

**QUANTUM MECHANICS WORKSHEET**

1. In Bohr's theory of the atom, the energy levels of an atom are said to be "quantized". What is meant by the term quantum of energy?
2. Both the Bohr model and the quantum mechanical model of the atom involve quantized energy levels for electrons. How are the models different in their description of electron location?
3. Define Heisenberg's uncertainty principle.
4. Define the term atomic orbital.
5. Sketch the shapes of the s, p, and d orbitals.
6. Name the 4 quantum numbers how are they designated, what information do they provide
7. Answer the following:
  - a) How many s-orbitals are there at any principal energy level?
  - b) How are s-orbitals designated for each level?
  - c) At which energy level do p-orbitals first appear?
  - d) How many p-orbitals are present for each level?
  - e) How is the orientation of the p-orbital indicated?
  - f) At which level do d-orbitals first appear?
  - g) How many d-orbitals are present at each level?
8.
  - a) What is the relationship between the principal energy level (n) and the number of orbitals found at that level?
  - b) What is the maximum number of electrons allowed in any orbital?
  - c) How do you determine the number of orientations for a particular orbital?
  - d) What does  $2n^2$  stand for?
  - e) How many subshells are available in the 4<sup>th</sup> energy level? How many orbitals are present in each of the subshells? Name each of the orbitals.
  - f) Why does the M shell in Bohr theory really contain 18 electrons while the N shell really contains 32 electrons?
9. Define the following.
  - a) Aufbau Principle
  - b) Hund's Rule
  - c) Pauli's Exclusion Principle
10. Write the orbital filling and electron configurations of the first 20 elements.
11. Write the electron configurations of the following:
  - a) selenium
  - b) vanadium
  - c) chromium
  - d) nickel
  - e) copper
  - f) strontium