(b) Using equation $\beta = b + q$ [From $B_4H_{10}^0$]

we get $\beta = 4 + 0 = 4$.

This bonding topology corresponds to sytx number 4102*. The 4102 bonding shown in fig. 7.14 is consistent with these parameters and fits well for the observed structure of the molecule. There are four three centre two electron B–H–B bonds, one B–B bond. and six normal B–H bonds. B–H bond is formed by the overlapping of 1s–orbital of H–atom and one of the sp^3 hybrid orbitals of boron. The B–B bond is formed when sp^3 hybrid orbitals of two boron atoms overlap each other. The B.....H.....B bond is formed when 1s–orbital of H–atom overlaps with sp^3 hybrid orbitals of two boron atoms. Here, the contribution of electrons is being done by H– atom and one boron atom.

Carboranes Or Carbaboranes.

These are polyhedral boranes that contain frame work carbon atoms as well as boron atom. A carborane may also be **defined** *as a boron–hydrogen compound in which carbon atoms occupy structural sites similar to those occupied by boron atoms.*

* we know (i) $a - b = x + y$

$4 - 2 = 2 + 0$

$2 = 2$

[∴ in the proposed structure of B_2H_6 ; x = no. of BH_2 groups (= 2) + 2 no. of BH_3 group (= 0) And. y = no. of B–B bonds = 0]

(ii) $\beta = s + t$

$2 = 2 + 0$

$2 = 2$

[∴ in B_2H_6 structure s = no. of B–H–B bonds (= 2) And. t = no. of B–B–B bonds

Hence sytx = 2002.

* We know (i) $a - b = x + y$

$7 - 4 = 2 + 1$

$3 = 3$

[∴ in the propored structure of B_4H_{10} ; x = no. of BH_2 groups (= 2) + 2 no.of BH_3 groups (= 0) = 2 + 0 = 2 And. y = no. ofB – B bonds = 1

(ii) $\beta = s + t$

$4 = 4 + 0$

[∴ in B_4H_{10} structure, s = no. of B – H – B bonds bonds (= 4) = 4 And. t = no. of B – B – B bonds.

Important series of carbonanes are :

(i) **Closo–carboranes.** These are such carboranes in which two BH^- units of a $B_nH_n^{2-}$ borane anions are replaced by the **isoel– electronic CH units.**

(ii) Carboranes having 1, 3, or even 4 carbon atoms and including arachno, nido as well as closo structures.

Nomenclature. Since in most cases, isomers are possible, nomenclature of

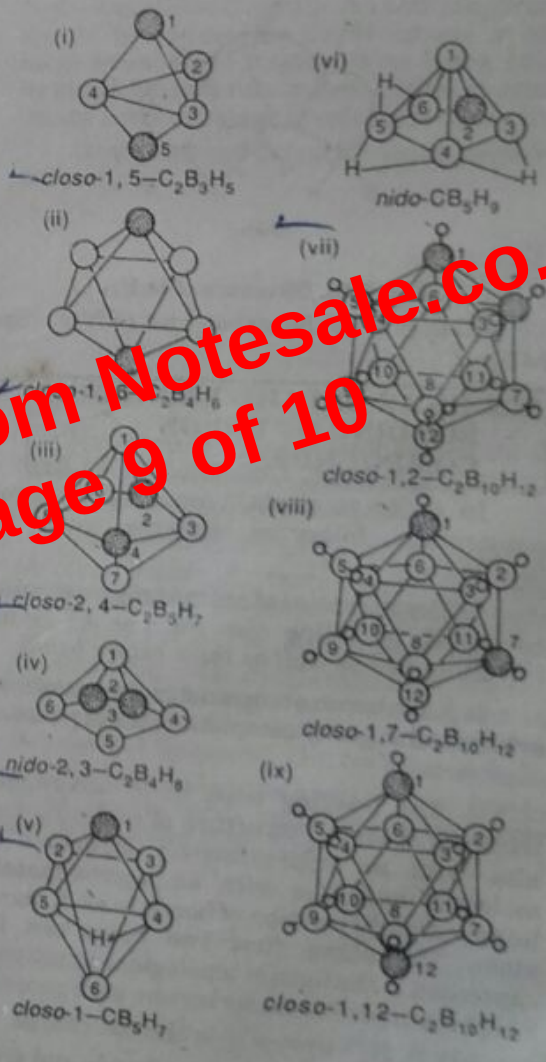

Fig. 7.16. Some representative carboranes showing numbering schemes.