

14.1

CLASSIFICATION OF THE ELEMENTS

SECTION REVIEW

Objectives

- Explain why you can infer the properties of an element based on those of other elements in the periodic table
- Use electron configurations to classify elements as noble gases, representative elements, transition metals, or inner transition metals

Key Terms

- noble gases
- representative elements
- transition metals
- inner transition metals

d-Block Groups
 f-Block Periods
 p-Block Valence electrons
 atomic number
 representative elements

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

- The periodic table organizes the elements into vertical _____ 1. _____
 _____ 1 _____ and horizontal _____ 2 _____ in order of increasing _____ 3 _____. 2. _____
- The table is constructed so that elements that have similar chemical _____ 3. _____
 properties are in the same _____ 4 _____. The elements in Groups 1A _____ 4. _____
 through 7A are called the _____ 5 _____. The _____ 6 _____ make up Group 0. 5. _____
- The elements in Groups 2A and 3A are interrupted in periods 4 and _____ 6. _____
 5 by the _____ 7 _____ and in periods 6 and 7 by the _____ 8 _____. 7. _____
- The atoms of the noble gas elements have their outermost s _____ 8. _____
 and _____ 9 _____ sublevels filled. The outermost s and p sublevels of _____ 9. _____
 the representative elements are _____ 10 _____. 10. _____

Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

- _____ 11. The representative elements are the Group A elements.
- _____ 12. Chlorine has the electron configuration $1s^2 2s^2 2p^6 3s^2 3p^7$.
- _____ 13. The element in Group 4A, period 3, is gallium.

- _____ 14. There is a relationship between the electron configurations of elements and their chemical and physical properties.

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A

- _____ 15. period
_____ 16. inner transition metal
_____ 17. representative element
_____ 18. transition metal
_____ 19. noble gas
_____ 20. group

Column B

- a. an element in which the outermost *s* and *p* sublevels are filled
b. a horizontal row on the periodic table
c. an element whose outermost *s* sublevel and nearby *d* sublevel contain electrons.
d. an element whose outermost *s* and nearby *f* sublevel generally contain electrons
e. a vertical column on the periodic table
f. an element whose outermost *s* or *p* sublevels are only partially filled.

Part D Questions and Problems

Answer the following in the space provided.

21. List the outer electron configurations for the atoms in period 3 from left to right.

22. List the elements of group 5A. Tell whether each is a solid, liquid or gas, at room temperature; and whether it is a metal, non-metal, or metalloid.

14.2 PERIODIC TRENDS

SECTION REVIEW

Objectives

- Interpret group trends in atomic radii, ionic radii, ionization energies, and electronegativities
- Interpret period trends in atomic radii, ionic radii, ionization energies, and electronegativities

Key Terms

- atomic radius
- ionization energy
- electronegativity

increase decrease
electron ionization
orbitals Left → Right
electronegativity Charge

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

Atomic radii generally 1 as you move from left to right
 in a period. Atomic size generally 2 within a given group
 because there are more 3 occupied and an increased
 shielding effect, despite an increase in nuclear 4.

The energy required to remove an electron from an atom is
 known as the 5 energy. This quantity generally 6 as
 you move left to right across a period. The size of an ion depends
 on whether the atom from which it formed gained or lost an
7. The ionic radius of anions and cations increases as you
 move 8. The ability of a bonded atom to attract electrons
 to itself is known as 9, and this quantity 10 as you
 move from left to right across a period.

Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

11. The radius of an atom cannot be measured directly.

Name _____ Class _____ Date _____

- _____ 12. Removing one electron from an atom results in the formation of a positive ion with a $1+$ charge.
- _____ 13. The relative radii of atoms are estimated as being half the distance between nuclei in diatomic molecules.
- _____ 14. Atoms with high electronegativity tend to form positive ions.

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A

- _____ 15. ionization energy
- _____ 16. electronegativity
- _____ 17. atomic radius
- _____ 18. cations
- _____ 19. periodic law

Column B

- a. half the distance between the nuclei of two atoms.
- b. When the elements are arranged in order of increasing atomic number, there is a periodic pattern in their physical and chemical properties.
- c. the energy required to overcome the attraction of the nuclear charge and remove an electron from a gaseous atom
- d. positively charged ions
- e. the tendency for the atoms of an element to attract electrons when they are chemically combined with another element

Part D Questions and Problems

Answer the following in the space provided.

20. For the following pairs of atoms, tell which one of each pair has the largest ionic radius.
- a. Al, B _____
- b. S, O _____
- c. Br, Cl _____
- d. Na, Al _____
- e. O, F _____
21. Indicate which element of the following pairs has the greater electronegativity.
- a. calcium, gallium _____
- b. lithium, oxygen _____
- c. chlorine, sulfur _____
- d. bromine, arsenic _____