

CHAPTER 5 STUDY GUIDE FOR CONTENT MASTERY

Section 5.3 Electron Configurations

In your textbook, read about ground-state electron configurations.

Use each of the terms below just once to complete the passage.

Aufbau principle	electron configuration	ground-state electron configuration	Hund's rule
lowest	Pauli exclusion principle	spins	stable

The arrangement of electrons in an atom is called the atom's

- (1) electron configuration. Electrons in an atom tend to assume the arrangement that gives the atom the (2) lowest possible energy. This arrangement of electrons is the most (3) stable arrangement and is called the atom's (4) ground-state electron configuration.

Three rules define how electrons can be arranged in an atom's orbitals. The

- (5) Aufbau principle states that each electron occupies the lowest energy orbital available. The (6) Pauli exclusion principle states that a maximum of two electrons may occupy a single atomic orbital, but only if the electrons have opposite (7) spins. (8) Hund's rule states that single electrons with the same spin must occupy each equal-energy orbital before additional electrons with opposite spins occupy the same orbitals.

Complete the following table.

Element	Atomic Number	Orbitals				Electron Configuration
		1s	2s	2p _x	2p _y 2p _z	
9. Helium	2	↑↓				1s ²
10. Nitrogen	7	↑↓	↑↓	↑	↑	1s ² 2s ² 2p ³
11. Neon	10	↑↓	↑↓	↑↓	↑↓	1s ² 2s ² 2p ⁶

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Section 5.3 continued

Answer the following questions.

12. What is germanium's atomic number? How many electrons does germanium have?
32; 32

13. What is noble-gas notation, and why is it used to write electron configurations?

Noble-gas notation uses the bracketed symbol of the nearest preceding noble gas atom in the periodic table in the electron configurations of an atom. Using noble-gas notation allows you to represent the complete electron configuration of an atom with many electrons in a shorthand form.

14. Write the ground-state electron configuration of a germanium atom, using noble-gas notation.

[Ar]4s²3d¹⁰4p²

In your textbook, read about valence electrons.

Circle the letter of the choice that best completes the statement or answers the question.

15. The electrons in an atom's outermost orbitals are called
a. electron dots. b. quantum electrons. c. valence electrons. d. noble-gas electrons.
16. In an electron-dot structure, the element's symbol represents the
a. nucleus of the noble gas closest to the atom in the periodic table.
b. atom's nucleus and inner-level electrons.
c. atom's valence electrons.
d. electrons of the noble gas closest to the atom in the periodic table.

17. How many valence electrons does a chlorine atom have if its electron configuration is [Ne]3s²3p⁵?
a. 3 b. 21 c. 5 d. 7

18. Given boron's electron configuration of [He]2s²2p¹, which of the following represents its electron-dot structure?

a. •Be• b. •B• c. B: d. B̄

19. Given beryllium's electron configuration of 1s²2s², which of the following represents its electron-dot structure?
a. •Be• b. •B̄• c. B̄: d. B̄

20. Which electrons are represented by the dots in an electron-dot structure?

a. valence electrons c. only s electrons
b. inner-level electrons d. both a and c