Answer Key

Supplemental Problems:

Chapter 6

For questions 1–5, do not use the periodic table.

1. Write the electron configurations for the elements in periods 2–4 of group 2A.

   period 2, group 2A: $1s^2 2s^2$

   period 3, group 2A: $1s^2 2s^2 2p^6 3s^2$

   period 4, group 2A: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

2. Determine the group, period, and block of the elements with the following electron configurations.

   a. $[He]2s^2 2p^4$

   group 6A, period 2, p-block

   b. $[Xe]6s^1$

   group 1A, period 6, s-block

   c. $[Ar]4s^2 3d^{10} 4p^2$

   group 4A, period 4, p-block

3. Categorize each of the elements in problem 2 as a representative element or a transition element.

   All of the elements are representative elements.

4. Write the electron configuration of the element fitting each of the following descriptions. Use noble-gas notations.

   a. Group 8A element in the third period

   $[Ne]3s^2 3p^6$

   b. Group 4A element in the fourth period

   $[Ar]4s^2 3d^{10} 4p^2$

   c. Halogen in the second period

   $[He]2s^2 2p^5$

   d. Group 1A element in the fourth period

   $[Ar]4s^1$

5. What are the noble-gas notations of all the elements with the following valence electron configurations?

   a. s^2

   $1s^2$, $[He]2s^2$, $[Ne]3s^2$, $[Ar]4s^2$, $[Kr]5s^2$, $[Xe]6s^2$, $[Rn]7s^2$

   b. $s^2 p^1$

   $[He]2s^2 2p^1$, $[Ne]3s^2 3p^1$, $[Ar]4s^2 3d^{10} 4p^1$, $[Kr]5s^2 4d^{10} 5p^1$, $[Xe]6s^2 4f^{14} 5d^{10} 6p^1$

For questions 6–9, do not use Figure 6-12, 6-15, or 6-20.

6. Rank the following atoms in order of decreasing radii.

   a. Al, Na, P, S

   Na, Al, P, S

b. Al, Ga, In

In, Ga, Al

c. As, Ge, Ga

Ga, Ge, As

d. Br, Ca, Cl, K

K, Ca, Br, Cl

7. Rank the following ions in order of decreasing radii.

a. Br^-, Cl^-, F^-

Br^-, Cl^-, F^-

b. Be^{2+}, Ca^{2+}, Mg^{2+}

Ca^{2+}, Mg^{2+}, Be^{2+}

c. Ca^{2+}, Ga^{3+}, K^+

K^+, Ca^{2+}, Ga^{3+}

8. Rank the following particles in order of decreasing radii.

a. I, I^-

I^-, I

b. K, K^+

K, K^+

c. Al, Al^{3+}

Al, Al^{3+}

9. Rank the following atoms in order of decreasing electronegativity.

a. Na, Li, K

Li, Na, K

b. K, Sc, Ca

Sc, Ca, K

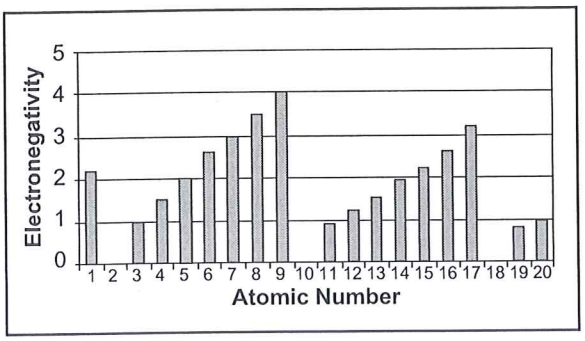
c. As, Sn, S

S, As, Sn

CHAPTER 6 The Periodic Table and Periodic Law

Name: Answer Key Date: _____

Use the graph below to answer questions 1–3.



1 The electronegativity of an element indicates the relative ability of its atoms to attract electrons to form chemical bonds. According to the graph, as you move across a period in the periodic table —

(A) the atomic number increases and the electronegativity increases

B the atomic number increases and the electronegativity decreases

C the atomic number decreases and the electronegativity increases

D the atomic number decreases and the electronegativity decreases

This question covers NSCS B1. This question tests the material that was covered in the textbook on page 169.

2 According to the graph, which of the following elements has the strongest attraction for electrons?

A Aluminum (atomic number = 13)

B Boron (atomic number = 5)

(C) Oxygen (atomic number = 8)

D Sulfur (atomic number = 16)

This question covers NSCS B1. This question tests the material that was covered in the textbook on page 169.

3 Why are there no electronegativity values for the elements with atomic numbers 2, 10, and 18?

A The noble gases form very few compounds because they are gases.

B The noble gases form very few compounds because they are rare.

C The noble gases form very few compounds because they are radioactive.

(D) The noble gases form very few compounds because their electron configurations are very stable.

This question covers NSCS B1. This question tests the material that was covered in the textbook on page 169.

4 Metal is to malleable as nonmetal is to —

(A) brittle

B solid

C dull

D gaseous

This question covers NSCS B1 and B2. This question tests the material that was covered in the textbook on pages 155–158.

5 Elements in the same group of the periodic table have similar chemical properties because they have —

A the same number of orbitals

(B) the same number of valence electrons

C atomic numbers that are multiples of each other

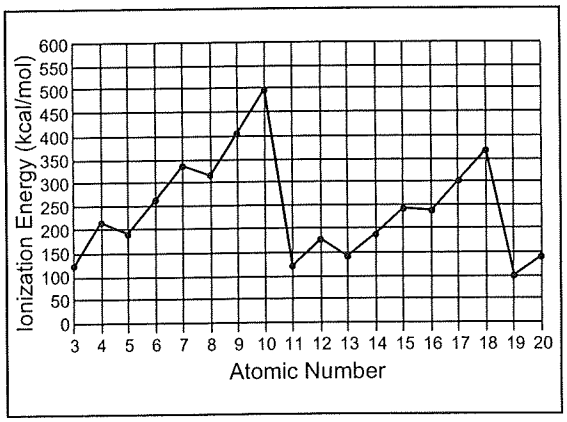
D the same principal energy levels

This question covers NSCS B1 and B2. This question tests the material that was covered in the textbook on page 159.

GO ON

Name: _____ Date: _____

Use the graph below to answer questions 6 and 7.



6 The graph shows the first ionization energy for elements with atomic numbers 3–20. According to the graph, what is the approximate first ionization energy for the element with atomic number 16?

A 300 kcal/mol
B 250 kcal/mol
(C) 240 kcal/mol
D 190 kcal/mol

This question covers NSCS B1 and B6. This question tests the material that was covered in the textbook on pages 167–168.

7 Elements with atomic numbers 4, 12, and 20 are in the same group in the periodic table. As you move down a group —

A the principal energy level increases and the first ionization energy increases
(B) the principal energy level increases and the first ionization energy decreases
C the principal energy level decreases and the first ionization energy increases
D the principal energy level decreases and the first ionization energy decreases

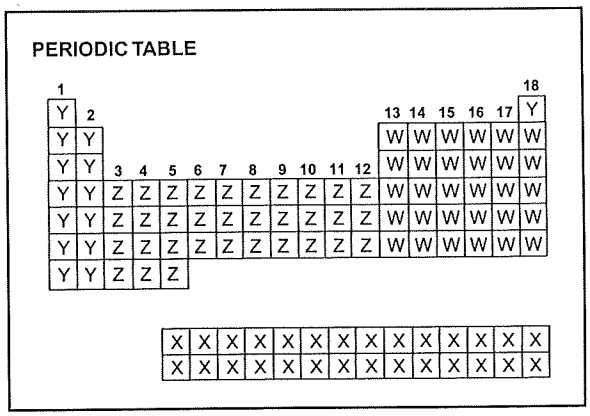
This question covers NSCS B1 and B6. This question tests the material that was covered in the textbook on page 168.

8 Mendeleev left blank spaces in his periodic table where he thought elements that had not yet been discovered should go. He was able to predict the properties of these elements by —

A studying the spectra of stars that contained them
B testing their properties such as melting point, density, and valence
(C) noting periodic trends in the properties of known elements that surrounded the blank spaces in the periodic table
D studying the new elements produced by radioactive decay

This question covers NSCS B1 and G2. This question tests the material that was covered in the textbook on page 153.

Use the diagram below to answer question 9.



9 The periodic table has an unusual shape because it is divided into blocks representing the energy sublevel being filled with valence electrons. In the periodic table shown in the diagram, which sequence lists these blocks in **s-p-d-f** order?

(A) Y, W, Z, X
B W, Y, X, Z
C Y, Z, W, X
D X, Y, Z, W

This question covers NSCS B1 and B6. This question tests the material that was covered in the textbook on pages 160–162.

STOP