Unit 2 Review: The Quantum Mechanical Model

1. Identify how each of the following contributed to our understanding of atoms…
   a. Leucippus & Democritus
   b. Aristotle
   c. John Dalton
   d. J.J. Thomson
   e. Rutherford

2. How does the atomic mass of protons, neutrons, and electrons compare? What SI unit do we use to measure the mass of these three sub-atom particles?

3. What is the difference between atomic mass, relative atomic mass, and mass number?

4. How do you identify the number of protons, neutrons, and electrons for each element using the periodic table?

5. Which of the three subatomic particles is used to define each element on the periodic table?

6. What is an ion? When elements ionize, what are they trying to accomplish?

7. What are isotopes? What is the percent abundance of isotopes in nature used to calculate?

8. How is relative atomic mass calculated? How can the relative atomic mass be used to identify the most common isotope of an element?

9. How did each of the following contribute to the development of the periodic table?
   a. Newlands
   b. Mendeleev
   c. Mosely

10. Why was Mendeleev’s periodic table considered better than Newlands?

11. What is the value of the Periodic Table?

12. Compare and contrast Periods and Groups on the periodic table?

13. Compare and contrast Metals, Non-metals, and Metalloids. Include in this discussion the characteristics of each group and their location on the periodic table.

14. Identify where the Main Group Elements and Transition Metals are located on the periodic table.


16. How did scientists discover that electrons were located in defined energy levels?

17. Explain how an orbital is different than an orbit. How are the Bohr Model and Quantum Mechanical Model vastly different in their presentation of electrons?

18. How is “n” represented on the periodic table?
19. State **Aufbau’s Principle**. Using the periodic table below, identify how it can be organized to help remember Aufbau’s principle. (The periodic table will be the only tool that you can use to complete electron configurations on the test. Know how to use it as a tool!)

![Periodic Table](image)

20. The quantum number “ℓ”…
   a. Compare and contrast the “s”, “p”, “d”, & “f” orbitals.
   b. How are the 3 “s” orbitals different?
   c. Compare and contrast the “1s” and “2s” orbitals.
   d. Compare and contrast the “2s” and “2p” orbitals.

21. What does the **Pauli Exclusion Principle** tell us about orbitals? Why is this rule important for you to understand?

22. When electrons are paired within an orbital, what do we know about their spin? How is this relationship represented?

23. Hund’s Rule is best modeled by completing orbital boxes. State **Hund’s Rule**.

24. Complete an orbital box diagram for each of the following elements.
   a. O
   b. Si
   c. K
   d. Fe
   e. Se
25. Identify the electron configuration for each of the following…
   a. Li
   b. Li$^{+1}$
   c. N
   d. N$^{3-}$
   e. Sn
   f. Sn$^{2+}$
   g. S
   h. S$^{2-}$

26. Ions…
   a. What does each of the ions in the above question have in common?
   b. When atoms ionize, what are they trying to achieve?
   c. What group of atoms on the periodic table is most stable? What do the electron configurations of these atoms have in common?

27. Identify the following element and write the **shorthand electron configuration** for each.
   a. $1s^22s^2$
   b. $1s^22s^22p^63s^23p^5$
   c. $1s^22s^22p^63s^23p^64s^23d^{10}$
   d. $1s^22s^22p^63s^23p^64s^23d^{10}4p^4$
   e. $1s^22s^22p^63s^23p^64s^23d^{10}4p^65s^24d^{10}5p^1$
   f. $1s^22s^22p^63s^23p^64s^23d^{10}4p^65s^24d^{10}5p^66s^1$
   g. $1s^22s^22p^63s^23p^64s^23d^{10}4p^65s^24d^{10}5p^66s^24f^{14}5d^6$

28. Draw a visual representation of Mg to represent the different orbitals in the quantum mechanical model.

29. Draw a visual representation of Kr to represent the different orbitals in the quantum mechanical model.