6.9

a) The *l* value for this orbital is 1

b) We label this orbital p

c) An analogous orbital in the n=4 shell would be larger

6.49

a) The Bohr model of the atom, which we refer to as the planetary model, requires that we know the exact position of the electrons as they orbit the nucleus through position of allowed energy. The HUP states that there are limits to the precision with which we can know the position and momentum of an electron, meaning the Bohr model of the atom is inherently limited in its usefulness.

b) De Broglie stated that electrons demonstrate the properties of particles and waves and that each particle (regardless of size or speed) has a wave associated with it. A wave function is the mathematical description of this associated wave.

c) Although we can't predict exactly where an electron will be at any given time, we can identify locations of greatest probability. The positions have a greater probability density.

6.50

a) The Bohr model of the atom attempts to describe with 100% certainty the location of an electron relative to the nucleus; in this case 0.53Å distant. In the quantum mechanical model, we understand that the electron is most likely found in a spherical volume 0.53Å in radius, but not exactly at this distance at any given time.

b) Classical physics attempts to describe particles based on their position, direction of travel, and speed. Wave equations account for the fact that this method of study is not allowed by subatomic particles.

c) Electrons in the 3s orbital have a larger average distance from the nucleus than electrons in the 2s

6.59

a) The 1s and 2s orbitals are similar in shape, both spherical. They differ in that the 1s is smaller than the 2s.

b) The 2p orbitals have a directional character in that they orient 90˚ to each other in order to minimize repulsion. The d_{x2-y2} has electron density along the x and y axis, while the p_x only has electron density along the x axis. (See pages 225-226 for diagrams).

c) An electron in the 2s orbital will have a smaller average distance from the nucleus than an electron in the 3s.

6.61

a) 1p is not allowed. The first energy level has no p sublevel

b) 4s is okey-dokey

c) 5f is allowed

d) 2d is not allowed. The second energy level has only an s and p sublevel.

6.68

a) The 3p sublevel has greater energy than the 3s sublevel. While both occupy the third every level, the p orbitals have slightly greater energy than the s

b) If will require less energy to remove a 3s electron from chlorine than a 2p electron.

6.71 a) 6 b) 10 c) 2 d) 14

6.73

a) Valence electrons are outer shell electrons. They are involved in chemical bonding.

b) Core electrons are the electrons that are not valence; they are in the inner shells.

c) Each box in an orbital diagram represents an orbital

d) Each arrow represents an electron. The direction of the arrow represents the electron's spin.

6.75

a) Cs: $[Xe]6s^1$

b) Ni: $[Ar]4s^23d^8$

c) Se: $[Ar]4s^23d^{10}4p^4$

d) Cd: $[Kr]5s^24d^{10}$

e) U: $[Rn]7s^26d^15f^3$

f) Pb: $[Xe]6s^25d^{10}4f^{14}6p^2$

6.77

a) Be; 0 unpaired electrons

b) O; 2 unpaired electrons

c) Cr; 6 unpaired electrons

d) Te; 2 unpaired electrons