

The Periodic Law

CHAPTER #5 - SECT. #1

Section Quiz: History of the Periodic Table

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

- D 1. In developing his periodic table, Mendeleev listed on cards each element's name, atomic mass, and
- atomic number.
 - electron configuration.
 - isotopes.
 - properties.
- A 2. Mendeleev's periodic table did not list all elements in order of increasing atomic mass because he grouped together elements with similar
- properties.
 - atomic numbers.
 - names.
 - isotopes.
- D 3. Mendeleev predicted that the gaps in his periodic table represented
- ions.
 - radioactive elements.
 - unstable elements.
 - undiscovered elements.
- A 4. The person whose work led to a periodic table based on increasing atomic number was
- Moseley.
 - Mendeleev.
 - Rutherford.
 - Cannizzaro.
- B 5. The periodic law states that the physical and chemical properties of elements are periodic functions of their atomic
- masses.
 - numbers.
 - radii.
 - structures.

Section Quiz, *continued*

- C 6. Which group of elements was discovered by Strutt and Ramsay?
- lanthanides
 - halogens
 - ☒ noble gases
 - actinides
- C 7. A repeating pattern is referred to as
- unpredictable.
 - irregular.
 - ☒ periodic.
 - a group.
- B 8. On most periodic tables, the lanthanides and actinides appear
- on a separate page.
 - ☒ below the main portion.
 - on the back.
 - at the top.
- B 9. What is the difference in atomic number between He and Ne?
- 2
 - ☒ 8
 - 18
 - 32
- D 10. Which noble gas has the greatest atomic number?
- Ar
 - Xe
 - Kr
 - ☒ Rn

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CHAPTER #5 - SECT. #2

Section Quiz: Electron Configuration and the Periodic Table

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

- B 1. An element that has the electron configuration $[\text{Ne}]3s^23p^5$ is in Period
- 2.
 - 3.
 - 5.
 - 7.
- D 2. An element that has the electron configuration $[\text{Ne}]3s^23p^5$ is in Group
- 2.
 - 5.
 - 7.
 - 17.
- B 3. Elements in the s and p blocks of the periodic table are called
- alloys.
 - main-group elements.
 - metals.
 - transition metals.
- A 4. Elements in Group 18 have
- very low reactivity.
 - good conductivity.
 - very high reactivity.
 - metallic character.
- B 5. Nonmetallic elements in Group 17 that react with most metals to form salts are
- alkali metals.
 - halogens.
 - lanthanides.
 - noble gases.

BE SURE TO KNOW AT LEAST
15 REGIONS/BLOCKS/ZONES OF THE
PERIODIC TABLE (LIKE PROJECT).

Section Quiz, *continued*B

6. The outer-level electron configuration of a neutral alkaline-earth metal atom consists of

- a. one electron in the *s* orbital.
- ☒ b. two electrons in the *s* orbital.
- c. one electron in the *p* orbital.
- d. two electrons in the *p* orbital.

B

7. In nature the alkali metals are found only in compounds because they

- a. have small atoms.
- ☒ b. are very reactive elements.
- c. are rare elements.
- d. each have a stable octet.

D

8. To which group does hydrogen belong?

- a. Group 1
- b. Group 2
- c. Group 18
- ☒ d. None of the above

C

9. An element found in groups 3–12 of the periodic table is classified as a(n)

- a. alkali metal.
- b. alloy.
- ☒ c. transition metal.
- d. actinide.

C

10. In which group is an element that has an outer-level electron configuration consisting of one electron in the *d* orbital and two electrons in the *ns* orbital?

- a. Group 1
- b. Group 2
- ☒ c. Group 3
- d. Group 5

Name

Class

Date

Assessment

The Periodic Law

CHAPTER #5 - SECTION #3

Section Quiz: Electron Configuration and Periodic Properties

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

- A 1. An electron that is in the highest energy level of an atom and determines the atom's chemical properties is called a(n)
 a. valence electron.
 b. paired electron.
 c. extra electron.
 d. opposite-spin electron.
- C 2. What can be removed from an atom if ionization energy is supplied?
 a. a proton
 b. a neutron
 c. an electron
 d. an ion
- C 3. Across a period in the periodic table, ionization energy generally
 a. decreases.
 b. decreases, then increases.
 c. increases.
 d. remains constant.
- A 4. Down a group in the periodic table, the change in ionization energy is due to
 a. increasing electron shielding.
 b. decreasing charge of the nucleus.
 c. increasing neutrons in the nucleus.
 d. decreasing atomic radii.
- B 5. The atomic radius of an atom that is chemically bonded to an identical atom is equal to
 a. the distance between the nuclei.
 b. half the distance between the nuclei.
 c. twice the distance between the nuclei.
 d. one-fourth the distance between the nuclei.

Atomic Radius
 Ionization Energy (IE)
 Electron Affinity
 Electronegativity
 Ionic Radius

BE SURE TO KNOW THE 5 TRENDS OF THE PERIODIC TABLE BOTH DOWN A GROUP + ACROSS (L → R)

A PERIOD.

Section Quiz, *continued*

- A 6. Across a period in the periodic table, atomic radii generally
- ☒ a. decrease.
 - b. decrease, then increase.
 - c. increase.
 - d. increase, then decrease.

- C 7. Down a group in the periodic table, atomic radii generally
- a. decrease.
 - b. remain constant.
 - ☒ c. increase.
 - d. vary unpredictably.

- A 8. One of the least electronegative elements would be found on the periodic table in
- ☒ a. Group 1, Period 7.
 - b. Group 3, Period 4.
 - c. Group 5, Period 3.
 - d. Group 17, Period 2.

- A 9. As the atomic numbers of the metals of Group 1 increase, the ionic radii
- ☒ a. increase.
 - b. decrease.
 - c. remain the same.
 - d. cannot be determined.
- MOVING DOWN THE GROUP #1
↓

- D 10. An element with the smallest anionic (negative-ionic) radius would be found on the periodic table in
- a. Group 1, Period 7.
 - b. Group 3, Period 4.
 - c. Group 5, Period 3.
 - ☒ d. Group 17, Period 2.

closest to the top of TABLE
smallest IN PER #2



Answer the following items on a separate piece of paper.

MULTIPLE CHOICE

- In the modern periodic table, elements are arranged according to
 - decreasing atomic mass.
 - Mendeleev's original model.
 - increasing atomic number.
 - when they were discovered.
- Group 17 elements, the halogens, are the most reactive of the nonmetal elements because they
 - require only one electron to fill their outer energy level.
 - have the highest ionization energies.
 - have the largest atomic radii.
 - are the farthest to the right in the periodic table.
- The periodic law states that
 - the chemical properties of elements can be grouped according to periodicity.
 - the properties of the elements are functions of atomic mass.
 - all elements in the same group have the same number of valence electrons.
 - all elements with the same number of occupied energy levels must be in the same group.
- As you move left to right across Period 3 from Mg to Cl, the energy needed to remove an electron from an atom
 - generally increases.
 - generally decreases.
 - does not change.
 - varies unpredictably.
- Which of the following elements has the highest electronegativity?
 - oxygen
 - hydrogen
 - fluorine
 - carbon
- The noble gases have
 - high ionization energies.
 - high electron affinities.
 - large atomic radii.
 - a tendency to form both cations and anions.

7. Which electron configuration is *not* correct?

- $O^{2-} [He]2s^2 2p^6$
- $Mg^{2+} [He]2s^2 2p^6$
- $V^{3+} [Ar]3d^2$
- $Al^{3+} [Ar]2s^2 2p^6$

8. Which two elements are more likely to have the same charge on their ions?

- Se and As
- Sn and Si
- Ca and Rb
- I and Xe

9. Using only the periodic table, choose the list that ranks the elements Sr, Te, Kr, Ru, and Cs in order of increasing ionization energy.

- $Sr < Te < Ru < Cs < Kr$
- $Te < Ru < Sr < Cs < Kr$
- $Cs < Sr < Ru < Te < Kr$
- $Kr < Cs < Sr < Ru < Te$

SHORT ANSWER

10. The second ionization energies for the elements S–Ti are listed in a scrambled order below. Assign the correct IE_2 value to each element. (Hint: S has $IE_2 = 2251$ kJ/mol, and Ti has $IE_2 = 1310$ kJ/mol.) Explain your reasoning.
 IE_2 values (kJ/mol): 2666, 2297, 3051, 1235, 2251, 1310, and 1145

11. What group most commonly forms 2– ions? Explain your reasoning.

EXTENDED RESPONSE

12. An ordered list of atomic radii for 14 consecutive elements is shown below. Without using Figure 13 on page 151, make a graph of these atomic radii versus the element's atomic number. Explain your reasoning.

Atomic radii (pm): 75, 73, 72, 71, 186, 160, 143, 118, 110, 103, 100, 98, 227, and 197

Test TIP

If you are short on time, quickly scan the unanswered questions to see which might be easiest to answer.

To give students practice under more realistic testing conditions, give them 60 minutes to answer all of the questions in this Standardized Test Preparation.

TEST ANSWERS

- C
- A
- A
- A
- C
- A
- D
- B
- C
- S: 2251 kJ/mol; Cl: 2297 kJ/mol; Ar: 2666 kJ/mol; K: 3051 kJ/mol; Ca: 1145 kJ/mol; Sc: 1235 kJ/mol; Ti: 1310 kJ/mol. For the second ionization, the general trend is for increasing IE_2 across the period in Groups 2–18 with Group 1 having the highest IE_2 . IE_2 decreases going down a group.
- Group 16 most commonly forms 2– ions, because these elements require only two more electrons to fill their shell (obtain a noble-gas configuration).

Answers are continued on page 173B.

REVIEW S.T.P. ANSWERS FOR
CHAPTER #5 TEST ON
Wed. 11/8/2017!
MR. NOVAK

