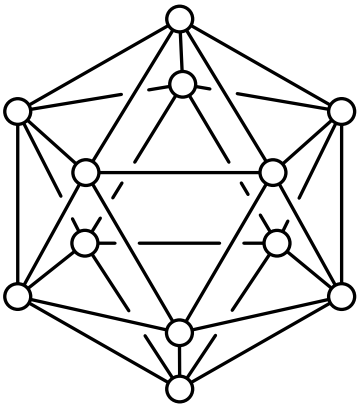
Ch112 Inorganic Chemistry
September 27, 2016
In-Class Problem A

Boranes, compounds of B and H, can exhibit a variety of structures. One interesting borane form is the dodecaborane dianion, $[B_{12}H_{12}]^{2-}$, which adopts an icosahedral structure. Replacement of two BH units in $[B_{12}H_{12}]^{2-}$ with CH moieties gives rise to neutral compounds called carboranes $[B_{10}C_2H_{12}]$.

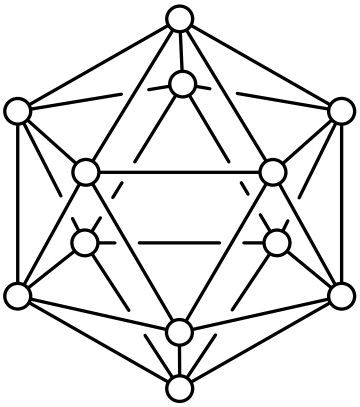
1. Draw all three possible isomers of $[B_{10}C_2H_{12}]$ using the template shown below.

For each isomer answer the following:

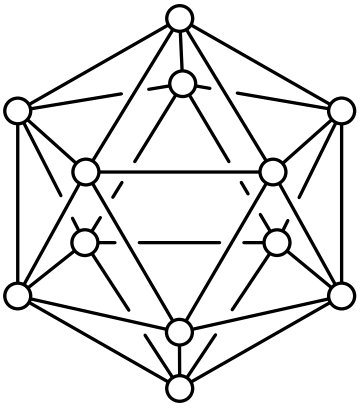
2. What is the point group?
3. How many unique shifts do you expect to observe in the $^{11}B-NMR$?
4. Is the molecule chiral? If not, which symmetry operation makes the molecule achiral?



○ = BH
● = CH



○ = BH
● = CH



○ = BH
● = CH

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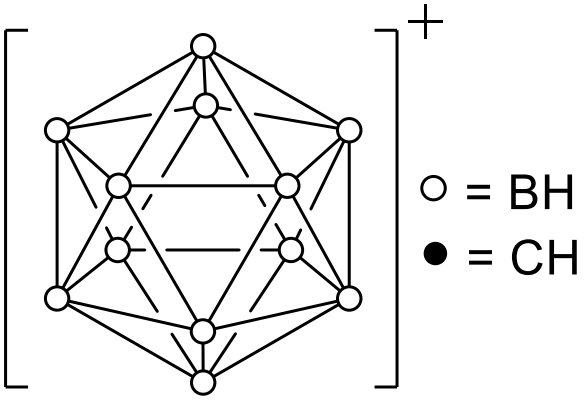
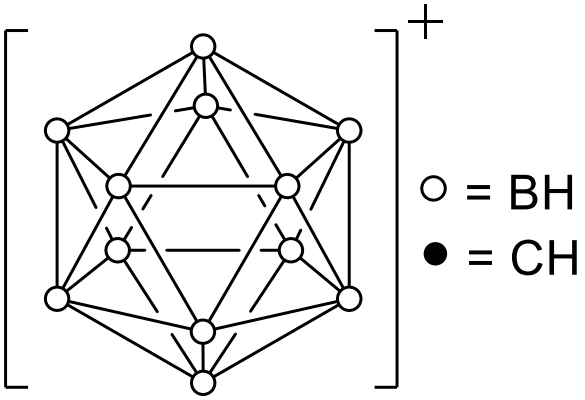
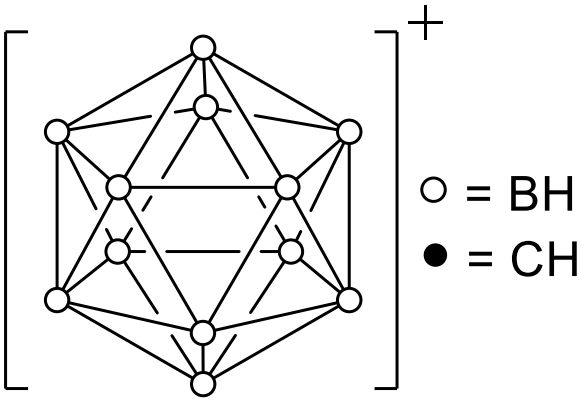
In-Class Problem B

Boranes, compounds of B and H, can exhibit a variety of structures. One interesting borane form is the dodecaborane dianion, $[B_{12}H_{12}]^{2-}$, which adopts an icosahedral structure. Replacement of BH units in $[B_{12}H_{12}]^{2-}$ with CH moieties gives rise to compounds called carboranes. For the particular case in which three BH units have been substituted with CH units, forming the $[B_9C_3H_{12}]^+$ cation, come up with three *different* isomers using the scheme below. For each isomer answer the following:

1. What is the point group?
2. How many unique shifts do you expect to observe in the $^{11}B-NMR$?
3. Is the molecule chiral? If not, which symmetry operation makes the molecule achiral?







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In-Class Problem C

Boranes, compounds of B and H, can exhibit a variety of structures. One interesting borane form is the dodecaborane dianion, $[B_{12}H_{12}]^{2-}$, which adopts an icosahedral structure. Replacement of BH units in $[B_{12}H_{12}]^{2-}$ with CH moieties gives rise to compounds called carboranes. For the particular case in which four BH units have been substituted with CH units, forming the $[B_8C_4H_{12}]^{2+}$ dication, three possible isomers are shown below. For each isomer answer the following:

1. What is the point group?
2. How many unique shifts do you expect to observe in the $^{11}B-NMR$?
3. Is the molecule chiral? If not, which symmetry operation makes the molecule achiral?