

Exercise 4.3b

Electron Cloud Models

Name: _____

Date: _____ Per: _____

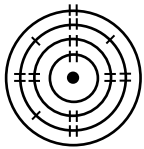
The electron cloud model is a product of quantum mechanics. It represents electrons as existing in areas of space around the nucleus based on probability, not as particles orbiting the nucleus like planets around the sun. These areas of space, or orbitals, collectively create a region with fuzzy boundaries like a cloud. That cloud can be subdivided into energy levels (1-7 typically), which can be subdivided into sublevels (s,p,d,f), and finally into orbitals. Each orbital may hold up to two electrons. This distribution of electrons can be described by using four formats; box orbital notation, electron configuration, Bohr model, or Lewis dot model.

Sample

Vanadium (V)

Electron Configuration: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^3$

Box Orbital																		
1s	2s	2p		3s	3p			4s	3d			4p	5s	4d				
↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑	↑	↑							



Bohr

Bohr models emphasize energy level.
 The 2 e⁻ from 1s are drawn on the first ring (n=1).
 The 8 e⁻ from 2s & 2p are drawn on the second ring.
 The 11 e⁻ from the 3s, 3p, & 3d are drawn on the third ring.
 The 2 e⁻ from 4s are drawn on the fourth ring.

The rings represent the energy level of the electrons.
 Dashes are used to represent electrons and are paired like they occur in orbitals.

Lewis Dot $\cdot \overset{\cdot}{\underset{\cdot}{\text{V}}} \cdot$

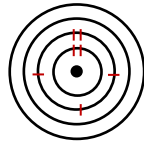
Lewis dot models emphasize valence electrons.
 Valence electrons are the electrons that occur only in the highest energy level of the atom. They would be in the outermost ring of the Bohr model. These electrons are shown as dots around the atomic symbol of the element. There can be no more than 8 and no more than 2 per side. Start at the top and draw the dots moving clockwise around the atomic symbol.

DIRECTIONS: Complete the following models for the species listed. Then write the electron configuration.

Nitrogen (N)

Electron Configuration: $1s^2 2s^2 2p^3$

Box Orbital (7e ⁻)																		
1s	2s	2p		3s	3p			4s	3d			4p	5s	4d				
↑↓	↑↓	↑	↑	↑														



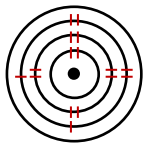
Bohr

Lewis Dot $\cdot \overset{\cdot}{\underset{\cdot}{\text{N}}} \cdot$

Sulfur (S)

Electron Configuration: $1s^2 2s^2 2p^6 3s^2 3p^4$

Box Orbital (16e ⁻)																		
1s	2s	2p		3s	3p			4s	3d			4p	5s	4d				
↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑	↑											



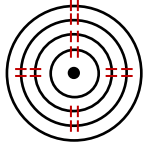
Bohr

Lewis Dot $\cdot \overset{\cdot}{\underset{\cdot}{\text{S}}} \cdot$

Calcium (Ca)

Electron Configuration: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

Box Orbital (20e ⁻)																		
1s	2s	2p		3s	3p			4s	3d			4p	5s	4d				
↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓										



Bohr

Lewis Dot $\cdot \overset{\cdot}{\underset{\cdot}{\text{Ca}}} \cdot$

Exercise 4.3b

Electron Cloud Models

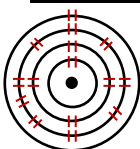
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Zinc (Zn)

Box Orbital ($30e^-$) Electron Configuration: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$

1s		2s		2p			3s	3p			4s	3d					4p			5s	4d										
↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓														



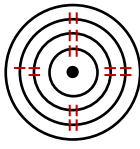
Bohr

Lewis Dot $\cdot \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{Zn}}}$

Chlorine (Cl)

Box Orbital ($17e^-$) Electron Configuration: $1s^2 2s^2 2p^6 3s^2 3p^5$

1s		2s		2p			3s	3p			4s	3d					4p			5s	4d									
↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑																				



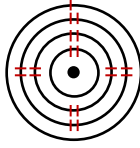
Bohr

Lewis Dot $\cdot \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{Cl}}}$

Potassium (K)

Box Orbital ($19e^-$) Electron Configuration: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

1s		2s		2p			3s	3p			4s	3d					4p			5s	4d									
↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑																			



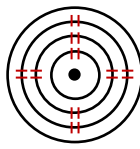
Bohr

Lewis Dot $\cdot \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{K}}}$

Argon (Ar)

Box Orbital ($18e^-$) Electron Configuration: $1s^2 2s^2 2p^6 3s^2 3p^6$

1s		2s		2p			3s	3p			4s	3d					4p			5s	4d									
↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓																				



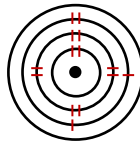
Bohr

Lewis Dot $:\overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{Ar}}}$

Silicon (Si)

Box Orbital ($14e^-$) Electron Configuration: $1s^2 2s^2 2p^6 3s^2 3p^2$

1s		2s		2p			3s	3p			4s	3d					4p			5s	4d									
↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑	↑																					



Bohr

Lewis Dot $\cdot \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{Si}}}$