

CHEMISTRY-1

p-Block Elements

[Set-1]

SECTION-A

- The basic structural unit present in silicates is
 - SiO_3^{2-}
 - SiO_4^{2-}
 - SiO_4^{4-}
 - SiO^{2-}
- Which of the following on hydrolysis gives methane gas?
 - Be_2C
 - Al_4C_3
 - Both (i) and (ii)
 - B_4C
- The thermodynamically most stable form of carbon is
 - Fullerene
 - Diamond
 - Graphite
 - Coke
- In diborane, the hybrid orbitals used by boron are
 - sp^3
 - sp^2
 - sp
 - dsp^2
- Match the following:

Column-I

- A. Inorganic benzene
 B. Asbestos
 C. Tincal
 D. Acidic oxide

Column-II

1. Borax, $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$
 2. Boron sesquioxide, B_2O_3
 3. Borazole, $\text{B}_3\text{N}_3\text{H}_6$
 4. Naturally occurring silicate mineral

	A	B	C	D
(i)	2	1	4	2
(ii)	2	4	3	1
(iii)	4	1	3	2
(iv)	3	4	1	2

Assertion-Reason type Questions:

- Both A and R are true and R is the correct explanation of A
- Both A and R are true and R is not the correct explanation of A
- A is true but R is false
- A is false but R is true

6. A: SiF_6^{2-} is known but SiCl_6^{2-} is not known.

R: F is extremely small in size and its lone pair interact strongly with d-orbitals of silicon

7. A: Orthoboric acid is a weak monobasic acid in water

R: In water, orthoboric acid act as a proton donor.

Passage based questions

The monomeric trihalides of boron are all covalent in nature and are hydrolysed by water. All these trihalides are electron deficient and are Lewis acids. They all combines with Lewis bases to form adduct. Although boron chloride in a monomer but aluminium chloride exist as a dimer. Aluminium can also show higher covalency of six but boron does not.

8. Which of the following boron halides is the strongest Lewis acid?

(i) BF_3

(ii) BCl_3

(iii) BBr_3

(iv) All are equally strong

9. In the reaction $\text{H}-\underset{\text{H}}{\overset{\text{H}}{\text{N}}} + \text{F}-\underset{\text{F}}{\overset{\text{F}}{\text{B}}}-\text{F} \rightarrow \left[\text{H}-\underset{\text{H}}{\overset{\text{H}}{\text{N}}} \rightarrow \underset{\text{H}}{\overset{\text{H}}{\text{B}}}-\text{H} \right]$ the hybridization of boron changes from

(i) sp^2 to sp^2

(ii) sp^2 to sp^3

(iii) sp^3 to sp^2

(iv) $\text{sp}^3 \rightarrow \text{sp}^3$

10. The correct statement about Al_2Cl_6 dimer is

(i) The covalence of Al is 4 and Al is sp^3 hybridised

(ii) The hbridisation of Al is sp^2

(iii) The covalence of Al in this dimer is six

(iv) On dissociation to form monomer, no change in hybridization of Al

SECTION-B

11. Write balanced equation for

(i) $\text{BF}_3 + \text{LiH} \rightarrow$

(ii) $\text{SiO}_2 + \text{HF} \rightarrow$

OR

Give reasons:

(i) Diamond is covalent, yet it has high melting point.

(ii) Boron is unable to form BF_6^{3-}

12. Account for the following:

- (i) BCl_3 is more stable than TlCl_3
- (ii) CO_2 is acidic whereas CO is a neutral oxide

13. (i) What are electron deficient compounds?

- (ii) Are BCl_3 and SiCl_4 electron deficient species? Explain

14. Explain the following reactions:

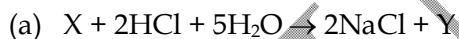
- (i) Silicon dioxide is treated with sodium hydroxide
- (ii) Carbon monoxide is heated with zinc oxide
- (iii) Silicon is heated with methyl chloride at high temperature in the presence of copper

OR

Give reason:

- (i) A mixture of dilute NaOH and aluminum pieces is used to open drain.
- (ii) Diamond is used as an abrasive
- (iii) Carbon forms stable CCl_4 but Pb from PbCl_2

15. (i) Identify X, Y, Z in the following reaction



(ii) Give reason:

- (a) Boron does not form B^{3+} ion.
- (b) Silicon does not form graphite like structure whereas carbon does.

OR

(i) (a) Discuss the structure of diborane

(b) What happens when diborane reacts with water?

(ii) Identify X, Y and Z in with following equations

