salt of hypochlorous acid = P

$NaOCl_3$ is salt of hypochlorous acid = Q

4. **Ans. (B, D)**

In graphite C — C bond have double bond character and hence higher bond order than diamond and also electrical conductivity is higher in graphite.

5. **Ans. (B, D)**

It accepts an electron pair from water so it behave as weak monobasic acid.

They form chelate which effectively removes $[B(OH)_4]^{\ominus}$ species from solution.

6. **Ans. (6)**

$B_2H_6 + 6\ MeOH \rightarrow 2B(OMe)_3 + 6H_2$

$3B_2H_6 + 18MeoH \rightarrow 6B(Ome)_3 + 18H_2$

7. **Ans. (B)**

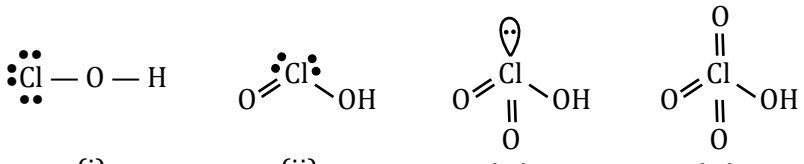
$(CH_3)_2SiCl_2$ is hydrolysis give chain polymer and $(CH_3)_3$ SiCl is used as Chain terminator.

8. **Ans. (D)**

Number of Cl = O bonds in (ii) and (iii) together is 3

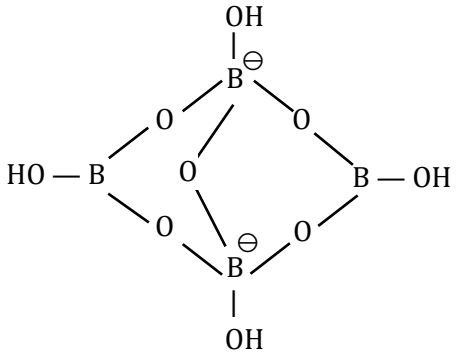
Number of l.p. on Cl in (ii) and (iii) together is 3. acid.

Hybridisation of Cl in (iv) is sp^3

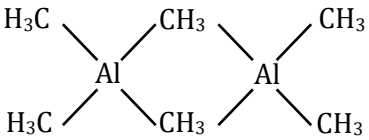


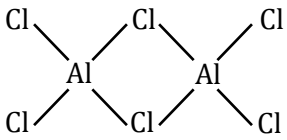
(i) (ii) (iii) (iv) Strongest acid.

9. Ans. (A,C,D)



10. Ans. (A,C,D)





11. Ans. (A, D)

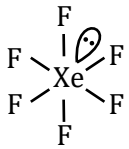
$$\underset{(Q)}{SnCl_2} + Cl^{\ominus} \longrightarrow \underset{(X)}{SnCl_3^{\ominus}}$$

$$\underset{(Q)}{SnCl_2} + Me_3N \longrightarrow SnCl_2\left[\underset{(Y)}{N(CH_3)_3}\right]$$

$$\underset{(Q)}{SnCl_2} + 2CuCl_2 \longrightarrow \underset{(Z)}{SnCl_4} + CuCl$$

12. Ans. (19)

$$XeF_4 + O_2F_2 \longrightarrow \underset{(Y)}{XeF_6} + O_2$$



3 lone pair on each F and 1 l.p on Xe

13. Ans. (288.00)

$32H_2O + S_8 \longrightarrow 8H_2SO_4 + 48H^{\oplus} + 48\,e^{\ominus}$

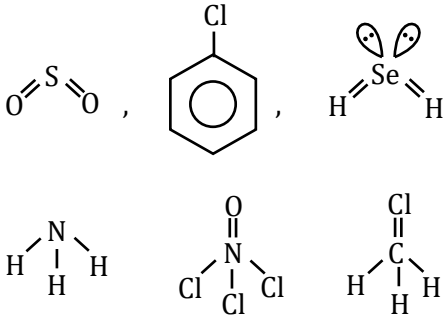
$[e^{\ominus} + H^{\oplus} + HNO_3 \longrightarrow NO_2 + H_2O] \times 48$

$S_8 + 48HNO_3 \longrightarrow 8H_2SO_4 + 48\,NO_2 + 16H_2O$

Mass of H_2O formed = 16 × 18 = 288 g

14. Ans. (B,D)

SO_2 (sp^2)

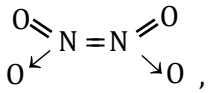


All possess permanent. dipole moment

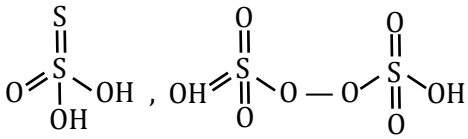
15. Ans. (4.00)

N_2O_4, $H_2S_2O_3$, N_2O, $H_2S_2O_8$

$N \equiv N \rightarrow O$,



,



16. Ans. (A)

X : Ag, Y : Pb, P : AgCl, Q : $PbCl_2$

$AgNO_3 + Pb(NO_3)_2 \xrightarrow{NaCl} AgCl\ (\downarrow) + PbCl_2$

(P) (Q)

Heated & filtered

AgCl (P) (white ppt.)

$PbCl_2$ (Q) (Hot solution) $\xrightarrow{KI}$ PbI_2 (Yellow ppt)

$AgCl\ (s) + 2NH_3 \longrightarrow [Ag(NH_3)_2] + Cl^{\ominus}$

(P) (Excess)

$\downarrow 2N_2S_2O_3$

$Na_3[Ag(S_2O_3)_2] + NaCl$

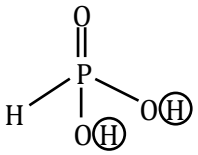
Soluble Complex Salt

17. Ans. (A,B,D)

(A) $4H_3PO_3 \xrightarrow{\Delta} 3H_3PO_4 + PH_3$ (correct)

(B) H_3PO_4 has "P" in its highest oxidation state, hence cannot act as a reducing agent (correct)

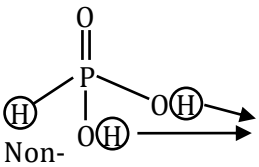
(C)



Dibasic acid (incorrect)

Two OH group present in H_3PO_3

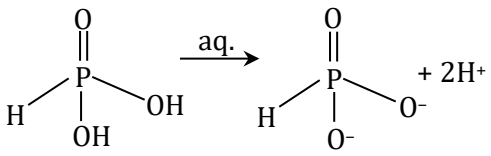
(D)



Non-ionizable

Ionizable (Correct)

The hydrogen which is directly attached to phosphorous does not ionized in water.



18. Ans. (B,C)

(A) $2B + 2NH_3 \rightarrow 2BN + 3H_2$

Boron produced BN with ammonia but Boron is element not compound. So that this option not involve in answer.

(B) $3B_2H_6 + 6NH_3 \longrightarrow 3[BH_2(NH_3)_2]^{\oplus}[BH_4]^{\ominus} \xrightarrow{T=200^\circ C} 2B_2N_3H_6 + 12H_2$

$B_3N_3H_6 \xrightarrow{T>200^\circ C} (BN)_x$

(C) $B_2O_3(\ell) + 2NH_3 \xrightarrow{200^\circ C} 2BN_{(s)} + 3H_2O_{(g)}$

(D) $HBF_4 + NH_3 \rightarrow NH_4[BF_4]$

19. Ans. (C)

$Pb(NO_3)_2 + 2NaCl \longrightarrow PbCl_2 + 2NaNO_3 \xrightarrow{\text{excess HCl}} [PbCl_4]^{2\ominus}$

20. Ans. (A,D)

$3PbS + 8HNO_3 \rightarrow 3Pb(NO_3)_2 + 2NO + 4H_2O + S$

NO $\Rightarrow$ Neutral oxide, Paramagnetic, Linear geometry, Colourless gas

21. Ans. (C)

$$HClO_3 + HCl \rightarrow \underset{\text{(Paramagnetic)}}{ClO_2} + \frac{1}{2}Cl_2 + H_2O$$

$2ClO_2 + 2O_3 \rightarrow Cl_2O_6 + 2O_2$

22. Ans. (D)

(P) $P_2O_3 + 3H_2O \rightarrow 2\underline{H_3PO_3}$

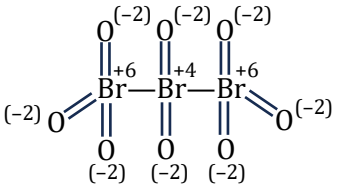
(Q) $P_4 + 3NaOH + 3H_2O \rightarrow 3NaH_2PO_2 + \underline{PH_3}$

(R) $PCl_5 + CH_3COOH \rightarrow CH_3COCl + \underline{POCl_3} + HCl$

(S) $H_3PO_2 + 2H_2O + 4AgNO_3 \rightarrow 4Ag + 4HNO_3 + \underline{H_3PO_4}$

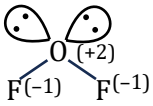
23. Ans. (6)

Br_3O_8



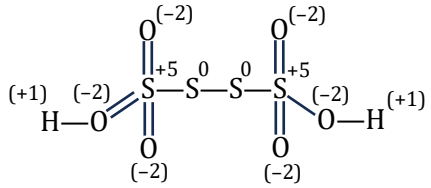
Number of atoms with zero oxidation state = 0

F_2O



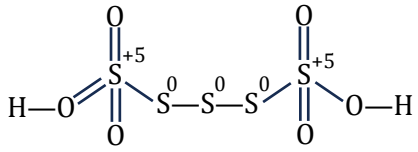
Number of atom with zero oxidation state = 0

$H_2S_4O_6$



Number of atoms with zero oxidation state = 2

$H_2S_5O_6$



Number of atoms where zero oxidation state = 3

C_3O_2

$O=C=\overset{(0)}{C}=C=O$

Number of atoms with zero oxidation state = 1

JEE (Main) Practice Paper

SECTION–A

1. Ans. (3)

The molecular formula Borax is $Na_2B_4O_7.10H_2O$. Borax is also called as sodium tetraborate decahydrate.

The complete reaction of borax with water is as shown below;

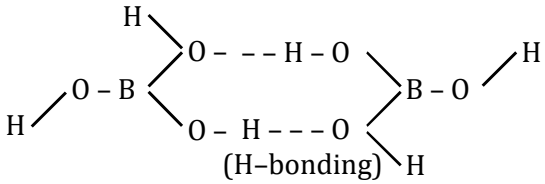
$Na_2B_4O_7.10H_2O + 7H_2O \rightarrow 2NaOH + 4H_3BO_3 + 10H_2O$

2. Ans. (4)

Elements of group 14, having outer electronic configuration ns^2np^2 show +2 and +4 oxidation states.

On moving down the group, the stability of +2 oxidation state increases and the stability of +4 oxidation state decreases.

3. Ans. (1)



H_3BO_3 boric acid.

4. Ans. (3)

$\overset{\oplus 1}{M_2}SO_4.\overset{\oplus 3}{M'_2}(SO_4)_3.24H_2O$ Alum

$2[M(H_2O)_6]^{\oplus}.2[M'(H_2O)_6]^{3\oplus}.4SO_4^{2\ominus}$

2 : 2 : 4 or 1 : 1 : 2

5. **Ans. (2)**

Al_2O_3 has high lattice energy and low heat of hydration, there fore, insoluble in water.

Lattice energy high and low hydration.

6. **Ans. (3)**

Size of Cl is bigger in comparison to H.

7. **Ans. (3)**

(1) SiC (Carborundum) has 3D-network like structure as diamond

(2) GeO_2 is an acidic oxide

(3) Carbogen is used as antidote in CO poisoning

(4) Oxidation number of Pb is +2 in PbO while +4 in PbO_2 that's why PbO is more basic

8. **Ans. (3)**

Stability of hydride decreases down the group

9. **Ans. (2)**

The correct option is B

SiO_2, CO

$SiO_2 + 2C \rightarrow Si + 2CO$.

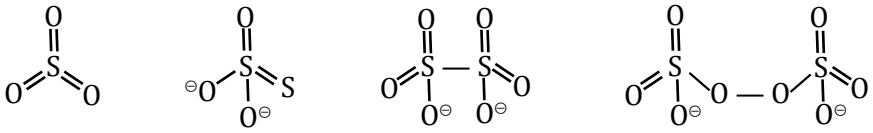
10. **Ans. (2)**

carbogen has 95% O_2 and 5% CO_2

It is used as antidote for poisoning of carbon mono-oxide

x = 5% Y = CO

11. **Ans. (2)**



12. **Ans. (1)**

Calcium carbide reacts with nitrogen at high temperature to form calcium cyanamide which is used as fertilizer.

$$Ca + C_2 \longrightarrow CaC_2 \xrightarrow{N_2} \underset{\text{Calcium cyanamide}}{CaCN_2} + C$$

13. **Ans. (4)**

Cl > F > Br > I $\rightarrow$ EA

14. **Ans. (1)**

$2MnO_4^{2\ominus} + 3H_2O_2 \longrightarrow 2MnO_2 + 3O_2 + 2H_2O + 2OH^{\ominus}$

Oxidation state of Mn in $MnO_4^{\ominus}$ is +7. H_2O_2 can only reduce Mn as it is in maximum oxidation state.

15. **Ans. (2)**

Down the group vander wall forces increases thus Xe has highest boiling point

16. Ans. (3)

Phosphine react with copper sulphate solution, gives copper phosphide.

$3CuSO_4 + 2PH_3 \longrightarrow \underset{\text{Black ppt}}{Cu_3P_2} + 3H_2SO_4$

17. Ans. (2)

Nitrogen gas does not react at normal temperature, but it react with oxygen gas at very high temperature (at about 2000 k) to form nitric oxide.

$N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$

$\Delta H = (+ve) \Rightarrow$ Endothermic reaction.

18. Ans. (1)

$\underset{\text{Oxalic acid}}{(COOH)_2} \xrightarrow[-H_2O]{\text{Conc.}H_2SO_4} \underset{\text{Neutral oxide}}{CO_{(g)}} + \underset{\text{Acidic oxide}}{CO_{2(g)}}$

$2KOH + CO_{2(g)} \longrightarrow K_2CO_3 + H_2O$

19. Ans. (2)

$\underset{\text{excess}}{3Cl_{2(g)}} + \underset{\text{(X)}}{NH_{3(g)}} \longrightarrow \underset{\text{(Y) Explosive compound}}{NCl_3} + 3HCl$

20. Ans. (1)

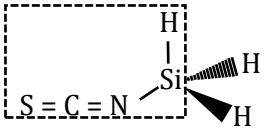
$\underset{\text{White P}}{(A)} \xrightarrow[1200 \text{ atmosphere}]{473 \text{ K}} \underset{\beta\text{-black P}}{(B)}$

$\text{White P} \xrightarrow[\text{Under } CO_2 \text{ atmosphere}]{573 \text{ K}} \underset{\text{Red P}}{(C)}$

SECTION-B

1. Ans. (5)

Maximum number of atoms lie in a plane = 5

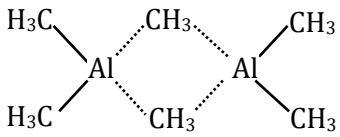


5 atoms S, C, N, Si and H in a plane

2. Ans. (5)

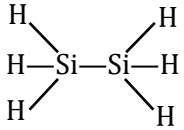
$3c - 4e^{\ominus}$ bond is a bridge bond

$Al_2(CH_3)_6$



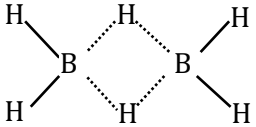
$3c–2e^{\ominus}$ bond

Si_2H_6

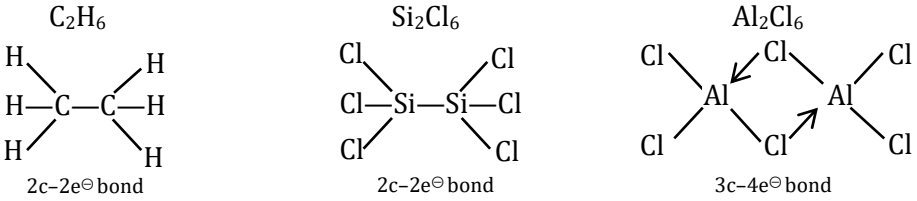


$2c–2e^{\ominus}$ bond

B_2H_6



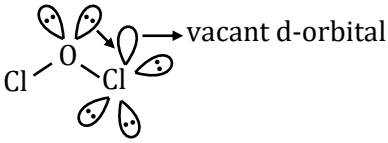
$3c–2e^{\ominus}$ bond



$Al_2(CH_3)_6$, Si_2H_6, C_2H_6, Si_2Cl_6, B_2H_6 don't have 3c – 4e$^{\ominus}$ bond

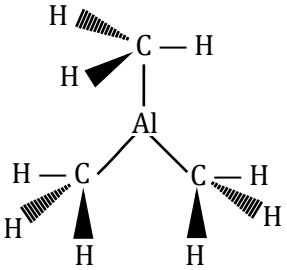
3. Ans. (2)

Species in which d-orbital of Cl is involved = OCl_2, $(CCl_3)^{\ominus}$



4. Ans. (7)

Maximum number of atom in one plane = 7 (3C + 1Al + 3H)



5. Ans. (3)

Species having 2pπ = 3dπ back bonding :

$N(SiH_3)_3$,	$O(SiH_3)_2$,	OCl_2
2pπ – 3dπ	2pπ – 3dπ	2pπ – 3dπ

6. Ans. (6)

Unsymmetrical (heterolytic) cleavage of B_2H_6 : with small sized strong Lewis bases like NH_3, $MeNH_2$, $(Me)_2NH$

Symmetrical (homolytic) cleavage of B_2H_6 : with large sized strong/weaker Lewis base like : PH_3, PF_3, Et_2O, $H^{\ominus}$, CO, THF, $(Me)_3N$, Pyridine

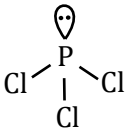
Me_3N, Py, CO, THF, PH_3, PF_3 give symmetrical cleavage product [Adduct]

7. Ans. (2)

$Fe + 2HCl \longrightarrow FeCl_2 + H_2 \Rightarrow$ O.S. of Fe in $FeCl_2$ = +2

8. Ans. (3)

$P_4 + 8\ SOCl_2 \longrightarrow \underset{(X)}{4PCl_3} + 4SO_2 + 2S_2Cl_2$



9. Ans. (1)

$\underset{\text{(Hot \& Conc.)}}{6NaOH} + 3Cl_2 \longrightarrow 5NaCl + NaClO_3 + 3H_2O$

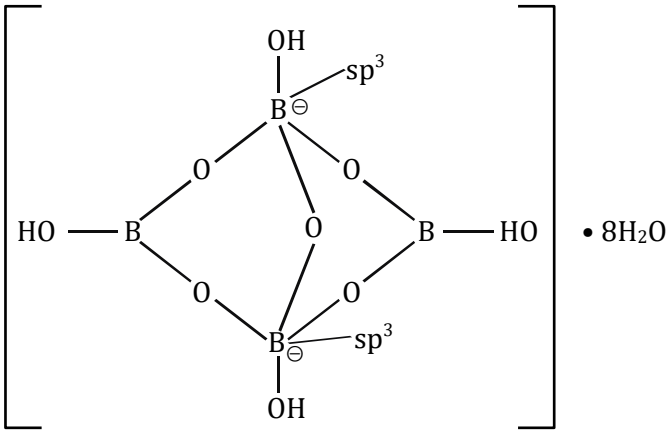
The compound X is $NaClO_3$ and Molecular weight of $NaClO_3$ is 106.5

10. Ans. (5)

All of the compounds are oxidised by O_3 hence correct answer is 5.

JEE (Advanced) Practice Paper

1. Ans. (C)



$\bullet\ 8H_2O$

2. Ans. (B)

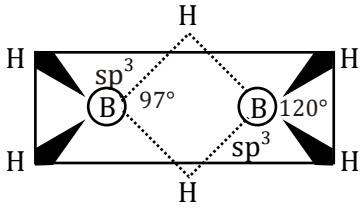
$CNO^{\ominus}$, $OCN^{\ominus}$, $N_3^{\ominus}$ are pseudo halide ions Pseudo halide ions have monovalent ion made by electronegative atom and possessing properties similar to halide ion.

3. Ans. (A)

$\Rightarrow BCl_3$ is stronger Lewis acid as the bond formed with the Lewis base will involve 2p orbital which is stronger than the 3p orbital overlap in case of $AlCl_3$

4. Ans. (A)

B_2H_6 diborane



2 Bridged hydrogen and four terminal hydrogen.

5. Ans. (A)

4 bonds = 2C – 2e
2 bonds = 3C – 2e } 12 electrons

Due to Bridge bonding boron is sp^3 hybridized.

6. Ans. (D)

Radon (Rn) is a noble gas and it is used in treatment of cancer and other malignant growths.

7. Ans. (C, D)

Pb_2O_3 contains the following ($PbO + PbO_2$)

Pb_3O_4 contains the following ($2PbO + PbO_2$)

8. Ans. (A,B,C)

$$\overset{(X)}{B_2H_6} + NH_3 \rightarrow \overset{(Y)}{B_3N_3H_6} \rightarrow \text{(inorganic Benzene)}$$

$$B_2H_6 + NH_3\ (\text{excess}) \xrightarrow{\text{high T}} \underset{(Z)}{(BN)_x} \longrightarrow \text{inorganic graphite (Similar structure like graphite)}$$

9. **Ans. (A,B,C,D)**

$Ca_3P_2 + 6H_2O \longrightarrow 2PH_3 + 3Ca(OH)_2$

$P_4 + 3NaOH + 3H_2O \longrightarrow PH_3 + 3NaH_2PO_2$

$PH_4I + KOH \longrightarrow PH_3 + H_2O + KI$

$H_3PO_2 \xrightarrow{\Delta} PH_3 + H_3PO_4$

10. **Ans. (A)**

$2KBr + H_2SO_4(conc.) \longrightarrow K_2SO_4 + Br_2 + SO_2 + H_2O$

Hence $Br^{\ominus}$ is oxidised to Br_2

11. **Ans. (C)**

$I_2 + 10HNO_3 \longrightarrow 2HIO_3 + 10NO_2 + 4H_2O$

12. **Ans. (C)**

(P) $XeF_2 + PF_5 \longrightarrow [XeF]^{\oplus} + [PF_6]^{\ominus}$

(Q) $XeF_4 + Pt \longrightarrow PtF_4 + Xe$

(R) $XeF_4 + 12H_2O \longrightarrow 4Xe + 2XeO_3 + 24HF + 3O_2$

Disproportionation reaction

(S) $XeF_6 + CsF \rightarrow [XeF_7]^{\ominus} + Cs^{\oplus}$

13. **Ans. (D)**

Reducing character order

$CH_4 < SiH_4 < GeH_4 < SnH_4$

intermolecular force increases

14. **Ans. (C)**

$\Rightarrow$ Reducing character increases down the group.

$\Rightarrow$ Bond angle order $CH_4 = SiH_4 = GeH_4 = SnH_4$

$\Rightarrow$ Intermolecular forces of Hydrogen halide follows irregular order.

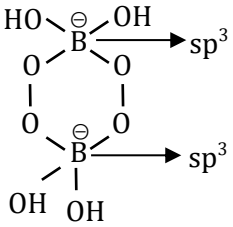
15. **Ans. (B,C,D)**

$\rightarrow$ Drago's rule is valid in NH_3, PH_3, AsH_3, SbH_3

$\rightarrow$ B.P. or reducing strength have no significance of drago's rule

$\rightarrow$ Drago's rule is not valid for B.A. of CH_4, SiH_4, GeH_4, SnH_4

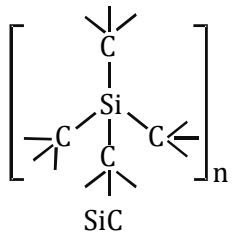
16. **Ans. (B)**



17. **Ans. (D)**

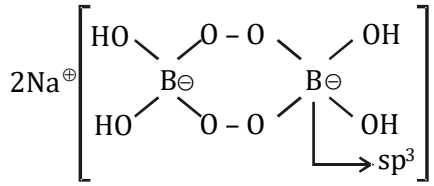
SiC is diamond like 3–D Structure which is non–planar. In SiC all atoms are sp^3 hybridised.

18. Ans. (D)

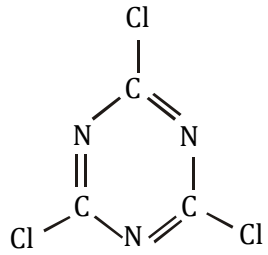
P.  (Carborundum)

SiC

Q. $O = C = C = C = O$ C_3O_2 (Carbon suboxide)

R.  (Sodium peroxoborate)

$Na_2[B_2O_4(OH)]$

S.  (Cyanuric chloride)

$C_3N_3Cl_3$

19. Ans. (D)

$I_2O_5(D) + NO_2(g)$ Brown Colour ↑

I_2 (E)

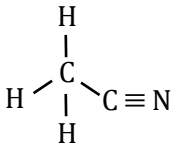
$P_4O_{10} \xrightarrow{NHO_3} N_2O_5 + (HPO_3)_n$

excess H_2O (B) (C)

H_3PO_4

Compound E(NO_2) have oxidation state of +4 on nitrogen.

20. Ans. (C)

$CH_3CONH_2 + P_4O_{10} \xrightarrow{-H_2O} CH_3 - C \equiv N$ 

5σ bond + 2 π - bond