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| (A) Ionization Energy for removing all the electrons from BORON, one by one1. If electrons are smiley faces, in which case is the outermost electron tougher to remove?

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| 1. This is data for removing five electrons from a Boron atom:

1. One this graph, next to all five dots write words similar to CLOSE or FAR or OTHER WORDS to describe where you think the electron is compared to the nucleus.
2. On other paper, draw a Bohr-style picture (Look at today’s class notes) of boron’s nucleus and how close its electron rings are to the nucleus. Number the electrons 1, 2, 3, 4, & 5 to match the five electrons from the graph above.
 | 1. This is data for removing just the first three electrons from a boron atom:

1. One this graph, next to all three dots write words similar to CLOSE or FAR or OTHER WORDS to describe where you think the electron is compared to the nucleus.
2. On other paper, draw a Bohr-style picture of boron’s nucleus and how close its electron rings are. Number the electrons 1, 2, & 3 to match the three electrons from the graph above.
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| (**B**) Ionization Energy for removing all the electrons from SODIUM, one by one 1. Electrons that are easy to remove are probably ( close to / far from ) the nucleus.
2. Choose one. All else being equal, removing an electron will be tougher in which situation?
	1. when the nucleus of the atom has 5 protons
	2. when the nucleus of the atom has 6 protons

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| 1. One this graph, next to all nine dots write words similar to CLOSE or FAR or OTHER WORDS to describe where you think the electron is compared to the nucleus.
2. On other paper, draw a Bohr-style picture (Look at today’s class notes) of boron’s nucleus and how close its electron rings are to the nucleus. Number the electrons 1 through 9 to match the nine electrons from the graph above.
 |  1. One this graph, next to all eleven dots write words similar to CLOSE or FAR or OTHER WORDS to describe where you think the electron is compared to the nucleus.
2. On other paper, draw a Bohr-style picture (Look at today’s class notes) of boron’s nucleus and how close its electron rings are to the nucleus. Number the electrons 1, 2, 3… to match the eleven electrons from the graph above.
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| (C) Ionization Energy for removing all the electrons from CALCIUM, one by one 1. If electrons are smiley faces, in which case is the outermost electron tougher to remove?

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| 1. One this graph, next to all twenty dots write words similar to CLOSE or FAR or OTHER WORDS to describe where you think the electron is compared to the nucleus.
2. On other paper, draw a Bohr-style picture (Look at today’s class notes) of boron’s nucleus and how close its electron rings are to the nucleus. Number the electrons 1, 2, 3… to match the twenty electrons from the graph above.
 | 1. One this graph, next to all 18 dots write words similar to CLOSE or FAR or OTHER WORDS to describe where you think the electron is compared to the nucleus.
2. On other paper, draw a Bohr-style picture (Look at today’s class notes) of boron’s nucleus and how close its electron rings are to the nucleus. Number the electrons 1, 2, 3..to match the 18 electrons from the graph above.
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| (D) The Radius of each element 1. If electrons are smiley faces, in which case is the outermost electron tougher to remove?

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1. Circle the atom that has more protons in the nucleus: **Liuthium**  or **Beryllium**
2. Circle the atom that has the greater radius: **Lithium**  or **Beryllium**.
3. Circle the atom that has more protons in the nucleus: **fluorine** or **sodium**
4. Circle the atom that has the greater radius: **fluorine** or **sodium**.
5. Circle correct words: “Going from Na to Mg, the radius gets ( smaller / larger ) and there are ( less / more ) protons.
6. Circle correct words: “Going from F to Na, the radius gets ( smaller / larger ) and there are ( less / more ) protons.
7. Make a rule: “When an element has more protons in the nucleus..
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