

Practice Problems Chapter 6

1. Answer the following questions:

(a) Without using quantum numbers, describe the differences between the shells, subshells, and orbitals of an atom.

Shells are where all electrons that have the same value for N go

Within a shell all electrons that share the same L are in the same subshell

When electrons share the same N and L and M_l are in the same orbital

(b) How do the quantum numbers of the shells, subshells, and orbitals of an atom differ?

The first quantum number that stands for the shell is represented by a positive integer. (1,2,3) This number gets bigger the farther it is away from the nucleus. The subshells rely on the first quantum number. This describes the function and where you can most likely find an electron. The first subshell s has 1 orbital and each successive subshell adds 2 more orbitals. (0 to $(n-1)$) The third quantum number is based off of the second number and represents the orbital. It describes how the shape is oriented in space. Each orbital can only hold 2 electrons of opposite spin. The magnetic quantum number is what distinguishes different orbitals in a subshell. ($-l$ to $+l$)

2. State the Heisenberg uncertainty principle. Describe briefly what the principle implies.

The Heisenberg uncertainty principle states that there is inherent uncertainty in the act of measuring a variable of a particle. The more precisely the position is known the more uncertain the momentum is and vice versa. This principle is basically saying that the position and velocity of an object can't both be measured exactly at the same time.

3. Write a set of quantum numbers for each of the electrons with an n of 3 in a Sc atom.

$3s^2 3p^6 3d^1 4s^2$

4. Based on their positions in the periodic table, predict which has the smallest first ionization energy: Li, Cs, N, F, I.

Cs has the smallest ionization energy