

ionization energies of boron, B, and between the fourth and fifth ionization energies of carbon, C. In each case, the jump in ionization energy occurs when an ion assumes a noble-gas configuration. For example, the removal of one electron from a lithium atom ( $[\text{He}]2s^1$ ) leaves the helium noble-gas configuration. The removal of four electrons from a carbon atom ( $[\text{He}]2s^22p^2$ ) also leaves the helium configuration. A bigger table would show that this trend continues across the entire periodic system.

### SAMPLE PROBLEM F

Consider two main-group elements, A and B. Element A has a first ionization energy of 419 kJ/mol. Element B has a first ionization energy of 1000 kJ/mol. Decide if each element is more likely to be in the *s* block or *p* block. Which element is more likely to form a positive ion?

**SOLUTION** Element A has a very low ionization energy, which means that atoms of A lose electrons easily. Therefore, element A is most likely to be an *s*-block metal because ionization energies increase across the periods.

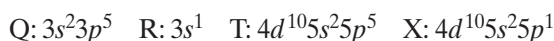
Element B has a very high ionization energy which means that atoms of B have difficulty losing electrons. Element B would most likely lie at the end of a period in the *p* block.

Element A is more likely to form a positive ion because it has a much lower ionization energy than element B does.

### PRACTICE

Answers in Appendix E

1. Consider four hypothetical main-group elements, Q, R, T, and X, that have the outer electron configurations indicated below. Then, answer the questions that follow.



- a. Identify the block location of each hypothetical main-group element.
- b. Which of these elements are in the same period? Which are in the same group?
- c. Which element would you expect to have the highest first ionization energy? Which would have the lowest first ionization energy?
- d. Which element would you expect to have the highest second ionization energy?
- e. Which of the elements is most likely to form a 1+ ion?

#### extension

Go to [go.hrw.com](http://go.hrw.com) for more practice problems that ask you to use periodic trends in ionization energy.



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