Assessment

# Chapter Test B

## Teacher Notes and Answers

### 5 *The Periodic Law*

**TEST B**

1. a
2. c
3. d
4. d
5. a
6. a
7. c
8. a
9. lanthanides
10. 2
11. fourth
12. transition elements
13. 32
14. valence electrons
15. electron affinity
16. electronegativity
17. ionization energy
18. $3s^2\ 3p^4$
19. atomic radius
20. ion
21. Group 1, Period 7, *s* block
22. All three groups of elements are metals. Alkali and alkaline-earth metals are so reactive that they are not found in nature as free elements. Transition elements are generally less reactive. Some are so unreactive that they do not form compounds easily and exist as free elements in nature.
23. Sodium has the largest atomic radius. All the elements belong to Period 3, but sodium has the lowest atomic number and is therefore the first element in Period 3. Atomic radii decrease as you move from left to right across a period.
24. In general, ionization energies of main-group elements increase from left to right across a period and decrease down a group.
25. Electron affinity and electronegativity are related. Electron affinity is a measure of the ease with which an atom gains electrons. Electronegativity is a measure of the ability of an atom to attract electrons. Therefore, atoms with a high negative electron affinity are also the most electronegative.
26. The physical and chemical properties of the elements are periodic functions of their atomic numbers.
27. The ionic radii of cations are always smaller than the atomic radii of the neutral atoms from which they are formed. The ionic radii of anions are always larger than the atomic radii of the neutral atoms from which they are formed.
28. c
29. b
30. e
31. a
32. d
33. Period 5, *s* block
34. Period 4, *p* block
35. Period 4, *d* block
36. $3d^5\ 4s^2$
37. $3s^2\ 3p^3$
38. $4f^{14}5d^{10}6s^2$
39. 1+, helium
40. 2–, neon
41. 2–, argon
42. 3+, neon

Name: _____ Class: _____Date: _____

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## Chapter: The Periodic Law

**PART I In the space provided, write the letter of the term or phrase that best completes each statement or best answers each question.**

_____ 1. In his periodic table, Mendeleev did not list all of the elements in order of increasing atomic mass because he wanted to group together elements with similar
   a. properties.
   b. atomic numbers.
   c. isotopes.
   d. charges.

_____ 2. A new group was added to Mendeleev's periodic table after the discovery of
   a. alkali metals.
   b. electrons.
   c. noble gases.
   d. atomic nuclei.

_____ 3. Moseley discovered that elements with similar properties occurred at regular intervals when the elements were arranged in order of increasing
   a. atomic mass.
   b. density.
   c. radioactivity.
   d. atomic number.

_____ 4. Compared with the elements at the left end of the *p*-block element group, the elements at the right end
   a. have larger radii.
   b. are all solids at 0°C.
   c. have lower ionization energies.
   d. are less metallic.

_____ 5. As the atomic number increases within a group of elements, the atomic radius
   a. generally increases.
   b. remains generally constant.
   c. decreases regularly.
   d. varies unpredictably.

_____ 6. For each successive electron removed from an atom, the ionization energy
   a. increases.
   b. decreases.
   c. remains the same.
   d. equals the nuclear charge.

_____ 7. The halogens are located on the periodic table in Group
   a. 1.
   b. 2.
   c. 17.
   d. 18.

_____ 8. The number of valence electrons for Group 2 elements is
   a. 2.
   b. 8.
   c. *n*–1.
   d. equal to the period number.

**PART II Write the correct term (or terms) in the space provided.**

9. The elements with atomic numbers from 58 through 71 in the periodic table are called the _____.
10. Since the first energy level contains only the 1*s* sublevel, the number of elements in this period is _____.
11. The electron configuration of an element in its ground state is $[Ar]3d^{10}4s^{2}4p^{5}$. This element is in the _____period.
12. Elements whose atoms contain partially filled *d* sublevels when they are in the ground state are called _____.
13. For elements in groups 1, 2, and 18, the increase in atomic number for successive elements follows the pattern 8, 8, 18, 18, _____.
14. The electrons available to be gained, lost, or shared in the formation of chemical compounds are called _____.
15. The energy change when an electron is acquired by a neutral atom is called the _____of the atom.

16. The measure of the ability of an atom in a chemical compound to attract electrons from another atom in the compound is called _____.
17. The energy required to remove one electron from an atom is called its _____.
18. The valence electron configuration for the Group 16 element in Period 3 is _____.
19. One-half the distance between the nuclei of identical atoms that are bonded together is the _____.
20. An atom or group of bonded atoms that has a positive or negative charge is called a(n) _____.

**PART III Write the answers to the following questions in the space provided.**

21. List the group, period, and block in which the element with the electron configuration [Rn]$7s^1$ is located.

_____

22. How do the properties of the transition elements compare with those of the alkali metals and alkaline-earth metals?

_____

_____

_____

23. Of the following elements, which has the largest atomic radius: sodium (atomic number 11), magnesium (atomic number 12), phosphorus (atomic number 15), and chlorine (atomic number 17). Explain your answer in terms of trends in the periodic table.

_____

_____

_____

24. Describe the general trends in ionization energies down a group and across a period.

_____

_____

25. Why are elements with high electron affinities also the most electronegative?

_____

_____

_____

_____

26. State the periodic law.

_____

_____

27. How do the sizes of a cation and an anion compare with the sizes of the neutral atoms from which they are formed?

_____

_____

_____

**PART IV On the line at the left of each term in the first column, write the letter of the expression in the second column that is most closely related.**

28. _____ main group elements
29. _____ lanthanides and actinides
30. _____ transition elements
31. _____ alkali metals
32. _____ halogens

a. Group 1 elements
b. elements that make up the *f* block
c. elements of the *s* and *p* blocks
d. Group 17 elements
e. entire set of *d*-block elements

## PART V

**In the space provided, identify the period and block to which each of the following elements belongs.**

33. Strontium: $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^{10}\,4s^2\,4p^6\,5s^2$

_____

34. Krypton: $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^{10}\,4s^2\,4p^6$

_____

35. Chromium: $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^5\,4s^1$

_____

**In the space provided, write the ground-state valence electron configuration for each of the following elements.**

36. Group 7, Period 4

_____

37. Group 15, Period 3

_____

38. Group 12, Period 6

_____

**In the space provided, list the charge of the ion most likely to be formed from the element and the name of the noble gas with an electron configuration achieved by that formation. (The atomic numbers of the noble gases are: He, 2; Ne, 10; Ar, 18; Kr, 36; Xe, 54; and Rn, 86.)**

39. lithium (atomic number 3)

_____

40. oxygen (atomic number 8)

_____

41. sulfur (atomic number 16)

_____

42. aluminum (atomic number 13)

_____