



WEIRD CHEMIST

P-Block Elements

Dimerisation / Polymerisation

DPP – 02

Topic: Dimerisation / Polymerisation

Questions: 15 Questions

Exam: JEE / NEET

▶ TYPE 1 : Diborane (B_2H_6) — Structure & Bonding

Q1. In which of the following molecules do vacant orbitals not participate in bonding?

- (1) B_2H_6 (2) Al_2Cl_6 (3) $[H_3N \cdot BF_3]$ (4) Si_2H_6

Q2. In diborane

- (1) 2 bridged hydrogen and four terminal hydrogen are present
(2) 3 bridged and three terminal hydrogen are present
(3) 4 bridged hydrogen atoms are not in the same plane in diborane
(4) 1 bridged hydrogen and 1 terminal hydrogen are present

Q3. Which of the following statements is correct in the context of diborane (B_2H_6)?

- (1) There are 12 valence electrons — three from each of the two boron atoms and six from the six hydrogen atoms
(2) Two of the six hydrogen atoms form two bridges between the two boron atoms
(3) The two bridging hydrogen atoms are in a plane perpendicular to the rest of the molecule and prevent rotation between the two boron atoms
(4) All of these

Q4. Which of the following statements is incorrect in relation to the structure of diborane?

- (1) All the terminal B–H bond lengths are equal
(2) The terminal B–H bond is a 2-centre 3-electron bond
(3) The terminal B–H bond is a 2-centre 2-electron bond
(4) The bridge B–H–B unit is a 3-centre 2-electron bond

Q5. The type of hybridisation of boron in diborane is

- (1) sp (2) sp^2 (3) sp^3 (4) sp^3d^2

Q6. Which of the following statements is not correct about diborane?

[NTA]

- (1) The four terminal B–H bonds are 2-centre 2-electron bonds
- (2) The four terminal hydrogen atoms and the two boron atoms lie in one plane
- (3) Both the boron atoms are sp^2 hybridised
- (4) There are two 3-centre 2-electron bonds

▶ TYPE 2 : Dimerisation — Comparison, Octet & Applications

Q7. Which one of the following molecular hydrides acts as a Lewis acid? [AIPMT Pre. 2010]

- (1) CH_4 (2) NH_3 (3) H_2O (4) B_2H_6

Q8. Which of the following molecules has a complete octet around the central atom?

- (1) BeCl_2 (dimer) (3) BeH_2 (s)
 (2) BeH_2 (dimer) (4) BeCl_2 (s)

Q9. In which of the following dimers does the empty atomic orbital of the central atom of the monomer not involve in hybridisation?

- (1) Ga_2H_6 (2) Al_2Br_6 (3) Be_2H_4 (4) Cl_2O_6

Q10. In Al_2Cl_6 (dimer of AlCl_3), the hybridisation of Al and the nature of the bond formed by the bridging Cl atoms are respectively

- (1) sp^2 ; coordinate bond (3) sp^2 ; covalent bond
 (2) sp^3 ; coordinate bond (4) sp^3 ; ionic bond

▶ TYPE 3 : NCERT Based questions

Q11. In Al_2Cl_6 , the bridging Al–Cl bond (221 pm) is longer than the terminal Al–Cl bond (206 pm). A student claims this is because the bridging Cl shares its lone pair between two Al atoms, reducing bond order per Al. Which option BEST supports this claim?

- (1) Bridging Cl uses a full lone pair for one Al only, making it stronger (3) Longer bonds are always stronger in coordinate bonds
 (2) Bridging Cl shares its lone pair between two Al atoms, reducing bond order per Al (4) Both bonds have equal strength since Cl is the same atom

Q12. The metal species in Al_2Cl_6 completes its octet by

- (1) losing electrons to Cl atoms
- (2) sharing electrons covalently with terminal Cl
- (3) accepting a lone pair from bridging Cl atoms
- (4) forming ionic bonds with bridging Cl

Q13. BF_3 is electron-deficient like AlCl_3 , yet BF_3 does NOT dimerize. The most likely reason is

- (1) F is more electronegative than Cl, making BF_3 ionic
- (2) B is smaller than Al, causing steric strain
- (3) F back-donates π electron density into empty B orbital via filled 2p orbitals, partially satisfying B's deficiency
- (4) BF_3 achieves octet by forming ionic bonds with F

Q14. In the structure of Al_2Cl_6 , the central 4-membered ring has angle at bridging Cl = 79° and angle at Al = 101° , while terminal Cl-Al-Cl angle = 118° . Which conclusion is correct?

- (1) Al-Cl-Al angle (79°) is greater than Cl-Al-Cl bridge angle (101°)
- (2) The central ring is a perfect square with all angles = 90°
- (3) Cl-Al-Cl bridge angle (101°) > Al-Cl-Al angle (79°), showing the ring is puckered
- (4) Terminal Cl-Al-Cl angle equals the bridge Cl-Al-Cl angle

Q15. Which set of properties is correct for Al_2Cl_6 ?

- (1) Trigonal planar geometry at Al; bridging bond shorter than terminal; ionic bridge bond
- (2) Tetrahedral geometry at Al; bridging bond longer than terminal; coordinate bridge bond
- (3) Tetrahedral geometry at Al; bridging bond shorter than terminal; covalent bridge bond
- (4) Trigonal planar geometry at Al; bridging bond longer than terminal; coordinate bridge bond