Solutions

S1. Ans.(d)

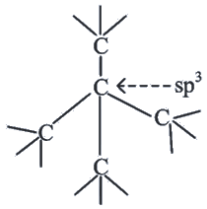
$LaH_{2.87}$ ⟶ Non-stoichiometric

⟶ Metallic/Interstitial hydride.

S2. Ans.(b)

Coke: It is used as reducing agent in carbon reduction methods. (in metallurgical process)

Diamond: It is a allotrope of carbon in which each carbon is sp^3 hybridised.



Fullerene: It contains pentagonal & hexagonal rings (cage like structure)

Graphite: It is soft solid because graphite layers are bonded with weak Vander Wall attractions.

S3. Ans.(b)

F^{-1}, N^{-3}, Na^+ and O^{-2}

all ions are isoelectronic containing $10e^-$

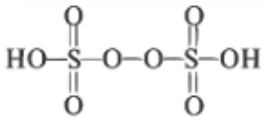
Z_{eff} ⟶ $Na^+ > F^- > O^{-2} > N^{-3}$

order of radius ⟶ $N^{-3} > O^{-2} > F^- > Na^+$

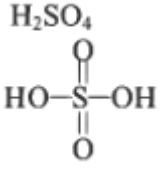
⟶ Nitrogen to achieve Noble gas configuration by gaining $3e^-$ and form N^{-3}

S4. Ans.(a)

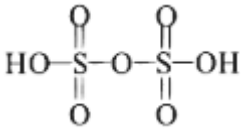
A ⟶ Peroxodisulphuric acid



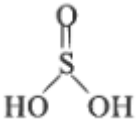
B ⟶ Sulphuric acid



C ⟶ Pyrosulphuric acid $H_2S_2O_7$



D ⟶ Sulphurous acid H_2SO_3



S5. Ans.(b)

Borax:

$Na_2B_4O_7.10H_2O = Na_2[B_4O_5(OH)_4].8H_2O$

Kernite: $Na_2B_4O_7.4H_2O$

Orthoboric acid: H_3BO_3=$B(OH)_3$

Borax bead: $NaBO_2$ (Sodium metaborate)

S6. Ans.(c)

$4NH_3 + 5O_2$ (from air) $\xrightarrow[500K,9bar]{Pt}$ $4NO + 6H_2O$

$2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g)$

$3NO_2(g) + H_2O(l) \longrightarrow 2HNO_3(aq) + NO(g)$

This is industrial method of preparation of nitric acid.

S7. Ans.(c)

$Na_2B_4O_7 \xrightarrow{\Delta} B_2O_3 + 2NaBO_2$

Product X is B_2O_3

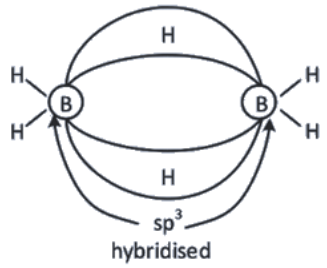
S8. Ans.(a)

List I (Hydrides)			List II (Nature)
A.	MgH_2	⟶	Ionic
B.	GeH_4	⟶	Electron precise
C.	B_2H_6	⟶	Electron deficient
D.	HF	⟶	Electron rich

A-IV, B-I, C-II, D-III

S9. Ans.(d)

Each boron atoms in diborane uses sp^3 hybrid orbitals for bonding.



S10. Ans.(b)

Compound	Boiling point (K)
H_2O	373
H_2S	213
H_2Se	232
H_2Te	269

The boiling points of these hybrids not exactly increases with increase in molar mass.

H_2O has maximum boiling point due to intermolecular hydrogen bonding.

S11. Ans.(c)

Dry ice, CO_2(s), is used as refrigerant

C_{60} contains 20 six membered rings, 12 five membered rings statement 3 and 4 are correct.

S12. Ans.(a)

CO is Neutral oxide

BaO is Basic oxide

Al_2O_3 is Amphoteric oxide

Cl_2O_7 is Acidic oxide

S13. Ans.(b)

Carbon monoxide binds with Hb to form 300 times more stable compound carboxyhaemoglobin than oxyhaemoglobin complex.

S14. Ans.(d)

CO_2 : acidic

SnO_2 : amphoteric

SiO_2 : acidic

GeO_2 : acidic

S15. Ans.(d)

Due to presence of vacant d-orbital in si, Ge and Sn they form species like SiF_6^{2-}, $[GeCl_6]^2$, $[Sn(OH)_6]^{2-}$.

$SiCl_6^{2-}$ does not exist because six large chloride ions cannot be accommodated around Si^{4+} due to its small size.

S16. Ans.(a)

PbF_4 is ionic in nature, because cation is bigger and anion is smaller.

SiF_4 is easily hydrolysed because it has unoccupied 3d orbital that are able to accept electron pairs from the oxygen atoms on water to form bond.

$$SiCl_4 + 3H_2O \rightarrow H_2SiO_3 + 4HCl$$

GeX_4 is more stable than GeX_2 as in GeX_4 all the orbitals are fully filled.

SnF_4 is ionic in nature as F atom is very small and Sn atom is very large. So, it is ionic in nature according to Fajan's rule.

S17. Ans.(c)

Group 13 order of atomic radius is not regular due to transition contraction.

So order is: B < Ga < Al < In < Tl

S18. Ans.(d)

∵ 'B' has no vacant d-orbitals in its valence shell, so it can't extend its covalency beyond 4, i.e., 'B' cannot form the ion like MF_6^{3-} i.e. BF_6^{3-}.

Hence, the correct option is (d).

S19. Ans.(b)

Sn^{2+} is reducing while Pb^{4+} is oxidizing. This is because of absence of f-orbital (fully filled) in Sn^{2+} and presence in Pb^{4+} due to which Pb^{4+} show inert pair effect but not Sn^{2+}.

S20. Ans.(b)

+1 oxidation state increases down the group as the fully filled d- and f- orbitals will get added due to which inert pair effect will come into role.

Tl > In > Ga > Al > B

S21. Ans.(a)

Boric acid is a Lewis acid, it accepts a pair of electron in aqueous solution to complete its octet because it is an electron deficient compound.

$B(OH)_3 + H_2O \rightleftharpoons [B(OH)_4]^- H^+$

S22. Ans.(b)

$AlF_3 + 3KF \xrightarrow{HF} K_3[AlF_6]$

AlF_3 is insoluble in Anhydrous HF because F^- ion are not available in Hydrogen bonded HF.

S23. Ans.(c)

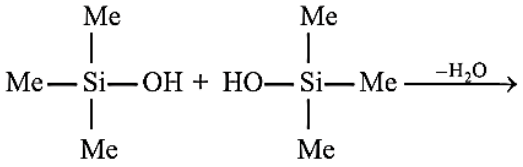
Order of oxidation state in group 13 is Al < Ga < In < Tl

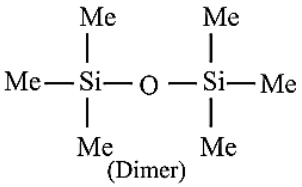
(+1) oxidation state stability increases down the group because of inert pair effect.

S24. Ans.(c)

Me_3SiCl is not a monomer for high molecular mass silicone polymer because it generates Me_3SiOH when subjected to hydrolysis which contains only one reacting site.

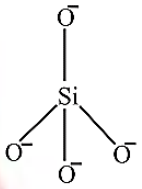
Hence, the polymerization stops just after first step.





S25. Ans.(b)

Basic unit for silicates is SiO_4^{4-}



S26. Ans.(a)

BN is also known as inorganic graphite with sp^2 hybridisation and hexagonal structure.