

# The Electron Cloud

## Content Objectives:

I can explain the movement of electrons within atoms as they absorb or emit different amounts of energy.

## Criteria for Success:

I can define and explain ground state and excited state.

I can tell the difference between an atom in the ground state and an excited state using the electron configuration.

I can explain the concept of emission spectra.

## Notes

### Absorption and Emission of Energy by Electrons

A. Atoms will exist in two states in relation to \_\_\_\_\_.

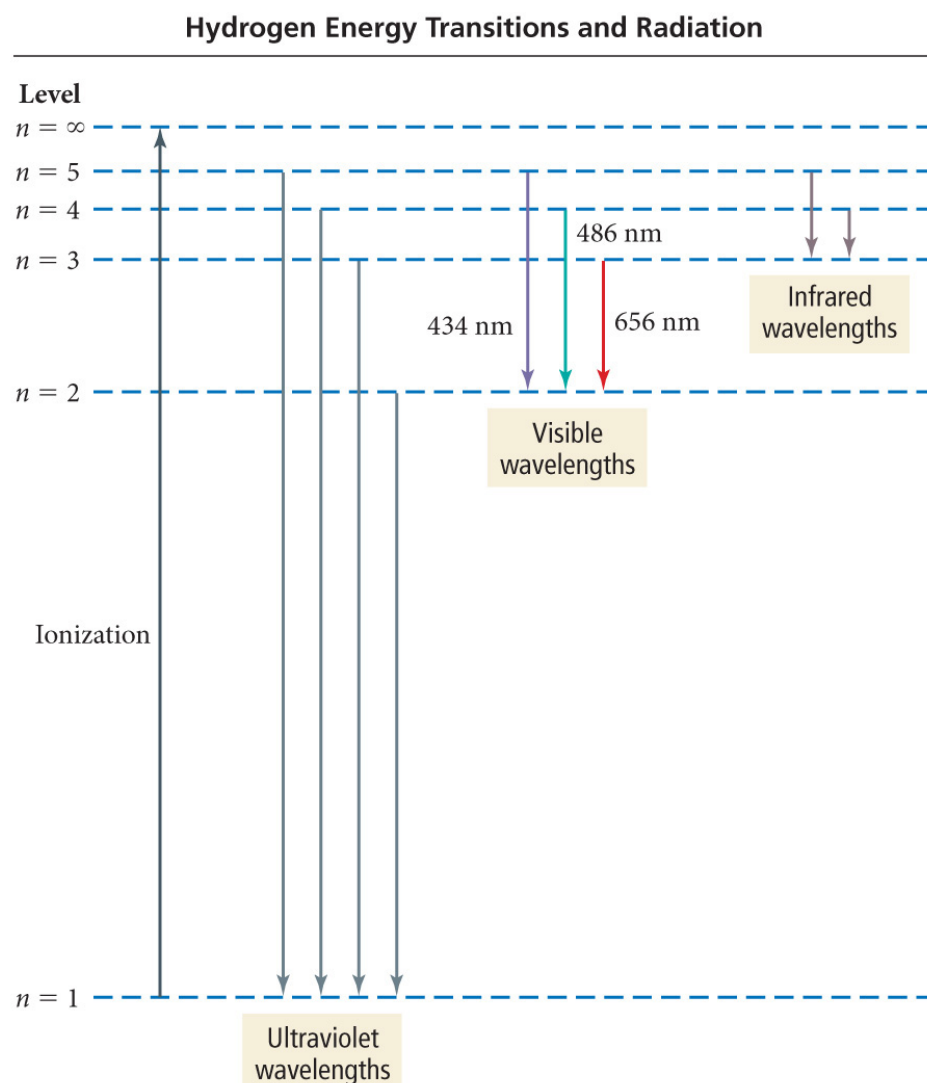
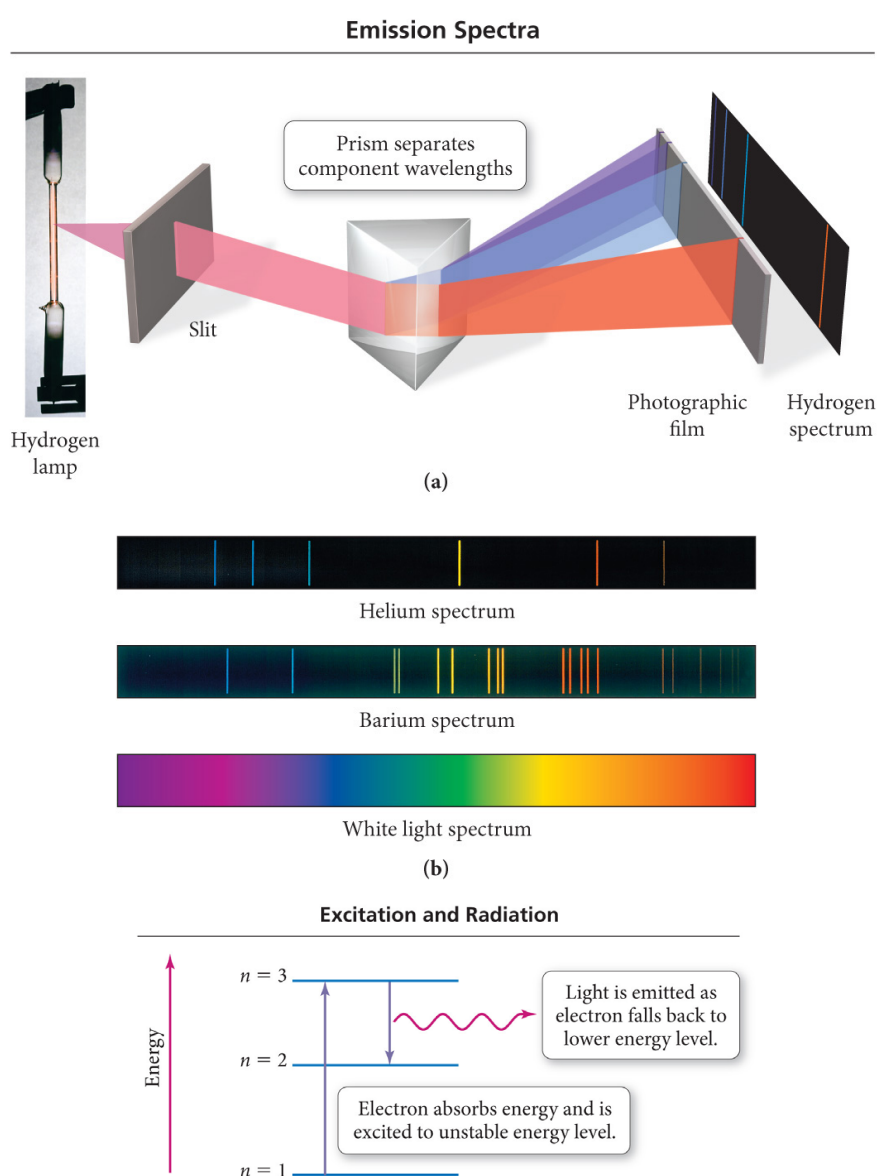
1. The lowest potential energy state of an atom is its \_\_\_\_\_.

2. A state in which an atom has a higher potential energy than it does in its ground state is an \_\_\_\_\_.

B. Electrons can move to a higher energy orbital by gaining a specific amount, or \_\_\_\_\_, of \_\_\_\_\_.

C. When electrons fall back from the excited state a specific amount or, a \_\_\_\_\_, of \_\_\_\_\_ is released equal to the energy difference between the two orbitals.

D. The \_\_\_\_\_ of an element is the relative intensity of each frequency of electromagnetic radiation emitted by the atom as the atom's electrons return from the excited state to the ground state.



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## Independent Practice

- 1 In a calcium atom in the ground state, the electrons that possess the *least* amount of energy are located in the  
 A first electron shell  
 B second electron shell  
 C third electron shell  
 D fourth electron shell
- 2 An atom of oxygen is in an excited state. When an electron in this atom moves from the third shell to the second shell, energy is  
 A emitted by the nucleus  
 B emitted by the electron  
 C absorbed by the nucleus  
 D absorbed by the electron
- 3 As an electron in an atom moves from the ground state to the excited state, the electron  A gains energy as it moves to a higher energy level  
 B gains energy as it moves to a lower energy level  
 C loses energy as it moves to a higher energy level  
 D loses energy as it moves to a lower energy level
- 4 A bright-line spectrum of an atom is caused when electrons  
 A release energy and jump to a higher energy level  
 B release energy and fall to a lower energy level  
 C absorb energy and jump to a higher energy level  
 D absorb energy and fall to a lower energy level
- 5 Which electron configuration represents an atom in an excited state?  
 A  $1s^2 2s^2 2p^6 3p^1$   
 B  $1s^2 2s^2 2p^6 3s^2 3p^1$   
 C  $1s^2 2s^2 2p^6 3s^2 3p^2$   
 D  $1s^2 2s^2 2p^6 3s^2$
- 6 How does the ground state electron configuration of the hydrogen atom differ from that of a ground state helium atom?  
 A Hydrogen has one electron in a higher energy level.  
 B Hydrogen has two electrons in a lower energy level.  
 C Hydrogen contains a half-filled orbital.  
 D Hydrogen contains a completely filled orbital.
- 7 Which is an electron configuration of a fluorine atom in the excited state?  
 A  $1s^2 2s^2 2p^4$   
 B  $1s^2 2s^2 2p^5$   
 C  $1s^2 2s^2 2p^4 3s^1$   
 D  $1s^2 2s^2 2p^5 3s^1$
- 8 A transition element in the ground state could have an electron configuration of  
 A  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$   
 B  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^5$   
 C  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$   
 D  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6$
- 9 Which electron configuration represents a potassium atom in the excited state?  
 A  $1s^2 2s^2 2p^6 3s^2 3p^3$   
 B  $1s^2 2s^2 2p^6 3s^1 3p^4$   
 C  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$   
 D  $1s^2 2s^2 2p^6 3s^2 3p^5 4s^2$
- 10 Which electron configuration represents an atom in an excited state?  
 A  $1s^2 2s^2 2p^2$   
 B  $1s^2 2s^2 2p^1$   
 C  $1s^2 2s^2 2p^5 3s^2$   
 D  $1s^2 2s^2 2p^6 3s$