### Part A - Multiple Choice

**Identify the choices that best complete the statement or answer the question.**

**A.**
1. In Bohr's model of the atom, where are the electrons and protons located?
   a. The electrons move around the protons, which are at the center of the atom.
   b. The electrons and protons move throughout the atom.
   c. The electrons occupy fixed positions around the protons, which are at the center of the atom.
   d. The electrons and protons are located throughout the atom, but they are not free to move.

2. The principal quantum number indicates what property of an electron?
   a. Position
   b. Energy level
   c. Electron cloud shape
   d. Speed

3. How many energy sublevels are in the second principal energy level?
   a. 1
   b. 2
   c. 3
   d. 4

4. What is the maximum number of orbitals in any single energy level in an atom?
   a. 1
   b. 2
   c. 3
   d. 4

5. What is the maximum number of electrons in the fourth principal energy level?
   a. 2
   b. 8
   c. 18
   d. 32

6. What does an electron move from a lower to a higher energy level?
   a. Always absorbs energy
   b. Absorbs a continuous amount of energy
   c. Absorbs a quantized amount of energy
   d. Moves closer to the nucleus

7. The letter "p" in the symbol [Ar] indicates the __________
   a. Principal energy level
   b. Orbital shape
   c. Quantum number
   d. Speed of an electron

8. If the spin of electron 1 in an orbital is clockwise, what is the spin of the other electron in that orbital?
   a. Anti-clockwise
   b. Clockwise
   c. Both clockwise and anti-clockwise
   d. Not possible

9. What types of atomic orbitals are in the third principal energy level?
   a. s and p only
   b. p and d only
   c. s, p, and d only
   d. Not possible

10. What is the next atomic orbital in the series 1s, 2s, 2p, 3s, 3p?
    a. 3d
    b. 4s
    c. 5s
    d. 4d

11. What is the number of electrons in the outermost energy level of an oxygen atom?
    a. 2
    b. 3
    c. 4
    d. 5

12. What is the electron configuration of potassium?
    a. [Ar] 4s² 3p⁶
    b. [Ar] 3s² 3p⁶
    c. [Ar] 4s² 4p³
    d. [Ar] 3s² 3p⁶

13. If these electrons are available to fill these empty 3p orbital, how will the electron be distributed in the three orbitals?
    a. One electron in each orbital
    b. Two electrons in one orbital, one in another, none in the third
    c. Three in one orbital, none in the other two
    d. Three electrons cannot fill three empty 3p atomic orbitals.

### Part B - Short Answer

1. Give the electron configuration for each of the following atoms:
   - **Beryllium:** $\text{Be}^2+$
   - **Chlorine:** $\text{Cl}^-$
   - **Titanium:** $\text{Ti}^4+$

2. State the energy level and the number of valence electrons for each of the following:
   - **Boron:** 2p², 2 electrons
   - **Sodium:** 3s¹, 2 electrons
   - **Lithium:** 2p⁰, 4 electrons
   - **Silicon:** 3s², 4 electrons

3. Write the abbreviated electron configuration for each of the following elements:
   - **Tin:** [Kr] 5s² 5p²
   - **Magnesium:** [Ar] 4s²
   - **Tellurium:** [Kr] 5s² 5p⁴

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**Chemistry 112**

**Chapter 5 Quiz**

**Name:**

**Date:**

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Part D - Essay

1. Describe the different principles that govern the building of an electron configuration.

Anthau - Lower energy first
Pauli - 2 e⁻ per orbital, opposite spins
Hund - e⁻ enter orbitals in single file, double up if they have a

2. Uranium has an unexpected electron configuration. Write both the expected and actual electron configurations of uranium and explain why this happens.

Exp: [Xe] 6s^2 4f^9 5d^2
Actual: [Xe] 6s^1 4f^8 5d^2 S→d promotion

By giving 1e⁻ to the 5d, 6s loses some of its stability by 5d gaining a lot more stability being exactly half filled.