

The p-Block Elements (Part – A)

1. Match the List I with List II.

List I (Hydride)		List II (Type of Hydride)	
A.	NaH	I.	Electron precise
B.	PH ₃	II.	Saline
C.	GeH ₄	III.	Metallic
D.	LaH _{2.87}	IV.	Electron rich

Choose the correct answer from option given below: **(2023)**

- (a) A-III, B-IV, C-II, D-I
 (b) A-II, B-III, C-IV, D-I
 (c) A-I, B-III, C-II, D-IV
 (d) A-II, B-IV, C-I, D-III

2. Match List I with List II:

List I		List II	
A.	Coke	I.	Carbon atoms are sp ³ hybridised
B.	Diamond	II.	Used as a dry lubricant
C.	Fullerene	III.	Used as a reducing agent
D.	Graphite	IV.	Cage like molecules

Choose the correct answer from the options given below: **(2023)**

- (a) A-IV, B-I, C-II, D-III
 (b) A-III, B-I, C-IV, D-II
 (c) A-III, B-IV, C-I, D-II
 (d) A-II, B-IV, C-I, D-III

3. The element expected to form largest ion to achieve the nearest noble gas configuration is **(2023)**

- (a) F
 (b) N
 (c) Na
 (d) O

4. Match List I with List II:

List I (Oxoacids or Sulphur)		List II (Bonds)	
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A.	Peroxodisulphuric acid	I.	Two S-OH, Four S=O, One S-O-S
B.	Sulphuric acid	II.	Two S-OH, One S=O
C.	Pyrosulphuric acid	III.	Two S-OH, Four S=O, One S-O-O-S
D.	Sulphurous acid	IV.	Two S-OH, Two S=O

Choose the correct answer from the option given below: **(2023)**

- (a) A-III, B-IV, C-I, D-II
 (b) A-I, B-III, C-IV, D-II
 (c) A-III, B-IV, C-II, D-I
 (d) A-I, B-III, C-II < D-IV

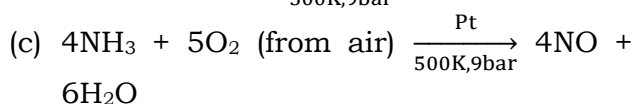
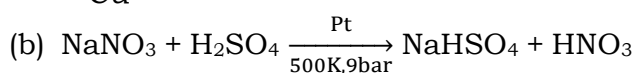
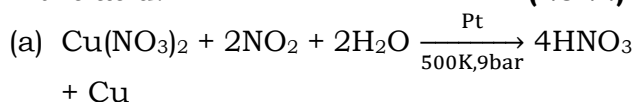
5. Match List I with List II:

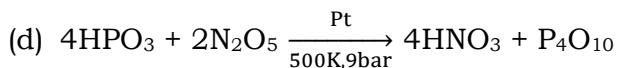
	List I (Compounds)		List II (Molecular formula)
A.	Borax	I.	NaBO ₂
B.	Kernite	II.	Na ₂ B ₄ O ₇ ·4H ₂ O
C.	Orthoboric acid	III.	H ₃ BO ₃
D.	Borax bead	IV.	Na ₂ B ₄ O ₇ ·10H ₂ O

Choose the correct answer from the options given below: **(2022)**

- (a) A-I, B-III, C-IV, D-II
 (b) A-IV, B-II, C-III, D-I
 (c) A-II, B-IV, C-III, D-I
 (d) A-III, B-I, C-IV, D-II

6. Which of the following reactions is a part of the large-scale industrial preparation of nitric acid? **(2022)**





7. $\text{Na}_2\text{B}_4\text{O}_7 \xrightarrow{\text{heat}} \text{X} + \text{NaBO}_2$
In the above reaction the product "X" is:
(2022)

- (a) NaB_3O_5
(b) H_3BO_3
(c) B_2O_3
(d) $\text{Na}_2\text{B}_2\text{O}_5$

8. Match List I with List II.

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

Choose the correct answer from the options given below:
(2022)

- (a) A-IV, B-I, C-II, D-III
(b) A-III, B-I, C-II, D-IV
(c) A-I, B-II, C-IV, D-III
(d) A-II, B-III, C-I, D-IV
9. Which of the following statement is not correct about diborane?
(2022)
- (a) There are two 3-centre-2-electron bonds
(b) The four terminal B-H bonds are two centre two electron bonds
(c) The four terminal Hydrogen atoms and the two Boron atoms lie in one plane
(d) Both the Boron atoms are sp^2 hybridised
10. Given below are two statements.
Statement I: The boiling points of the following hydrides of group 16 elements increases in the order-
 $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$
Statement II: The boiling points of these hydrides increase with increase in molar mass.
In the light of above statements, choose the most appropriate answer from options given below:
(2022)
- (a) Both Statement I and Statement II are correct.
(b) Both Statement I and Statement II are incorrect.
(c) Statement I is correct but Statement II is incorrect.
(d) Statement I is incorrect but Statement II is correct.

11. Identify the correct statements from the following:
(2020)

- (1) $\text{CO}_2(\text{g})$ is used as refrigerant for ice-cream and frozen food.
(2) The structure of C_{60} contains twelve six carbon rings and twenty five carbon rings.
(3) ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.
(4) CO is colorless and odourless gas.
(a) 1 and 3 only
(b) 2 and 3 only
(c) 3 and 4 only
(d) 1, 2 and 3 only

12. Match the following :
(2020)

Oxide	Nature
A. CO	(i) Basic
B. BaO	(ii) Neutral
C. Al_2O_3	(iii) Acidic
D. Cl_2O_7	(iv) Amphoteric

Which of the following is correct option?

- | | | | |
|-----------|-------|-------|-------|
| (A) | (B) | (C) | (D) |
| (a) (ii) | (i) | (iv) | (iii) |
| (b) (iii) | (iv) | (i) | (ii) |
| (c) (iv) | (iii) | (ii) | (i) |
| (d) (i) | (ii) | (iii) | (iv) |

13. Which of the following is not correct about carbon monoxide?
(2020)

- (a) It reduces oxygen carrying ability of blood.
(b) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.
(c) It is produced due to incomplete combustion.
(d) It forms carboxyhaemoglobin.

14. Which of the following oxide is amphoteric in nature?
(2020 Covid Re-NEET)

- (a) SiO_2
(b) GeO_2
(c) CO_2
(d) SnO_2

15. Which of the following species is not stable?
(2019)

- (a) $[\text{SiF}_6]^{2-}$
(b) $[\text{GeCl}_6]^{2-}$
(c) $[\text{Sn}(\text{OH})_6]^{2-}$
(d) $[\text{SiCl}_6]^{2-}$

16. Which of the following is incorrect statement? **(2019)**
 (a) PbF_4 is covalent in nature
 (b) SiCl_4 is easily hydrolysed
 (c) GeX_4 ($\text{X} = \text{F}, \text{Cl}, \text{Br}, \text{I}$) is more stable than GeX_2
 (d) SnF_4 is ionic in nature
17. The correct order of atomic radii in group 13 elements is **(2018)**
 (a) $\text{B} < \text{Al} < \text{In} < \text{Ga} < \text{Tl}$
 (b) $\text{B} < \text{Al} < \text{Ga} < \text{In} < \text{Tl}$
 (c) $\text{B} < \text{Ga} < \text{Al} < \text{In} < \text{Tl}$
 (d) $\text{B} < \text{Ga} < \text{Al} < \text{Tl} < \text{In}$
18. Which one of the following elements is unable to form MF_6^{3-} ion? **(2018)**
 (a) Ga
 (b) Al
 (c) In
 (d) B
19. It is because of inability of ns^2 electrons of the valence shell to participate in bonding that : **(2017-Delhi)**
 (a) Sn^{4+} is reducing while Pb^{4+} is oxidising
 (b) Sn^{2+} is reducing while Pb^{4+} is oxidising
 (c) Sn^{2+} is oxidising while Pb^{4+} is reducing
 (d) Sn^{2+} and Pb^{2+} are both oxidising and reducing
20. The tendency to form monovalent compounds among the Group 13 elements is correctly exhibited in: **(2017-Gujarat)**
 (a) $\text{B} \approx \text{Al} \approx \text{Ga} \approx \text{In} \approx \text{Tl}$
 (b) $\text{B} < \text{Al} < \text{Ga} < \text{In} < \text{Tl}$
 (c) $\text{Tl} < \text{In} < \text{Ga} < \text{Al} < \text{B}$
 (d) $\text{Tl} \approx \text{In} < \text{Ga} < \text{Al} < \text{B}$
21. Boric acid is an acid because its molecule: **(2016-II)**
 (a) Accepts OH^- from water releasing proton
 (b) Combines with proton from water molecule
 (c) Contains replaceable H^+ ion
 (d) Gives up a proton
22. AlF_3 is soluble in HF only in presence of KF . It is due to the formation of: **(2016-II)**
 (a) $\text{K}_3[\text{AlF}_3\text{H}_3]$
 (b) $\text{K}_3[\text{AlF}_6]$
 (c) AlH_3
 (d) $\text{K}[\text{AlF}_3\text{H}_3]$
23. The stability of +1 oxidation state among Al, Ga, In and Tl increases in the sequence: **(2015 Re)**
 (a) $\text{In} < \text{Tl} < \text{Ga} < \text{Al}$
 (b) $\text{Ga} < \text{In} < \text{Al} < \text{Tl}$
 (c) $\text{Al} < \text{Ga} < \text{In} < \text{Tl}$
 (d) $\text{Tl} < \text{In} < \text{Ga} < \text{Al}$
24. Which of these is not a monomer for a high molecular mass silicone polymer? **(2013)**
 (a) MeSiCl_3
 (b) Me_2SiCl_2
 (c) Me_3SiCl
 (d) PhSiCl_3
25. The basic structural unit of silicates is: **(2013)**
 (a) SiO
 (b) SiO_4^{4-}
 (c) SiO_3^{2-}
 (d) SiO_4^{2-}
26. Which of the following structure is similar to graphite? **(2013)**
 (a) BN
 (b) B
 (c) B_4C
 (d) B_2H_6

Answer Key

S1. Ans. (d)

S2. Ans. (b)

S3. Ans. (b)

S4. Ans. (a)

S5. Ans. (b)

S6. Ans. (c)

S7. Ans. (c)

S8. Ans. (a)

S9. Ans. (d)

S10. Ans. (b)

S11. Ans. (c)

S12. Ans. (a)

S13. Ans. (b)

S14. Ans. (d)

S15. Ans. (d)

S16. Ans. (a)

S17. Ans. (c)

S18. Ans. (d)

S19. Ans. (b)

S20. Ans. (b)

S21. Ans. (a)

S22. Ans. (b)

S23. Ans. (c)

S24. Ans. (c)

S25. Ans. (b)

S26. Ans. (a)

Solutions

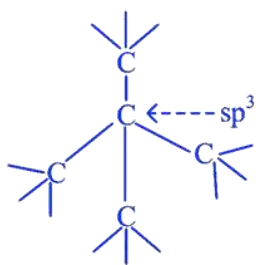
S1. Ans.(d)

$\text{LaH}_{2.87} \rightarrow$ Non-stoichiometric
 $\rightarrow$ 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 $10e^{-}$

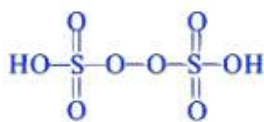
$Z_{\text{eff}} \rightarrow \text{Na}^{+} > \text{F}^{-} > \text{O}^{-2} > \text{N}^{-3}$

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

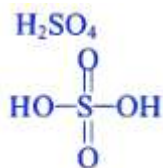
$\rightarrow$ Nitrogen to achieve Noble gas configuration is tan $3e^{-}$ and form N^{-3}

S4. Ans.(a)

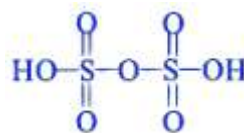
A $\rightarrow$ Peroxodisulphuric acid



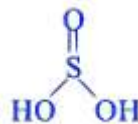
B $\rightarrow$ Sulphuric acid



C $\rightarrow$ Pyrosulphuric acid $\text{H}_2\text{S}_2\text{O}_7$



D $\rightarrow$ Sulphurous acid H_2SO_3



S5. Ans.(b)

Borax:

$\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O} = \text{Na}_2[\text{B}_4\text{O}_5(\text{OH})_4] \cdot 8\text{H}_2\text{O}$

Kernite: $\text{Na}_2\text{B}_4\text{O}_7 \cdot 4\text{H}_2\text{O}$

Orthoboric acid: $\text{H}_3\text{BO}_3 = \text{B}(\text{OH})_3$

Borax bead: NaBO_2 (Sodium metaborate)

S6. Ans.(c)

$4\text{NH}_3 + 5\text{O}_2 \text{ (from air)} \xrightarrow[500\text{K, 9bar}]{\text{Pt}} 4\text{NO} + 6\text{H}_2\text{O}$

$2\text{NO}(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$

$3\text{NO}_2(\text{g}) + \text{H}_2\text{O}(\text{l}) \rightarrow 2\text{HNO}_3(\text{aq}) + \text{NO}(\text{g})$

This is industrial method of preparation of nitric acid.

S7. Ans.(c)

$\text{Na}_2\text{B}_4\text{O}_7 \xrightarrow{\Delta} \text{B}_2\text{O}_3 + 2\text{NaBO}_2$

Product X is B_2O_3

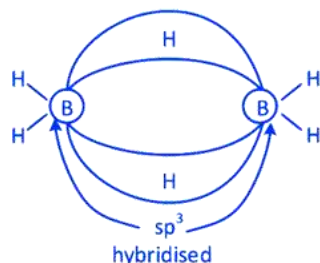
S8. Ans.(a)

List I (Hydrides)		List II (Nature)	
A.	MgH_2	$\rightarrow$	Ionic
B.	GeH_4	$\rightarrow$	Electron precise
C.	B_2H_6	$\rightarrow$	Electron deficient
D.	HF	$\rightarrow$	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 ₂ O	373
H ₂ S	213
H ₂ Se	232
H ₂ Te	269

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

H₂O has maximum boiling point due to intermolecular hydrogen bonding.

S11. Ans.(c)

Dry ice, CO₂(s), is used as refrigerant

C₆₀ 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

Al₂O₃ is Amphoteric oxide

Cl₂O₇ 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)

CO₂ : acidic

SnO₂ : amphoteric

SiO₂ : acidic

GeO₂ : acidic

S15. Ans.(d)

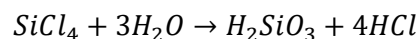
Due to presence of vacant d-orbital in Si, Ge and Sn they form species like SiF_6^{2-} , $[GeCl_6]^{2-}$, $[Sn(OH)_6]^{2-}$.

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

S16. Ans.(a)

PbF₄ is ionic in nature, because cation is bigger and anion is smaller.

SiF₄ 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.



GeX₄ is more stable than GeX₂ as in GeX₄ all the orbitals are fully filled.

SnF₄ 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)

Sn²⁺ is reducing while Pb⁴⁺ is oxidizing. This is because of absence of f-orbital (fully filled) in Sn²⁺ and presence in Pb⁴⁺ due to which Pb⁴⁺ show inert pair effect but not Sn²⁺.

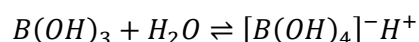
S20. Ans.(b)

+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.

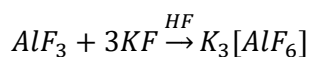
Tl > In > Ga > Al > B

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.



S22. Ans.(b)



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

S23. Ans.(c)

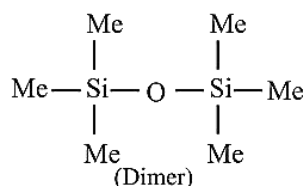
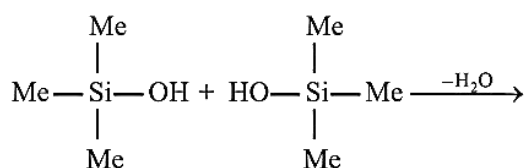
Order of oxidation state in group 13 is $Al < Ga < In < Tl$

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

S24. Ans.(c)

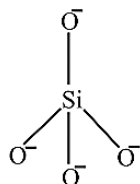
Me_3SiCl is not a monomer for high molecular mass silicone polymer because it generates Me_3SiOH when subjected to hydrolysis which contains only one reacting site.

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.