Practice Sheet Chapter 7 second part

1. The following sets of quantum numbers describe electrons in an atom. Identify those that are not valid and explain why they are not valid. Draw the shape of the orbital of each valid designation.

n l m s

* 1. 3 2 -1 ½
  2. 3 2 2 ½
  3. 1 1 2 ½
  4. 3 1 2 ½

1. Give a possible set of quantum numbers for an electron in the following orbitals:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **6d** | **4s** | **7p** |
| ***n*** |  |  |  |
| ***l*** |  |  |  |
| ***ml*** |  |  |  |
| ***ms*** |  |  |  |

1. An electron in a hydrogen atom relaxes to the *n* = 4 level, emitting light of 114 THz (1 THz= 1 x1012 Hz). What is the value of *n* for the level in which the electron originated?
2. What physical meaning is attributed to the square of the wave function ψ2?
3. Write the complete electron configuration for an atom of magnesium.
4. Write the shorthand electron configuration as predicted by the periodic table for osmium.
5. What are valence electrons and why are they important?
6. Both vanadium and its 3+ ion are paramagnetic. Use electron configurations to explain why this is so.
7. Explain how effective nuclear charge and ionization energy are related.
8. Explain briefly why the atomic radii increase moving down the periodic table, and *decrease* moving to the right on the periodic table.
9. Below is a list of successive ionization energies in kJ/mol for a period 3 element. Identify the element and explain how you came to that conclusion.

IE1 = 1012; IE2 = 1900; IE3 = 2910; IE4 = 4960; IE5 = 6270; IE6 = 22,200

1. Define shielding and effective nuclear charge. What is the connection between the two (5 points)?