Miscellaneous Exercise Question Bank

Single correct option Type

1.(D) Catenation means chain linking tendency of atoms of the same element.
Catenation tendency is maximum in C due to strong $C-C$ bond strength.

2.(D) $Si \xrightarrow{HNO_3/HF} SiF_4 \xrightarrow{HF} H_2SiF_6$

$SiF_4 \xrightarrow{H_2O} \underset{(B)}{H_2SiF_6} + \underset{(C)}{H_4SiO_4}$

3.(C) Aluminium vessel should not be washed with materials containing washing soda because it reacts with aluminium to form soluble aluminate.

$$Al + Na_2CO_3 + H_2O(aq) \longrightarrow NaAlO_2 + NaHCO_3 + H_2$$

4.(D) $B_2H_6 + NH_3 \longrightarrow 2[BH_3 \leftarrow NH_3] \xrightarrow[450K]{\Delta} B_3N_3H_6 + H_2$

5.(C) NH_4OH is used as a precipitating reagent for Al^{3+} ion as $Al(OH)_3$ rather than aqueous NaOH because $Al(OH)_3$ being amphoteric dissolve in NaOH to form soluble aluminate

$Al(OH)_3 + NaOH \longrightarrow NaAlO_2$

6.(C) $H_3BO_3 + NaOH(aq) \xrightarrow{\Delta} Na[B(OH)_4]$

$H_3BO_3 + \text{molten NaOH} \xrightarrow{\Delta} Na_3BO_3 + H_2O$

7.(C) $BF_3 + H_2O \longrightarrow H_3BO_3 + HBF_4$

8.(D) $BCl_3 + C_5H_5N \longrightarrow BCl_3(C_5H_5N)$

9.(D) These reactions lead to chemical inertness due to formation of inert oxide layer on its surface.

10.(D) H_3BO_3 is monobasic acid.

$H_3BO_3 + H_2O \longrightarrow B(OH)_4^- + H^+$

11.(C) III is incorrect. Potash alum is $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$

12.(A) $T\ell I_3$ exist as $T\ell^+$ and I_3^-

13.(D) $Na_2B_4O_7 + 2NH_4Cl \xrightarrow{\text{Red hot}} BN + NaCl + H_2O + HCl$

14.(A) $H_3BO_3 + C_2H_5OH \longrightarrow \underset{\text{green flame}}{B(OEt)_3}$

15.(D) Li^+ does not form alums.

16.(D) $B > A\ell < Ga > In < T\ell$

Here IE of Ga is more than that of $A\ell$ due to high zeff and poor shielding effect of d-electrons. It of $T\ell > In$ due to poor shielding effect of f electrons and high zeff.

17.(D) Tl^{3+} is good oxidising agent because its stable oxidation state is + 1 due to inert pair effect.

18.(B) $Al + N_2 \longrightarrow AlN \xrightarrow{H_2O} \underset{Y}{Al(OH)_3} + \underset{Z}{NH_3}\uparrow$

Y is insoluble in water.

19.(D) All are correct

20.(A) Si forms covalent compounds due to its high ionization energy.

21.(A) Silicons are not combustible

22.(B) $CH_2(COOH)_2 + P_4O_{10} \longrightarrow C_3O_2 + H_2O$

23.(B) Silyl Isocyanate is linear due to presence of back bonding.

24.(C) Water in presence of oxygen reacts with Pb pipes to from soluble $Pb(OH)_2$ which gives poisnous Pb^{2+} ions in solution.

25.(B) $C + H_2O \longrightarrow \underset{\text{water gas}}{CO + H_2}$

26.(A) Bond length of $B-F$ in $Me_3N \longrightarrow BF_3$ is greater than that in BF_3 due to back bonding in BF_3.

27.(D) $Al + KOH \longrightarrow \underset{\text{(soluble)}}{K_2AlO_2} + H_2$

More than One Correct Type

28.(BCD) Graphite is paramagnetic due to presence of unpaired electron.

29.(BCD) $B_2O_3 + C \longrightarrow CO + B_4C$

30.(ABC) $SiO_2 + C \longrightarrow Si + CO$

31.(ABC) Al can form covalent compound also like $AlCl_3$, Al_2O_3

32.(AB) PbO and PbO_2 are amphoteric as they reacts with acid as well as base.

33.(ABC) Diborane undergoes unsymmetrical cleavage with lewis base like NH_3, RNH_2 and Me_2NH due to small size of Base

34.(BD) B_2H_6 is also lewis acid due to 3c-2e bond.
It is used as reducing agent for reduction of organic compounds.

35.(BCD) Borax bead test is given by transition metal salts.

36.(AB) $HCOOH \xrightarrow[H_2SO_4]{\text{conc.}} H_2O + CO$

Malonic acid $\xrightarrow{P_4O_{10}} C_3O_2$

$Mg_2C_3 \xrightarrow{H_2O} Mg(OH)_2 + C_3H_4$

$K_4[Fe(CN)_6] + H_2SO_4 \longrightarrow K_2SO_4 + FeSO_4 + CO + (NH_4)_2SO_4$

37.(B) Bond angle in graphite is 120°.

38.(ABCD) B_2H_6 is not polar. It undergoes symmetrical cleavage with large Nucleophiles due to stearic strain.

39.(C) Hydrolysis of R_3SiCl will form dimer hydrolysis of $SiCl_4$ will for $Si(OH)_4$

40.(ABCD) Refer module

41.(A) C_4H_4 cannot be prepared by hydrolysis. CH_4, C_2H_2 and C_3H_4 are prepared by hydrolysis of Al_4C_3, CaC_2 and Mg_2C_3 respectively.

42.(ABD) $NO^+BF_4^-$

It has 5σ and 2π bond

Nitrogen-oxygen bond length in NO^+ is higher than that in Nitric oxide.

Comprehension Type

43 to 48

$$\underset{(A)}{NaBH_4} + I_2 \longrightarrow \underset{(B)}{B_2H_6} + H_2 + NaI$$

$$\underset{(B)}{B_2H_6} \xrightarrow[H_2O]{} \underset{(C)}{H_3BO_3} + H_2$$

$$\underset{(C)}{H_3BO_3} \xrightarrow{H_2O} B(OH)_4^- + H^+$$

$$B_2H_6 \xrightarrow[\Delta]{O_2} B_2O_3$$

43.(C)

44.(ACD) Cis-1, 2-diol is used in titration of NaOH with H_3BO_3. Cis-1, 2-diol forms stable complex with H_3BO_3.

45.(B) $B_2H_6 \xrightarrow{NH_3} [B(NH_3)_2H_2]^+[BH_4]^-$

46.(A) $Al_2Cl_6 \xrightarrow{H_2O} [Al(H_2O)_6]^{3+}3Cl^-$

47.(C) AlX_3 forms dimer to overcome electron deficiency.

48.(C) $AlCl_3$ can be sublimed easily. It is lewis acid and covalent compound.

49 to 53

A is $Na_2B_4O_7 \cdot 10H_2O$

aq. Solution of A is alkaline due to formation of NaOH

$$Na_2B_4O_7 \cdot 10H_2O \xrightarrow{\Delta} \underset{(B)}{Na_2B_4O_7} \longrightarrow \underset{(C)}{B_2O_3} + NaBO_2 \xrightarrow{NiO} Ni(BO_2)_2$$

49.(A) Water of crystallisation present per mole Borax is 10.

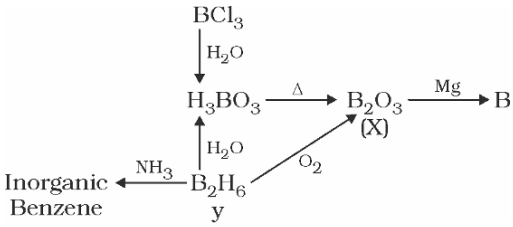
50.(C) Aqueous solution of Borax is alkaline due to hydrolysis of anion i.e. $B_4O_7^{2-}$

51.(A) $Na_2B_4O_7 \xrightarrow{Ca^{2+}} CaB_4O_7$

52.(A) $Na_2B_4O_7$

53.(B) C is B_2O_3 and D is $Ni(BO_2)_2$

54-55. 54.(C) 55.(C)

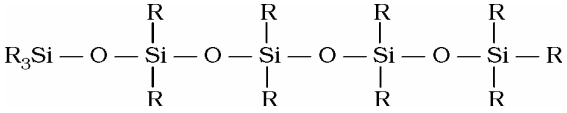


56 to 58

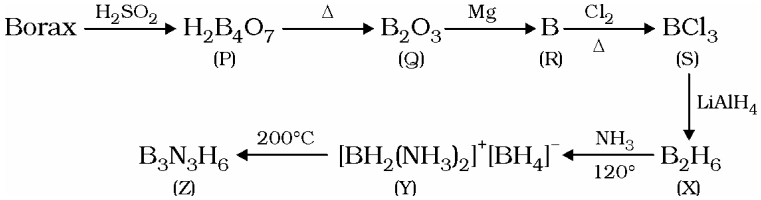
56.(D) R_2SiCl_2 on hydrolysis gives linear polymer and R_3SiCl act as chain terminating unit.

57.(D)

58.(B)



59-61. 59.(A) 60.(B) 61.(D)



62.(C) $B_2H_6 \xrightarrow[450K]{NH_3} \underset{\text{Borazine}}{(B_3N_3H_6)}$

63.(A) CO undergoes symmetrical cleavage with B_2H_6

$B_2H_6 \xrightarrow{2CO} 2[BH_3 \cdot CO]$

64.(C) $B_2H_6 + HCl \longrightarrow B_2H_5Cl + H_2$

Assertion & Reason Type

65.(A) Al shows passivity with conc. HNO_3 due to formation of inert layer of Al_2O_3.

66.(A) $Al + HCl \longrightarrow AlCl_3 + H_2$

$Al + NaOH \longrightarrow NaAlO_2 + H_2$

Amphoteric substance react with acid as well as base.

67.(A) Alums like $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$ are acidic due to cationic hydrolysis.

68.(A) Boron has highest melting point due to Icosahedral structure.

69.(A) Stable O.S of T*l* is +1 due to inert pair effect.

70.(C) BF_3 undergoes partial hydrolysis due to formation of HBF_4.

$BF_3 + H_2O \longrightarrow H_3BO_3 + HBF_4$

71.(A) Diborane has two types of hydrogen i.e. Bridging hydrogen and terminal hydrogen.
Bridge bond is stronger than terminal bond.

72.(A) Borazole i.e $B_3N_3H_6$ is isostructural to Benzene

73.(B) Borazole is known as inorganic benzene. When diborane is heated with NH_3 at 200°C, Borazole is formed. Here NH_3 act as Lewis base and diborane as Lewis acid.

74.(A) Refer 219

75.(A) Lewis acid character in boron trihalide is $BF_3 < BCl_3 < BBr_3 < BI_3$ because electron deficiency in BF_3 is overcome by back bonding. As we move down the group, extent of back bonding decreases due to poor overlap.

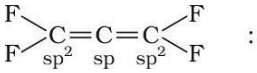
76.(A) $BCl_3 + H_2O \longrightarrow H_3BO_3 + HCl$

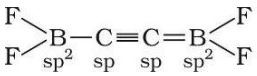
77.(D) Boric acid is Monobasic acid

78.(A) O = C = C = C = O

79.(C) CCl_4 does not react with water due to absence of Vacant d orbital.
Both $SiCl_4$ and CCl_4 are covalent.

80.(B) SiO_2 is solid (3D silicate)

81.(C)  : Non-planar

 : Non-planar

82.(D) Carbonates are sp^2 and silicates are sp^3 hybridised.

83.(B) Bond dissociation energy of $B-F$ bond in BF_3 molecule is more than $C-F$ bond in CF_4 due to back bonding in BF_3.

84.(A) Diamond is extremely hard to strong $C-C$ bond in the structure.

85.(A) In $Si_4O_{12}^{x-}$, x is 8. Here number of shared oxygen is 2.

Matrix Matching Type

86.(D)

Al_2O_3	:	Amphoteric i.e. can react with acid as well as base
$AlCl_3$	:	exist as dimer
B	:	Non metal
B_2O_3	:	Non-metallic oxide so acidic

87.(D)

BN (Boron Nitride)	:	Inorganic graphite
$B_3N_3H_6$ (Borazole)	:	Inorganic Benzene
Ruby	:	Contain Al_2O_3
Black lead	:	Graphite

88.(A)

Water gas	:	$CO + H_2$
Producer gas	:	$CO + N_2$
Coal gas	:	Mixture of CO, H_2, CH_4 and CO_2
Natural gas	:	CH_4

89. **[A-p, r] [B-p, r] [C-q, r] [D-q, s]**

B_2H_6	:	Dimer of BH_3 and each B is sp^3 hybridised
Al_2Cl_6	:	Dimer of $AlCl_3$ and each Al is sp^3 hybridised
$BeCl_2$(Solid)	:	sp^2 hybridised
$(SiH_3)_3N$	:	Planer (sp^2) due to Back bonding

90. **[A-p, q] [B-p, r] [C-q, r, s] [D-q]**

$Al_2(C_2)_3 + H_2O \longrightarrow Al(OH)_3 + C_2H_2$

$CH_2(COOH)_2 + P_4O_{10} \longrightarrow C_3O_2 + H_3PO_4$

$CH_3SiCl_3 + H_2O \longrightarrow CH_3Si(OH)_3 \longrightarrow$ Cross linked polymer

$SnCl_2 \cdot 2H_2O \xrightarrow[\text{Standary}]{\text{on}} SnO_2$

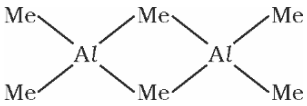
Integer Answer Type

91.(2) In Borax, 2 Boron are sp^2 hybridised and 2 Boron are sp^3 hybridised.

92.(5) B_2H_6, BCl_3, CO_2, Al_2Cl_6, $SiCl_4$

93.(4) $Al_2(Me)_6$, all atoms are sp^3 hybridized

No. of 3c-2e bonds = 2



x = 8, y = 2, $\frac{x}{y} = 4$

94.(3) $(CH_3)_3N$, CO, $(CH_3)_2O$

95.(3) i, iv, vi

96.(7) PbO, PbO_2, SnO, SnO_2, Al_2O_3, BeO, Ga_2O_3

97.(4) Refer structure of borax in solution 252.

98.(2) SiO_2, B_2O_3

99.(4) Al_4C_3, Mg_2C_3, B_2H_6, BaC_2

$Al_4C_3 \xrightarrow{H_2O} Al(OH)_3 + CH_{4(g)}$

$Mg_2C_3 \xrightarrow{H_2O} Mg(OH)_2 + C_3H_2(g)$

$B_2H_6 \xrightarrow{H_2O} H_3BO_3 + H_2(g)$

$BaC_2 \xrightarrow{H_2O} Ba(OH)_2 + C_2H_2(g)$

100.(7) $\underset{x}{SiF_4} \xrightarrow{H_2O} \underset{x}{Si(OH)_4} + \underset{y}{H_2SiF_6}$; $\underset{x}{SiCl_4} \xrightarrow{H_2O} \underset{x}{Si(OH)_4} + \underset{z}{HCl}$

Covalency of Si in y is 6 = C_1

Covalency of Cl in z is 1 = C_2