

Unit Four: Electrons in Atoms

Unit Review Guide

Learning Targets

- Describe what Bohr proposed in his model of the atom.
- Describe what the quantum mechanical model determines about the electrons in an atom.
- Explain how sublevels of principal energy levels differ.
- List the three rules for writing the electron configurations of elements.
- Explain what causes atomic emission spectra.

Define each of the following:

1. Atomic orbital

2. Aufbau principle

3. Electron configuration

4. Ground state

5. Excited state

6. Pauli exclusion principle

7. Hund's rule

8. Atomic emission spectrum

9. Quantum

Where in the Bohr's model are the following found:

1. Electrons

2. Protons

3. Nucleus

Which scientist developed the quantum mechanical model of the atom?

What is the quantum mechanical model?

What happens to the energy of an electron as the electron moves closer to the nucleus?

What is the shape of the s sublevel?

What is the shape of the p sublevel?

What is the shape of the d sublevel?

Describe the shape of the f sublevel.

What is the maximum number of s orbitals in any single energy level?

What is the maximum number of p orbitals in any single energy level?

What is the maximum number of d orbitals in any single energy level?

What is the maximum number of f orbitals in any single energy level?

The shape of an electron cloud is determined by what?

Describe the relationship of the spins of electrons in an orbital.

What does a stable electron configuration consists of?

When zapped with electricity, a tube containing gaseous element X emits a mixture of red and violet light.

What causes the electrons to jump in energy?

What happens when those electrons relax?

Which color emitted represents light with a higher energy?

Draw an energy level diagram below, represent the electron energy level transitions that are associated with the red and violet lights and label them. Note that there are several possible answers.

Draw the orbital diagram and provide the electron configuration for each of the following atoms:

Boron

Carbon

Chlorine

Neon

Calcium

How many valence electrons are in each of the atoms from question 2?

Boron _____ Carbon _____ Chlorine _____ Neon _____ Calcium _____

Using noble gas abbreviations, give the electron configurations for the following neutral atoms:

Niobium (Nb)

Indium (In)

Antimony (Sb)

Iodine

Radium (Ra)

Copper

Palladium (Pd)

Barium

How many valence electrons are in each of the above atoms?

Niobium _____ Indium _____ Antimony _____ Iodine _____

Radium _____ Copper _____ Palladium _____ Barium _____

List the element that is represented by each of the following electron configurations:

a. $[\text{Ar}] 4s^2 3d^5$ b. $[\text{Kr}] 5s^2 4d^{10} 5p^4$ c. $[\text{Ne}] 3s^2$ d. $[\text{Xe}] 6s^1$ e. $[\text{Xe}] 6s^2 4f^{14} 5d^{10} 6p^2$

Write the electron configuration for the following elements, using only your periodic table (do not draw the orbital diagram first).

Magnesium

Chlorine

Nitrogen

Potassium

Copper

Arsenic

Silver