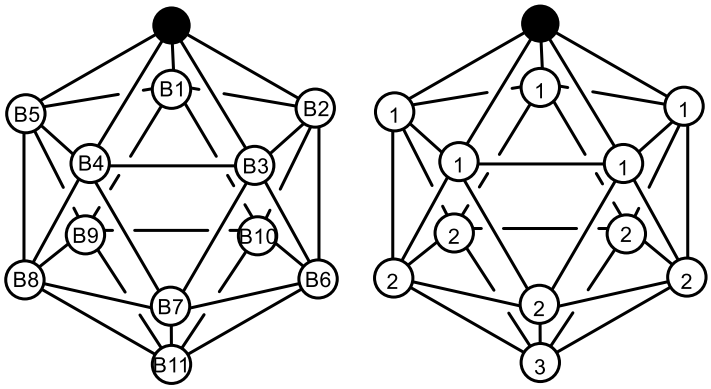
Ch112 Inorganic Chemistry
September 29, 2016
In-Class Problem A

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 one BH unit in $[B_{12}H_{12}]^{2-}$ with a CH moiety gives rise to a monoanion carborane $[B_{11}CH_{12}]^{-}$. On the left, each boron is given a unique label. On the right, symmetry equivalent borons are given identical numerical labels.



Using the eleven boron atoms as the basis set, fill out the transformation matrix for the C_5^2 operation (clockwise rotation).

											•	B1	= B3
												B2	
												B3	
												B4	
												B5	
												B6	
												B7	
												B8	
												B9	
												B10	
												B11	

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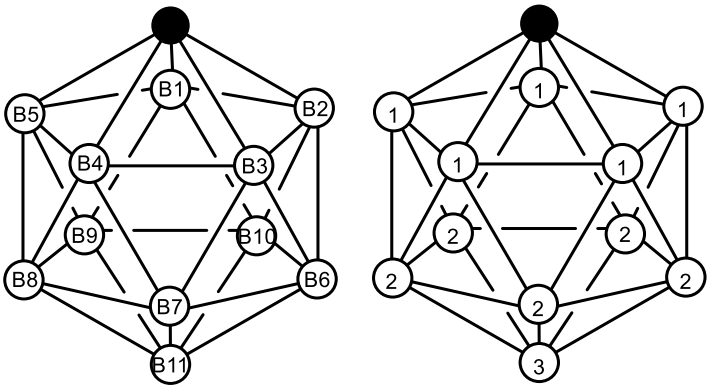
In-Class Problem B

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 one BH unit in $[B_{12}H_{12}]^{2-}$ with a CH moiety gives rise to a monoanion carborane $[B_{11}CH_{12}]^{-}$. On the left, each boron is given a unique label. On the right, symmetry equivalent borons are given identical numerical labels.



Using the eleven boron atoms as the basis set, fill out the transformation matrix for the σ_v operation through the plane perpendicular to the page.

$\bullet$

B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
B11

$=$

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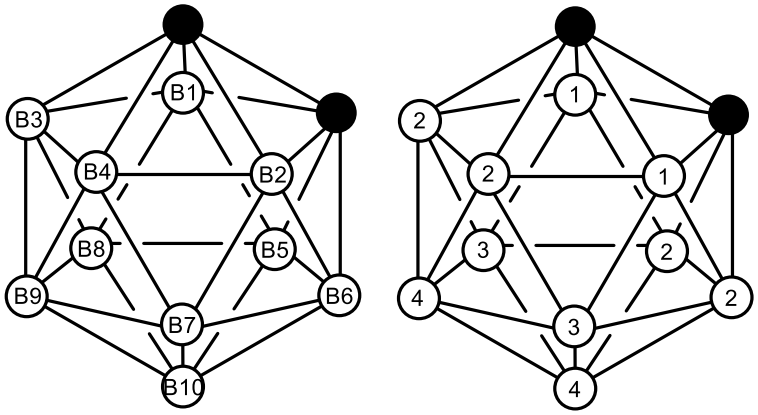
In-Class Problem C

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 two BH units in $[B_{12}H_{12}]^{2-}$ with CH moieties gives rise to neutral compounds called carboranes $[B_{10}C_2H_{12}]$.

The *ortho* isomer is shown below. On the left, each boron is given a unique label. On the right, symmetry equivalent borons are given identical numerical labels.



Using the ten boron atoms as the basis set, fill out the transformation matrix for the C_2 operation.

$\bullet$

B1
B2
B3
B4
B5
B6
B7
B8
B9
B10

$=$

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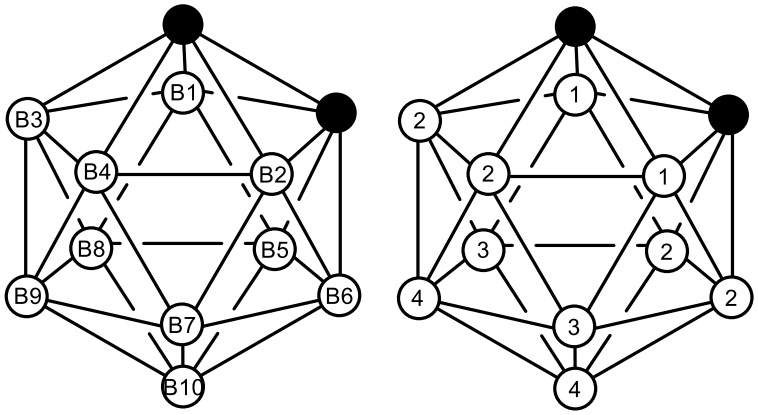
In-Class Problem D

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 $[B_{10}C_2H_{12}]$.

The *ortho* isomer is shown below. On the left, each boron is given a unique label. On the right, symmetry equivalent borons are given identical numerical labels.



Using the ten boron atoms as the basis set, fill out the transformation matrix for the σ_v operation through the plane containing both carbon atoms.

$\bullet$

B1
B2
B3
B4
B5
B6
B7
B8
B9
B10

$=$
